THE

PROCEEDINGS

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OF

NEW SOUTH WALES.

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FOR THE YEAR 1884.

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ERRATUM.

Page 252, line 34—instead of "reason for this, for it appears," read "reason for what appears."

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF NEW SOUTH WALES.

WEDNESDAY, 30TH JANUARY, 1884.

The President, C. S. Wilkinson, F.L.S., F.G.S., etc., in the Chair.

Dr. von Lendenfeld and Mr. Joseph E. Carne, of the Mines Department, were introduced as visitors.

MEMBER ELECTED.

Capt. George Richard Stevens, F.R.G.S., F.R.A.S., Culver, Little Hartley.

DONATIONS.

"Feuille des Jeunes Naturalistes." No. 158, December, 1883. From the editor.

Two pamphlets, "Humanism and Realism in their Relations to Higher Education," and "The Progress of Geology, 1883." By Prof. Julius von Haast, F.R.S., &c. From the author.

"Prodromus systematis Mammalium et Avium." Caroli Illigeri, 1811. "Researches on the Southern Gold-fields of N.S.W." By the Rev. W. B. Clarke, M.A., 1860. "Manual of the Natural History, Geology and Physics of Greenland," 1875. Balfour's "Comparative Embryology," vol. ii. "South Australia and its Mines." By Francis Dutton, 1846. "Explorations in Australia." By John Forrest, F.R.G.S., 1875. From J. J. Fletcher, Esq., M.A., B.Sc.

"British Museum Catalogue of Birds," volumes VII. and VIII. From the Trustees.

"Bulletin of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass.," Vol. XI., Nos. 3 and 4. "Annual Report of the Curator for 1882-83." From the Curator.

"Science," Vol. II., Nos. 41, 43 and 44; Nov. 10th to Dec. 7th. From the Editor.

"Say's Conchology," edited by W. G. Binney, 8vo, 1858. "Official Catalogue of the Melbourne International Exhibition of 1881," Vols. I. and II. From J. F. Bailey, Esq.

"Bibliotheca Historico-Naturalis et Mathematica." Lager-Catalog, 1883. From Messrs. R. Friedlander and Son, Berlin.

Two pamphlets, "Botany of Kangaroo Island," and "Lists of Plants from South Australia." By Prof. R. Tate, F.L.S. From the author.

"Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirkes Frankfurt." No. 2, November, 1883. From the Society.

PAPERS READ.

Supplement to the Descriptive Catalogue of the Fishes of Australia.

By William Macleay, F.L.S., &c.

It is now nearly three years since I completed the "Descriptive Catalogue of the Fishes of Australia," and, as I thought probable at the time, it has become very necessary already to publish a Supplement, so many have been the additions made since that date to the Fish Fauna of the Australian waters both salt and fresh.

But in addition to the fishes described since the date of the Catalogue I am enabled by the kindness of Dr. Klunzinger to include now some fishes described by him some years ago in the publications of German Societies, but not seen by me.

Dr. Klunzinger's first publication on Australian Fishes appeared in the "Archiv. fur naturg. XXXVIII., 1872," and consisted of a list of fishes, some described as new, sent to him by Baron Sir F. von Mueller, and collected in South Australia. Dr. Klunzinger's next publication was of a much more important character. It was a list, with comments and descriptions, of all the Australian Fishes contained in the Mueller Colleetion in the Museum of Stuttgart, published in the "Sitzb. der K. Akad. Wissensch, 1879." It contains a carefully compiled list of the literature of New Holland Fishes from the earliest period known to the date of the publication, and in addition to the previous list of South Australian Fishes, the author gives notes and descriptions of a large number of fishes from Port Darwin and many parts of Northern Queensland. Dr. Klunzinger's first publication in 1872 clashes somewhat with Count Castelnau's published in the same year, in the first Vol. of the Proceedings of the Zool. and Acclim. Soc. of Victoria. I am not sure which has the priority, but I see that Dr. Klunzinger claims it. Dr. Klunzinger's second publication was read in 1879, and published sometime in 1880, it has therefore priority as regards my Catalogue.

Dr. Gunther's report on the shore fishes collected during the Challenger Expedition, "Zool. Part VI.," also published in 1880, adds a few to the list of Australian Fishes; some of them trawled off Twofold Bay and the rest collected by Sir Wyville Thomson, at the Mary River, Queensland. The greater number however, of the new species here recorded, have been already published in the Proceedings of the Linnean Society of New South Wales, by Mr. De Vis, M.A., Queensland, E. P. Ramsay, F.L.S., Sydney, and myself. I have also been able to add some species from a most excellent paper or rather a series of papers read by Mr. Robert M. Johnston, F.L.S., before the Royal Society of Tasmania in August 1882, on "The Fishes of Tasmania with a classified Catalogue of the known species." It would be well for the Australian Student of Natural History, if Mr. Johnston's example were followed in all branches of Zoology and Botany, in all our Australian colonies. Without questioning the superiority in Biological Science of the Germans, it still seems unnecessary, as it is degrading, for the simple purpose of the identification of species and the compilation of a classified Catalogue of the animal life of the country to send, as South Australia has done, all her collections to Vienna, to be recorded in a foreign tongue and in foreign publications.

I have adopted in this Supplement the same system as in the Catalogue. I number the species consecutively from the last in the Catalogue, and when referring to any previously noticed, I do so by the number given to it in the Catalogue. I give a description of every genus and species whether new or not, which has not been previously described in the Catalogue, or in the publications of this Society, and I take these descriptions either from Dr. Gunther's Catalogue or from the author direct.

Family. PERCIDÆ.

Species 7. *Lates Darwiniensis*, Macleay.

Found by Mr. Morton in Lillesmere Lagoon, Burdekin River. Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 200.

Species 9. *Pseudolates cavifrons*, All. and Macleay.

Also found in Lillesmere Lagoon. (loc. cit.)

Species 16. *Anthias rasor*, Richards.

I have lately seen a specimen of this Fish from South Australia. Dr. Klunzinger described it in 1872, as *A. rasor* var. *extensus*, from South Australia, and subsequently in 1879, made it a new species. I feel confident, however, that the species is not a good one; the absence of the lateral spot is, I believe, of not unfrequent occurrence.

1134. SERRANUS POLYPODOPHILUS. Bleek.

Atl. Ichth. Perc. p. 59, tab. 5, fig 1. Klunz. Sitzb. der K. Akad, der Wissensch, 1879.

D. 11/15-17. P. 2/16-17. A. 3/8-9. L. lat. 110. L. tr. 60/65.

Body oblong, compressed; the height 3 to $3\frac{1}{2}$ times in the length without, and 4 to $4\frac{1}{2}$ times in the length, with the caudal fin; the width of the body is from $1\frac{1}{4}$ to 2 times in the height, and the length of the head is from $2\frac{2}{3}$ to 3 times in the length of the body without, and $3\frac{1}{2}$ to $3\frac{2}{3}$ times, with the caudal fin; the height of the head is $1\frac{1}{4}$ to $1\frac{1}{2}$ times, and its width $1\frac{5}{6}$ to 2 times in its length; the line of the forehead is straight or slightly convex; the snout and suborbital bone scaly; the maxillary reaches beyond the posterior margin of the orbit; canine teeth in both jaws, rather small; jaws about equal in length; praeoperculum angled, the posterior margin with numerous conspicuous teeth, sometimes becoming spiniform at the angle; the sub and interoperculum without conspicuous teeth; operculum with three spines, the middle one conspicuously the longest, and the upper the shortest; the lateral line slightly curved, the apex of the curvature opposite the 5th or 6th dorsal spine. The tail is about as high as it is long; the spines of the dorsal fin are of moderate strength, the first two shorter, the others about 2 or $2\frac{1}{2}$ times in the height of the body, the membrane between the spines deeply incised not lobate; the soft dorsal is a little higher than the spinous, the longest rays being from 2 to $2\frac{1}{4}$ times in the height of the body; the pectoral fins are longer than the postocular part of the head; ventral fins rather rounded; the 2nd and 3rd anal spines nearly equal and nearly the length of two diameters of the eye, the rays resembling the soft dorsal in height; caudal fin rounded. Colour of the body of a brownish or greenish shade, the fins of a golden hue, eyes with the iris yellow or red with a golden margin to the pupil. In young specimens there are generally six broad transverse oblique brown fasciæ, broader than the intermediate spaces on the body, and at all ages there are dispersed over the body numerous blackish and yellowish spots, becoming smaller and more closely distributed with age.

Hab. Cleveland Bay.

I give this habitat on the authority of Dr. Klunzinger. The description is taken from Bleeker. Dr. Gunther, in his Catalogue, (Vol. I., p. 128), suggests the identity of this species with *S. salmonoides.* I have seen many specimens of *S. salmonoides* from New Guinea, all of very much more elongate form than one would infer from the above description the present Fish must be.

1135. SERRANUS ESTUARIUS. Macl.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 200

Hab. Burdekin River.

Species 38. *Serranus armatus.* Casteln.

Dr. Klunzinger finds this to be a *Plectropoma.* Its name, therefore, should be *P. armatum.*

Hab. King George's Sound.

Species 45. *Plectropoma dentex.* Cuv. and Val.

Dr. Klunzinger gives a detailed description and a figure of this species. (Sitzb. der K. Akad der Wissensch, 1879, tab. 1, fig 1.)

1136. *Genyoroge Macleayana.* Rams.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 178.

Port Jackson.

1137. MESOPRION ARGENTIMACULATUS. Forsk.

Gunth. Cat. 1, p. 192. Bleek Atl. Ichth. Perc. p. 74, tab. 46, fig 3. Klunz. Sitzb. der K. Akad. der Wissensch, 1879, p. 341.

D. 10/13. A. 3/8. L. lat. 46. Cœc. pylor. 4.

The height of the body is $3\frac{2}{3}$ in the total length, and equal to the length of the head. The upper maxillary bone reaching to the level of the posterior margin of the eye ; a slight notch of the præoperculum always conspicuous ; knob of the interoperculum sometimes wanting : fine denticulations above the notch, coarser ones beneath. Caudal fin truncated, pectorals not fully reaching to the anal. Greenish, each scale lighter at the edge, sometimes white.

Port Darwin and Cleveland Bay.

I have never seen this species. The description is taken from Gunther's catalogue, and the localities are given on the authority of Dr. Klunzinger (loc. cit.) Dr. Bleeker gives quite 20 synonyms of this fish in the "Atlas," p. 74.

1138. MESOPRION FULVIFLAMMA. Forsk.

Gunth. Cat. 1, p. 201. Bleek. Atl. Ichth. Perc. 2, p. 66, tab. 66, fig. 3.

D. 10/13. A. 3/8. L. lat. 50. Cœc. pylor 5.

The height of the body is $3\frac{2}{3}$ in the total length, and the length of the head $3\frac{1}{2}$; the diameter of the eye one fourth of the length of the head. Jaws equal, the upper maxillary bone reaching nearly to below the middle of the eye. Præoperculum indistinctly notched, the denticulations becoming gradually stronger at the angle ; no knob on the interoperculum. Caudal fin truncated, pectorals not reaching to the anal; the third, fourth, and fifth dorsal spines, and the second and third anal spines, nearly equal in length and strength.

Yellowish olive, with oblique streaks above the lateral line, and with longitudinal ones beneath ; a black lateral blotch on scales of the 22nd to 30th transvere lines.

Port Denison. (Klunzinger.)

Species 68. *Glaucosoma scapulare.* Macleay.

Several fine specimens of this Fish have been captured during the last few months. It is known to some of the fishermen as the "Pearl Perch," and is said to be a most excellent food fish.

1139. AMBASSIS MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch, 1879, p. 346, tab. 1, fig. 3.

A. urotænia Klunz. Fishes S. Aust., p. 19 (nec Bleeker.)

This species differs from *A. urotænia* of Bleeker in the lower and weaker second dorsal spine, in the number of dorsal and anal rays, in the development of the lateral line and in the colour. The height of the body is $3\frac{1}{3}$, and length of head $3\frac{2}{3}$ in the total length as in *A. urotæmia.* From *A. agassizi* Gunth. this species is distinguished by its lower 2nd dorsal spine, which however is higher than the 3rd anal spine, and by the armature of the præorbital which is less distinctly toothed on the margin. There is no trace of a spine above the orbital ; the ventral fin does not nearly reach to the anal ; the fins are hyaline, slightly spotted with black ; the silvery longitudinal band is not very distinct, and there seems to be another above it on the 3rd row of scales. Lateral line ill defined or none.

D. 7 $\frac{1}{8}$. A. 3/8. L. lat. 25-26. L. tr. 13-14.

Port Darwin (Klunzinger.)

Dr. Klunzinger thinks this species resembles *A. agrammus* Gunth. It is very probably the same.

1140. AMBASSIS MARIANUS. Gunth.

Zool. Voy. H.M.S. Challenger. Part VI., Shore Fishes.

D 7 1/10-11. A. 3/11. L. lat. 28.

The height of the body is two-fifths, or in young specimens less than two-fifths of the total length (without caudal), the length of the head one-third. The diameter of the eye is two-sevenths of the length of the head, and two-thirds of that of the postorbital portion. Præorbital strongly serrated. Scales on the middle of the trunk much larger, and those on the nape much smaller than the remainder. Lateral line interrupted below the end of the spinous dorsal, the pores of the posterior portion being rather indistinct. The second dorsal spine is as long as and sometimes a little longer than the third, and one-fourth of the total length (without caudal.) The third anal spine is longer than the second but considerably shorter than the second of the dorsal. A narrow silvery longitudinal streak along the middle of the tail; the membrane between the second and third dorsal spine blackish. Caudal fin not coloured. Queensland.

Length of specimens $1\frac{1}{2}$ to $3\frac{1}{4}$ inches. River Mary, near the Village of Tiaro.

Species 100. *Apogonichthys polystigma.*

Dr. Klunzinger regards this species as identical with *Apogon auritus* C. & V., which it may be, and also as identical with *Apogonichthys marmoratus* All. and Macleay, which it certainly is not.

1141. APOGON CONSPERSUS. Klunz.

Archiv. fur Naturg. XXXVIII., 1872. Sitzb. der K. Akad. der Wissensch., 1879,

D. 7. 1/9. A. 3/9. L. lat. 27. L. tr. $3\frac{1}{2}$/7.

Body oval, rather high, chin not or scarcely prominent. Teeth in moderately broad bands in both jaws, short and conical. Eyes of moderate size ; the maxillary reaches to the vertical from the hindmargin of the orbit ; the under margin of the præ and suborbital bones not toothed. The rounded angle of the præoperculum is toothed, the anterior edge not. No teeth on the suprascapula. The scales of the lateral line are marked with simple flat triangular figures longer than high. The dorsal spine is strong, particularly the third and fourth ; the second dorsal fin is higher than the first and like the anal, both are rather rounded at the extremity. The ventrals reach to the anal rays ; the pectorals are a little shorter. Tail slightly rounded. Colour (in spirits) brownish with black dots on the anterior part of the body, as well as on the pectoral fins and head. Fins colourless or with indistinct blackish specks, the ventrals blackish on the hinder half.

Hab. Port Phillip. Length, 11 ctm.

This description is translated from the German of Dr. Klunzinger. I have never seen the species, which seems to be very different from anything hitherto described.

Species 91. *Apogon Guntheri.* Casteln.

Redescribed by Mr. Ramsay, "Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 110."

1142. APOGON PUNCTATUS. Klunz.

"Sitzb. der K. Akad. der. Wissensch, 1879, tab. 3, fig. 3."

D. 8/10. A. 2/10. L. lat. 25. L. tr. $1\frac{1}{2}$/7.

Height of body and length of head $3\frac{1}{2}$ in the total length. 3rd and 4th dorsal spines $1\frac{1}{2}$ in the height of the body. Like *A. conspersus*, but distinguished by the remarkable length of the caudal peduncle which is only a little shorter than the head. The number of rays also in the transverse line is smaller, and the 8th dorsal spine is sometime absent ; the suprascapula is toothed, the anal fin has ten rays at least, that of *A. conspersus* only 9.

Colour, on the trunk numerous black spots or specks arranged longitudinally along nearly the whole length of the side ; beneath this line each scale has a black spot, but not arranged in lines : the first dorsal has the membrane dark, especially towards the summit Ventral fins the same ; the other fins light. Caudal slightly rounded. 13 ctm.

King George's Sound. (Klunzinger.)

1143. APOGON LEMPRIERI. Johnston.

Proc. Roy. Soc. Tasmania 1882, p. 142.

"B. 7. D. 6. 1/10. A. 2/9. L. lat. 27. L. tr. 3/10."

"The height of the body is equal to the length of the head, and is contained nearly three times in the total length. Snout short; length about half the diameter of the eye, which latter is fully one-third of the length of the head. The maxillary scarcely reaches the vertical from the posterior margin of the eye. Lower jaws prominent. Two minute cavities on upper part of snout. Hinder margin of præoperculum minutely dentate, anterior ridge simple. Spine of operculum reduced to a soft pointed membrane. No dark spots on root of caudal. Uniformly brownish, with iridescent shades of purple, gold, and light blue; lighter towards belly. Tips of ventral and dorsal fins blackish. Other fins light reddish."

Hab. Dunkley's Point, Sandy Bay, Tasmania. One specimen 4 inches long.

Species 86. *Nannoperca Riverinæ.* Macleay.

Klunzinger's *Paradules lætus* seems to be this species. His genus *Paradules* must go, as Gunther's genus *Nannoperca* has priority by more than 10 years.

1144. NANNOPERCA OBSCURA. Klunz.

Paradules obscurus Klunz. Archiv. f. Naturg., 1872.

Sitzb. der K. Akad. der Wissensch., 1879, tab. 1, fig 2.

D. 9/10. A. 3/6. P. 9-10. C. 17. L. lat. 28-30. L. tr. $2\frac{1}{2}$/10.

Height $3\frac{3}{4}$ and head $3\frac{3}{9}$ in the length. Body elongate, elliptic; profile of head slightly parabolic, nearly straight. Head, snout, forehead and præorbital naked; mouth small, the maxillary reaching only to below the front margin of the eye. Præorbital nearly square, dentate on the posterior margin and angle. Operculum with two spines. Lateral line not continuous, following the line of the back. Dorsal fin deeply notched, the first spine small, the last ray longest; the fin commences before the last third of the pectoral; the third anal spine is higher than the second, the soft dorsal and anal fins are alike, the ventrals commence beneath the first quarter of the pectorals and extend to the anus. Caudal slightly rounded. Colour in spirit dark brown, fins grey.

Yarra Lagoon. (Klunzinger.)

1145. MICROPERCA TASMANIÆ. Johnston.

Proc. Roy. Soc. Tasmania, 1882. p. 110.

D. $8/\frac{1}{7\text{-}8}$. A. 3/8. L. lat. 28-30. L. tr. 12. P. 13.

"Body compressed. Length of head equal to depth of body at shoulder, and contained in total length four times. Præoperculum not serrated. Scales relatively large, ctenoid. Eye large, nearly as broad as length of snout; the latter contained in head four times; dorsal deeply cleft, the first spine slightly pointing forward when erect; situated immediately over the posterior extremity of pectoral; the second and third spines longest. Anal commencing in a vertical line, scarcely in advance of the first spinous ray of second dorsal. The second dorsal and the anal soft rays gradually increase in width, the last two or three being of equal length and nearly half the length of the body. Caudal peduncle somewhat elongate. Caudal truncate. Colour dark olive with a pinkish streak along the sides from shoulder to tail. Base of dorsal, anal and caudal fins pinkish, with blackish margins. Belly silvery tinged with gold. Eye dark blue, with golden streak around eye ball."

Abundant in Rivers North and South Esk. (Johnston.)

Length, 3 to $5\frac{1}{2}$ inches.

1146. GULLIVERIA RAMSAYI. N. sp.

B. 5. D. $6/\frac{1}{10}$. A. 2/9. L. lat. 44. L. tr. 4/12.

Body compressed and moderately elevated; the height being twice and two-thirds in the length, exclusive of the caudal fin; the length of the head is about the same; the diameter of the eye is rather more than the width of the interorbital space, which is flat, naked, much channelled, and about equal to the length of the snout measured to the extremity of the lower jaw. The profile of the head is slighly concave, but swells out towards the snout into a rather prominent convexity truncate in front. The cleft of the mouth is slightly oblique, the lower jaw distinctly longer than the upper, the maxillary large, triangular, naked and extending to, or very nearly to, the vertical from the posterior margin of the eye. The teeth in the jaws are numerous in broad viliform bands, those on the vomer are situated on a very prominent horse-shoe shaped bony protuberance. The præoperculum has a double ridge, both quite smooth ; the operculum has one membranous point. The dorsal spines are very strong, the first very short, the last less than half the length of the second ; the first anal spine is very short : the caudal fin is rounded. The lateral line follows the curve of the back. Colour (in spirits) pale brown, the membranes connecting the spines of the first dorsal fin, and the rays of the pectorals, black. Length 5 inches.

From fresh water inland from Port Darwin.

Species 114. *Oligorus Macquariensis.*

This fish is found in the Mary River, Queensland.

1147. OLIGORUS GOLIATH. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 318.
Moreton Bay.

1148. HOMALOGRYSTES LUCTUOSUS. De Vis.

Pro. Linn. Soc., N. S. Wales, Vol. VII., p. 369.
Brisbane.

1149. THERAPON MACLEAYANUS. Ramsay.

Proc. Linn. Soc. N. S. Wales, Vol. VI., p. 831.
Macquarie River.

Species 139. *Therapon niger.* Casteln.

Klunzinger thinks this fish is identical with *Therapon ellipticus* of Richardson. It should be noted, however, that their respective habitats are far removed from one another ; the one inhabiting the rivers of the Murray system, the other those of Western Australia.

1150. THERAPON FULIGINOSUS. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 201.
Burdekin River.

1151. THERAPON PARVICEPS. Macleay.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 201.
Burdekin River.

1152. DIAGRAMMA PUNCTATUM. Cuv. and Val.

Gunth. Cat. 1 p. 323. Quoy and Gaim. Voy. Astrol., p. 699., Pl. 12, fig. 2. *Plectorhynchus pictus.* Bleek. Alt. Ichth. Perc. 11, p. 24, tab. 51, fig. 4. Syn. *Diagramma ocellatum, cinerascens, centurio, pœcilopterum,* and *balteatum.* Cuv. and Val.

B. 7. D. 10/22-23. A. 3/7. L. lat. 85. Vert. 12/15.

"The height of the body is 3½ in the total length, the length of the head 4⅕. The width of the eye is scarcely longer than the extent of the snout, and 3½ in the length of the head. The upper maxillary extends to the vertical from the front margin of the orbit. Præoperculum with the posterior limb vertical, and the angle rounded, finely and equally serrated. The dorsal fin moves in a high scaly sheath, and is even or slightly notched; the spines are moderate, the second and third the longest, half the length of the head. Caudal truncated; the second and third anal spines equally strong, the latter rather longer. Body and vertical fins with numerous brown spots, disappearing with age; the dorsal and anal fins with a black margin. Sometimes light longitudinal streaks at the side of the head."

Queensland. (Klunzinger.)

1153. DIAGRAMMA LABIOSUM. Macleay.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 202.
Wide Bay.

Species 157. *Histiopterus labiosus.*

Add Port Jackson to the other "habitats."

1154. SCOLOPSIS AFFINIS. Peter.

Monatsber. Berlin Akad., 1876, p. 832. Klunz. Sitzb. der K. Akad. der Wissensch, 1879.

D. 10/9. A. 3/6-7. L. lat. 45. L. tr. 4½/12.

Height of body and length of head 4 times in the total length. Body oblong; the spine of the præorbital not very distinct, as in *S. inermis*, Richards. Eye large. Colour dark, underneath the dorsal fin a darker longitudinal band. A horizontal silvery stripe on the præorbital. 8 ctm.

Port Darwin. (Klunzinger.)

1155. Scolopsis specularis. De Vis.

Proc. Linn. Soc. N. S. Wales. Vol. VII., p. 369.

Queensland.

1156. Synagris upeneoides. Bleek.

Gunth. Cat. 1 p. 375. *Dentex upeneoides.* Bleek. Atl. Ichth. Perc. **11**, p. 92. tab. 49, fig. 2.

B. 6. D. 10/9. A. 3/7. L. lat. 50.

"The height of the body is $4\frac{1}{2}$ times in the total length, the length of the head $4\frac{1}{5}$; the diameter of the eye is one-third of the latter and as long as the snout. The upper maxillary reaches to the vertical from the anterior margin of the orbit; the height of the præorbital is $1\frac{2}{5}$ in the diameter of the eye; there are three series of scales between the præorbital and the margin of the præoperculum. Six canine teeth in the upper jaw, none in the lower. The spines of the fins slender, flexible; the middle ones of the dorsal longest, half the height of the body; the soft portion of the fin lower than the spinous. Caudal deeply forked. Rose-coloured; the soft dorsal with a yellow longitudinal band near the upper margin." (Bleek.)

Queensland. (Klunzinger.)

Family. SQUAMIPINNES.

1157. Chelmo Mulleri. Klunz.

Sitzb. der. K. Akad. der Wissensch., 1879, p. 361.

D. 9/29-30. A. 3/21. L. lat. 50. L. tr. 9/25 (in front 10/22.)

Height of body 2 and length of head $3\frac{1}{5}$ in the total length. Snout very short, but narrow and tubular, it is $2\frac{1}{2}$ in the length of the head. The præorbital and præoperculum are toothed on the posterior margin; caudal truncate.

The colour is the same as that of *C. rostratus*, but the bands are a little broader, and of an uniform brown colour without white margin. The ventral fins are black. (Klunzinger.)

No habitat is given of this species by Dr. Klunzinger, but he includes it among his Australian Fishes.

Family. SPARIDÆ.

1158. Girella carbonaria. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. 8, p. 283.

Moreton Bay. Black Bream of the Brisbane Market.

1159. Girella mentalis. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. 8, p. 284.

Moreton Bay.

Genus Pemilepterus.

In both jaws a single anterior series of cutting teeth, implanted by a horizontal posterior process, behind which is a band of villiform teeth; fine teeth on the vomer, the palatine bones and the tongue. The soft portions of the vertical fins thickly enveloped by minute scales; eleven dorsal and three anal spines. Præoperculum generally denticulated. Scales of moderate size, bony. Seven branchiostegals. Pyloric appendages sometimes in small number, sometimes exceedingly numerous. Air bladder notched posteriorly, and sometimes anteriorly.

Tropical seas.

1160. Pemilepterus indicus. Cuv. and Val.

Klunz. Sitzb. der K. Akad. der Wissensch., 1879. Plate 7.

P. tahmel Klunz. Fisch. Roth. Meer. 1, p. 795 (nec. Forsk.)

D. 11/11-12. A. 3/11. L. lat. 66. L. tr. 10-11/20-22.

This species differs from *P. tahmel* Forsk. in the 2nd dorsal, being not nearly so high, and always lower than the middle highest dorsal spines. It is also lower than the anterior highest anal rays, which are not quite as high as the highest dorsal spines. In these respects this species resembles *P. Waigiensis* and *P. lembus*, but these again have always a greater number of dorsal rays. The height of the body is $2\frac{3}{4}$, the length of the head 5, in the total length; the fifth dorsal spine 3, the highest dorsal ray 4, in the height of the body. The præorbital is naked, in *P. Waigiensis* it is scaled. 30 Ctm.

King George's Sound. (Klunzinger.)

Species 230. *Pachymitopon squamosum.* All. and Macleay.

Dr. Klunzinger suggests that this may be the *Pemilepterus tahmel* of Forsk.

1161. HAPLODACTYLUS MŒANDRATUS. Sol.

Richards Trans. Zool. Soc. III., p. 83. Klunz. Archiv. fur Naturg. XXXVIII., 1872, p.

About 18 inches in length, of a brownish olive colour, with anastomosed wavy lines, and small white spots, getting gradually lighter towards, and quite white on the belly. Teeth, numerous in the jaws, in many rows, lanceolate, compressed, rather obtuse, flexile; a few acute ones on the palate, none on the tongue. Pectoral fins ovate, obtuse, short, not reaching to half the length of the abdomen, unarmed, at the base externally rivulose, ashen coloured, immaculate, with 14 rays, the inferior rays covered with a thick skin. Anal fin broadly rivulose, acute, 7 rayed, the first ray simple, the last bipartite. Caudal fin blackish-olive, clouded with paler.

B. 6. D. 16/18. P. 14. A. 1/6. C. 17.

The above is a translation of Dr. Solander's description, who took it at Cape Kidnapper, New Zealand. Sir John Richardson adds, the head is scarcely gibbous over the orbit, the spinous dorsal is higher than the jointed one, and the caudal is truncated with the corners rounded. Re-described at great length by Dr. Klunzinger (loc. cit.)

Hobson's Bay. (Klunzinger.)

1162. LETHRINUS NEBULOSUS. Forsk.

Gunth. Cat. 1, p. 460. Syn. *L. esculentus.* Cuv. and Val.

D. 10/9. A. 3/8. L. lat. 48. L. tr. 6/15.

The height of the body is $3\frac{1}{4}$ in the total length, the length of the head four times. The snout is rather elongate and pointed.

The length of the diameter of the eyes is rather more than the width of the distance between them, and $1\frac{3}{4}$ in the length of the snout; the maxillary reaches to the vertical from the anterior nostril. There is a slight protuberance before the upper anterior angle of the orbit. Canine and molar teeth moderate. Dorsal spines moderate; the fourth rather shorter than the longest ray, and one-third of the length of the head: caudal forked with pointed lobes. Olive, bluish spots on the sides of the head. (Gunther.)

Port Darwin. (Klunzinger.)

1163. Lethrinus reticulatus. Cuv. and Val.

Gunth. Cat 1, page 457.

D. 10/9. A. 3/8. L. Lat. 43 (48?) L. tr. 5/17.

The height of the body is 4 in the total length, the length of the head $3\frac{3}{4}$; the snout is pointed, scarcely longer than the diameter of the eye, which is one-third of the length of the head, the maxillary reaches nearly to the vertical from the anterior margin of the eye. Canine teeth distinct and curved; lateral teeth conical, the posterior ones obtuse. Caudal fin emarginate with pointed lobes. Olive or rose coloured; head and body with violet specks, arranged in irregular transverse bands; generally two violet streaks from the eye to the snout; the spinous dorsal marbled with violet; ventral fins violet; the rays of the vertical fins with five cross streaks.

Endeavour River and Port Darwin (Klunzinger.)

Family. CIRRHITIDÆ.

Species 272. *Chilodactylus spectabilis*. Hutton.

Add to synonyms *Chilodactylus asper* Klunzinger.

Archiv. fur. Naturg. XXXVIII., 1872.

Mr. R. M. Johnston (Cat. Roy. Soc, Tasm., 1883) considers *C. Alporti.* a distinct species. In my catalogue I followed Dr. Gunther.

1164. Chilodactylus nebulosus. Klunz.

Archiv. fur. Naturg. XXXVIII., 1872. Sitzb. der K. Akad. der Wissensch., 1879, p. 364.

D. 16/24. A. 3/9. P. 8/6. L. lat. 55. L. tr. 5/12.

Height of body $3\frac{2}{3}$ in the total length. Body elliptic; profile of head slightly parabolic; a narrow band of small canine teeth in both jaws; the maxillary reacher to below the anterior margin of the eye. Scales of head small; forehead without process; scales of body slightly rough; lateral line nearly quite straight, its figures form simple obliquely ascending striæ. Dorsal spines rather low, not higher than the rays; those of the anal a little higher than those of the dorsal; the anal is rather obliquely truncated. The second simple pectoral ray is the longest, but only one-sixth longer than the longest compound one, and reaches to the extremity of the ventrals, which commence under the middle of the pectorals, and do not reach the anus. Caudal fin deeply emarginate, the outer rays being half again as long as the middle ones. Colour; yellowish with dark nebulose transverse bands, 8-9 in number, which commence broad on the back and extend obliquely forwards, the 3rd, 4th and 5th arch shaped or angular forwards, forming each a longitudinal somewhat continuous stripe. The uppermost runs close along the eye, the second over the pectoral to the lower margin of the eye, the third rather indistinct extends along the belly. The dorsal and caudal fins are nebulous or spotted; margins of all the fins except the pectorals white; ventrals and anal dark. 16 Ctm.

Queenscliff. Port Phillip. (Klunzinger.)

1165. CHILODACTYLUS MULHALLI. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 366.

Port Jackson.

Genus DACTYLOPHORA. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 284.

1166. DACTYLOPHORA SEMIMACULATA. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 284.

South Australia.

Genus PSILOCRANIUM. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 439.

1167. PSILOCRANIUM COXII. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 440. Pl. XXII

Port Jackson.

Genus MENDOSOMA. Gay.

One dorsal fin deeply notched with twenty-two (23) spines; the anal fin of moderate length, the caudal forked; the simple pectoral rays feeble, not exceeding the margin of the fin. Small teeth in the upper jaw only, none in the lower or on the palate. Scales of moderate size; cheeks scaly. Six branchiostegals.

1168. MENDOSOMA ALLPORTI. Johnston.

Proc. Roy. Soc., Tasm., 1880, p. 64.

B. 6. D. 23/$\frac{1}{25}$. A. 3/18. P. 16. L. lat. 76. L. tr. 5/16.

"Body elliptical, compressed. Head small, pointed. Cheeks scaly. Height of body is $3\frac{1}{4}$ in the total length; the length of the head five times. Dorsal fin notched; the sixth, seventh and eighth spines are the longest, higher than the longest of the soft dorsal, and about one-fourth the depth of the body. The first soft dorsal is situated in a line vertically drawn through the anus; the third anal spine is longer than the thickish second, and about half the length of the longest dorsal spines. Pectoral rays more or less covered with linear oblong scales, simple rays fine, feeble, all shorter than the immediately superior branched rays. Body scales moderately large anteriorly, decreasing in size towards the tail. Caudal forked. Uniformly blackish grey, with a deeper shade along the back." (Johnston.)

Tasmania.

Family. SCORPÆNIDÆ.

Species 299 *Holoxenus cutaneus.* Gunth.

Mr. Johnston (Proc. Roy. Soc. Tasm., 1882, p. 114), describes a fish, known in Tasmania as the Velvet Fish, which he believes to be *H. cutaneus* of Gunther, but he finds some difference in the fin formation. Should it turn out to be a distinct species, he proposes for it the name *Holoxenus Guntheri.*

Family. TEUTHIDIDÆ.

1169. TEUTHIS SUTOR. Cuv. and Val.

Gunth. Cat. III., p. 317.

The height of the body is more than one-third of the total length. Brown, minutely dotted all over with whitish. (Val.)

Klunzinger got this species from Port Darwin, and gives a full description of it in "Sitzb. der K. Akad. Wissensch., 1879, p. 393."

1170. TEUTHIS FUSCESCENS. Houtt.

Gunth. Cat. III. p. 321. Schleg. Faun. Japon. Poiss., p. 127, pl. 68, f. 1.

The height of the body is contained three times and a half in the total length. Caudal fin scarcely emarginate. Uniform brownish.

Queensland. (Klunzinger.)

Family. BERYCIDÆ.

1171. TRACHICHTHYS MACLEAYI. Johnston.

Proc. Roy. Soc., Tasmania, 1880.

D. 5/13. A. 3/10. V. 8.

"Scales minutely irregularly spiniferous; a series forming the pierced scales of the lateral line (about fifty) larger, and armed with one or two visibly prominent transparent spines. Height of body $2\frac{1}{4}$ in the total length, the length of the head nearly three times. Cleft of the mouth wide, almost vertical. The serrated ventral keel is composed of 13 prominent spiniferous scutes. Upper and lower margins of caudal peduncle armed respectively with 8 and 7 strong adpressed translucent spines. Colour of a uniform bright golden yellow when fresh." Length, $9\frac{1}{2}$ inches.

Mouth of the Derwent River.

Genus. CLEIDOPUS. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 367.

1172. CLEIDOPUS GLORIA MARIS. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 368.

Brisbane River.

1173. BERYX MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p. 359, tab. 3, fig. 1.

B. 8. D. 7/14. A. 4/14. V. 1/7. P. 2/13. L. lat. 47. L. tr. $5\frac{1}{2}$. 1/12 to $6\frac{1}{2}$-7. 1/12.

Height of body $3\frac{5}{6}$ and length of head $4\frac{1}{4}$ in the total length. It differs from *B. affinis* in the scales of the lateral line being more numerous as also the rays of the dorsal and anal fins. In most other particulars it is very like *B. affinis.* The projecting chin has in front on each side an obtuse spine and above it a pore. The caudal fin is long and deeply forked, the fork tips narrow, pointed. and of the same length. Lateral line straight. Colour reddish with a blue glimmer (in spirits), especially on the upper part. 25 Ctm.

King George's Sound. (Klunzinger.)

Family. KURTIDÆ.

Klunzinger describes two species *Pempheris Mülleri* and *Pempheris multirardiatus* both from King George's Sound. I cannot make them out to be different from those already described.

Family POLYNEMIDÆ.

1174. POLYNEMUS SPECULARIS. De Vis.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 285.

Brisbane River.

1175. POLYNEMUS TETRADACTYLUS. Shaw.

Gunth. Cat. 1 p. 329. Macl. Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 203.

D. $8/_{13\text{-}15}^{1}$. A. 2/16-17. L lat. 73-85.

Four pectoral appendages, not or scarcely reaching beyond the tip of the ventral fin. Pyloric appendages in immense number.

Hab. Mouth of the Burdekin River.

1176. POLYNEMUS SHERIDANI. n. sp.

D. 7_{13}^{1}. A. 2/11. L. lat. 62.

Oblong, compressed. Height of body one-fourth of the length exclusive of caudal fin ; length of head slightly more. Eye large, lateral, near the snout, with a broad depressed interorbital space, showing a slightly concave profile; two nostrils close together in front of the upper part of the orbit; snout roundly pointed, considerably overlapping the mouth; maxillary large and triangular, appearing first under the hinder margin of the eye and extending far behind it. Præoperculum serrated on the posterior limb, and without a spine near the angle. Five pectoral appendages, the two upper ones extending far beyond the tips of the ventrals. The first dorsal fin is vertically in advance of the root of the ventrals; the first spine is very strong, and equal in height to $\frac{3}{4}$ the length of the head, the second is a little higher, the others become gradually lower; all are feeble except the first, and none of them are filamentose. The distance between the dorsals is more than the length of the base of the first; the second has a falcate appearance like the anal, and both are scaly and fleshy. The caudal fin is long, forked, scaly, and slightly filamentose. The distance between the origin of the ventrals and that of the anal, exactly equals the length of the head.

The scales are of moderate size, resembling somewhat those of the Mullet (Mugil), the lateral line is straight. The coloration is bluish-silvery towards the back, and whitish towards the belly; the dorsal, anal and caudal fins are blackish; the pectorals, ventrals, and pectoral appendages whitish; each line of scales shows a more or less distinct longitudinal streak. Length, 26 inches.

Mary River, Queensland.

I am indebted to the Hon. B. Sheridan for the specimen of this fish here described. It is abundant at some seasons in the tidal waters of the Mary, and has been known to attain a weight of 100 lbs. It is highly valued as a food-fish.

Family. SCIÆNIDÆ.

Genus Umbrina. Cuv.

Body oblong; muzzle convex, with the upper jaw overlapping the lower; a short barbel under the mandibulary symphysis. Two dorsals, the first with nine or ten flexible spines; the anal fin with one or two ; scales moderate ; pseudobranchiæ. The air bladder with or without appendages or absent. Pyloric cœca in small number.

All Seas and Mouths of Rivers.

1177. UMBRINA MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879.

D. $10/\frac{1}{25}$. A. 2/7. L. lat. supra. 63 infra. 55. L. tr. 6/16.

Height of body 4 and length of head $4\frac{1}{6}$ in the total length. Like *U. Russellii* and *Dussumieri*, but with a shorter barbel on the chin and a different fin formula. The snout is round and projecting. The barbel is very short not 1/3 of the diameter of the eye, with a pore at its base and around it four others ; there are also several pores on the snout ; præoperculum rounded without hard teeth. Teeth villiform in rows, some a little larger on the outer row of maxillaries ; 2nd and 3rd dorsal rays nearly equal, flexible ; 2nd anal ray much larger than the 1st. The maxillary reaches to behind the middle of the eye ; the posterior rays of the dorsal a little shorter than the others, and still shorter than those of the anal. The caudal fin is obtusely rhombic. Colour above, dark, on the ventral side silvery ; on the ventral side of the head, and snout and cheeks this colour is sharply circumscribed so that only the lower margin of the præorbital is silvery. All the fins are dark, the dorsal especially, the membranes densely speckled. 20 Ctm.

Queensland. (Klunzinger.)

1178. CORVINA AUSTRALIS. Gunth.

Rep. Shore Fishes. Voy. Challenger. Part 6, p. 33.

Corvina argentea. Macl. Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 204.

Mouth of Burdekin and Mary Rivers. Queensland.

1179. CORVINA MILES. Cuv. and Val.

Gunth. Cat. 2 p. 300.

D. $9\text{-}10/\frac{1}{29\text{-}30}$. A. 2/7.

The height of the body is nearly equal to the length of the head, and one-fourth of the total ; the diameter of the eye equals the length of the snout, and is one-fourth of the length of the head. The upper jaw overlapping the lower. The band of maxillary teeth with an outer row of stronger ones. The second anal spine very strong and as long as the first ray; caudal pointed. Above greyish green, sides and belly silvery; dorsals minutely dotted with brown, and with a black upper margin, in front of each dorsal ray a small brownish spot; ventrals whitish; the other fins with a blackish margin.

Queensland. (Klunzinger.)

Sciæna Mulleri Steind, is probably one of the Sciænidæ already mentioned, but I cannot find any description of it.

Family. CARANGIDÆ.

1180. Caranx ignobilis. Forsk.

Caranx sansun. Rupp. Gunth. Cat. 2, p. 447.

D. $8/\frac{1}{19\text{-}20}$. A. $2\frac{1}{16\text{-}17}$. L. lat. 30.

The teeth of the upper jaw form a villiform band, with an outer series of stronger ones; those of the lower one in a single series. The height of the body is 3 to 3½ in the total length. Breast scaly; the lateral line is bent anteriorly, the width of the arch being equal or nearly equal, to the length of the straight portion; the latter begins in the vertical from the seventh dorsal ray. The plates are very well developed and distinct from the beginning of the straight portion. The lower jaw is longer than the upper, and the maxillary reaches beyond the vertical from the centre of the eye. Opercular spot none.

Port Darwin and Cleveland Bay. (Klunzinger.)

1181. Caranx compressus. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 204.

Lower Burdekin, salt water.

1182. Chorinemus Sancti-Petri. Cuv. and Val.

Gunth. Cat. 2, p. 473.

D. $7\,\frac{1}{20\text{-}21}$. A. $2/\frac{1}{18\text{-}19}$. Vert. 10/16.

The height of the body is nearly equal to the length of the head, and one-fifth of the total. The maxillary is triangular and flat posteriorly, and reaches beyond the vertical from the centre of the eye. The length of the intermaxillary is contained one and two-third times, or twice in that of the head. The snout, in mature fishes, is nearly twice as long as the diameter of the eye. A series of rounded indistinct blackish spots above the lateral line, sometimes a second row beneath, sometimes both absent. An indistinct blackish streak from above the eye to the shoulder. Top of the dorsal black.

Port Jackson (Macleay), Port Denison (Klunzinger.)

1183. Equula splendens. Cuv. and Val.

Gunth. Cat. 2, p. 501. Kner Novara reise, p. 168.

D. 8/15. A. 3/14. Vert. 10/14.

The height of the body is $2\frac{1}{4}$ to $2\frac{2}{3}$ in the total length, the length of the head four times. The upper profile is much more convex than the lower. A pair of small spines above the anterior margin of the orbit; the cavity on the head is about twice as long as broad. The lower præopercular margin is finely serrated, and its length is $1\frac{1}{4}$ in that of the mandible, the latter is slightly concave, and ascends at an angle of about 35°. The length of the second dorsal spine is three-quarters of that of the head. Scales small. A black blotch on the spinous dorsal.

Port Denison. (Klunzinger.)

Species 384. *Equula edentula.* Bl.

I have no doubt that *E. coballa.* Cuv. and Val., mentioned by Dr. Klunzinger as coming from Port Darwin and Cleveland Bay, is identical with *E. edentula.*

Equula Novæ Hollandiæ, Sleindachner from Cleveland Bay and *Parequula bicornis* of the same author from Hobson's Bay, Victoria, are both unknown to me and I have never seen the descriptions.

Gen. Lactarius. Cuv. and Val.

Body oblong, compressed, covered with cycloid scales of moderate size; cleft of the mouth wide, oblique, with the lower jaw prominent. Teeth in the jaws small, *with one or two pairs of strong canines;* teeth on the vomer and the palatine bones.

Præopercular margin entire. The first dorsal with seven or eight feeble spines, continuous; the second and the anal are more developed and scaly, without detached finlets. Three anal spines, continuous with the fin. Lateral line not armed. Head with muciferous cavities. Branchiostegals seven; air bladder bifurcate anteriorly and posteriorly, the posterior branches united together behind the hæmal spine. Pyloric appendages in small number.

East Indian Seas.

1184. LACTARIUS DELICATULUS. Bl. Schn.

Gunth. Cat. 2, p. 507. Cuv. and Val. 9, p. 238. Pl. 261.

D. 7-8/$_{21-22}^{1}$. A. 3/25-26. L. lat. 74. Cœc. pylor. 63. Vert, 10/14.

The cleft of the mouth is very oblique and the lower jaw very prominent. Præorbital much narrower than the maxillary. The interocular space is convex, and equal in width to the orbit. Coloration uniform; sometimes with a black opercular spot.

Queensland. (Klunzinger.)

Family. NOMEIDÆ.

Genus GASTEROCHISMA. Richards.

Body oblong, compressed, covered with cycloid scales of moderate size; *cleft of the mouth wide.* Lateral line without any armature. The first dorsal with seventeen spines; the second and anal with the posterior rays detached, forming finlets, no separate anal spines. The ventral is exceedingly long and broad, and can be completely concealed in a deep fissure on the abdomen. Teeth conical, small, forming single series in the jaws, teeth on the vomer and the palatine bones.

A New Zealand genus.

1185. GASTEROCHISMA MELAMPUS. Richards.

Voy. Ereb. and Terr., p. 60. Gunth. Cat. 2, p. 387.

B. 7. D. 17/ 1/10 /VI. V. 1/5. A. 2/10 /VI. L. lat. 64. L. tr. 27.

Ventrals black, one third of the total length. The maxillary reaches somewhat beyond the vertical from the centre of the eye.

Mouth of the Derwent. (Johnston.) Length, 39 inches.

Family. SCOMBRIDÆ.

1186. Scomber janesaba. Bleek.

Gunth. Cat. 2, p. 359.

D. 9-10 $/\frac{1}{11}$ /V-VI. A. 1/$\frac{1}{10\text{-}11}$. /V-VI.

Scales small, conspicuous. The height of the body is $6\frac{1}{3}$-$6\frac{2}{3}$ in the total length, the length of the head four times; the diameter of the eye $3\frac{1}{3}$-$3\frac{1}{2}$ in the latter. Back with greenish-violet spots and waving transverse streaks; sides and belly silvery. An air bladder.

Hobson's Bay. (Klunzinger).

1187 Scomber kanagurta. Russ.

Gunth. Cat. 2 p 360. Syn. *S. loo.* Cuv. and Val. S. *chryzo-zonus.* Rüpp. *S. microlepidotus.* Rüpp. *S. moluccensis.* Bleek. and *S. reani.* Day.

D. 9-10 $/\frac{1}{11}$ /V. A. 1/$\frac{1}{11}$ /V.

Scales small. The height of the body is four times in the total, length of the head $3\frac{1}{3}$. Above uniform greenish, on the sides and belly silvery, sometimes with longitudinal stripes on the back and sides, and with four or five blackish spots along the base of the spinous dorsal fin.

Queensland. (Klunzinger.)

1188. Scomber tapeinocephalus. Bleek.

Gunth. Cat. 2 p. 361. The Tunny of the Mediterranean.

D. 11-11/$\frac{1}{11}$ /V-VI. A. 1/$\frac{1}{11}$ /V-VI

Scales small, conspicuous, those of the pectoral region larger than the others. The height of the body is seven times in the total length, the length of the head $4\frac{1}{5}$. Teeth conspicuous. Back and sides with greyish violet spots and waving transverse streaks. No air bladder.

Hobson's Bay. (Klunzinger.)

1189. Thynnus thynnus. L.

D. 14/$\frac{1}{13}$/IX. A. 2/12/VIII. Vert. 16/23.

The height of the body is $4\frac{1}{4}$ in the total length, the length of the head four times. The pectoral reaches nearly to the end of the spinous dorsal; dorsal spines rather feeble. The posterior margin of the præoperculum is somewhat shorter than the inferior. Above dark bluish; beneath greyish, spotted with silvery.

Tasmania. (Johnston)

1190. CYBIUM SEMIFASCIATUM. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 205,

Lower Burdekin, in salt water.

Family. TRACHINIDÆ.

1191. PERCIS COXII. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 179.

Loc. Port Jackson.

1192. SILLAGO SIHAMA. Forsk.

Gunth. Cat. 2, p. 243. Bleek. Atl. Ichth. Sillag., tab. 1, fig. 4.

D. 11/$\frac{1}{20}$. A. 1/22-23. L. lat. 70. L. tr. 4/11. Cœc. pyl. 2. Vert. 14/20.

The height of the body is one-sixth of the total length, the length of the head one-fourth. The space between the eyes is one-half of the length of the snout. The ventral spine feeble. Coloration uniform brownish yellow, with a silvery lateral streak; fins transparent, reddish-violet.

Queensland. (Klunzinger.)

Genus. PSEUDOCHROMIS. Rüpp.

Head and body rather compressed, more or less elongate; cleft of the mouth slightly oblique, with the lower jaw longest; eye lateral. Scales of moderate size, ciliated; lateral line interrupted. One dorsal with a few spines anteriorly; ventrals thoracie; the lower pectoral rays branched. Jaws with cardiform teeth, anteriorly with canines; vomer and palatine bones toothed. Præoperculum entire. Six branchiostegals; the gill-membranes joined inferiorly; pseudobranchiæ and air bladder present; pyloric appendages none.

Indian Seas.

1193. PSEUDOCHROMIS MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch, 1879, p. 370.

D. 3/23-24. A. 3/13. P. 18. V. 1/5. L. lat. 36. L. tr. c. 14.

Height of body and length of head $4\frac{1}{2}$ in the total length. In front of both jaws two strong canine teeth, and strong canine teeth also on the sides ; there are besides narrow bands of small canine teeth on jaws, vomer and palatine bones ; 3 to 4 rows of scales on the cheeks ; 3 spines on the operculum. Præorbital and præoperculum without serration. All the fins with long rays, particularly the dorsal, the middle rays of which are as high as the body. The caudal fin is rounded ; the ventrals extend to the anal fin ; the pectorals are a little shorter. The lateral line reaches to the 17th dorsal ray. Colour (in spirits) blackish brown ; head with many small blue spots. $6\frac{1}{2}$ Ctm.

Port Darwin. (Klunzinger.)

This fish seems to resemble very closely my *Cichlops filamentosus* species 423 of catalogue.

Family. BATRACHIDÆ.

1194. BATRACHUS PUNCTATULUS. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 177.

Torres' Straits.

1195. BATRACHUS MULLERI. Klunz.

Sitzb. dar K. Akad. der Wissensch., 1879. Tab. IX., fig 1.

D. 3/20-21. A. 17. Height 5, and head $3\frac{1}{2}$ in total length.

Like *B. diemensis.* No scales, body near the pectoral fins with reticulate folds of skin, 2 spines on the operculum and two on the suboperculum, the lowest small but distinct. Teeth villiform in bands on jaws, vomer and palatines. The maxillary extends to below the middle of the eye. Snout short, transversely vaulted. Forehead between the eyes broad, flat, much smaller than the orbit. The orbital cirrhus very minute, as also those of the head and back. Colour brownish with brown spots and a few larger dark specks, particularly one under the middle of the second dorsal fin. Head and forepart of back with thickly set alternately brown and lighter longitudinal stripes. 14 Ctm.

Port Darwin, (Klunzinger.)

Genus. PORICHTHYS.

Head broad, depressed; body subcylindrical anteriorly and compressed posteriorly; skin naked, with many series of very distinct pores. A canine tooth on each side of the vomer. Operculum with a single spine. The spinous dorsal formed by two very small spines. Gill-opening not narrow, extending downwards to the side of the isthmus. Gills three, pseudobranchiæ none, branchiostegals six; air bladder more or less deeply divided into two lateral parts. Pyloric appendages none.

Coasts of America.

1196. PORICHTHYS QUEENSLANDIÆ. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 370.

Queensland.

Family. PEDICULATI.

Species 430 and 431. *Brachionichthys hirsutes* and *B. lævis*, are considered by Mr. Johnston. (Proc. Roy. Soc., Tasmania, 1882, p. 121) to be identical.

Family. COTTINA.

1197. PLATYCEPHALUS SPECULATOR. Klunz.

Archiv. fur Naturg., XXXVIII., 1872. Sitzb. der K. Akad der Wissensch., 1879, tab. IV, fig. 1.

D. 1/7-12. A. 13. P. 17. L. lat. 85.

Height of body 14 times in the length, and length of head 4 times in the total length, and $3\frac{1}{2}$ times its height and $1\frac{1}{2}$ times its breadth. Resembles *P. insidiator*, but with the eye much larger, forehead and præorbital narrower, and parallel supraorbital crests, which in *P. insidiator* converge backwards. The point of the tongue is in this species spatulate and prominent, in the other species truncate. It differs also in the number of the dorsal rays, being 12 in this as against 13 in *P. insidiator*. The lower præopercular spine is a little longer than the upper. The colour resembles that of *P. insidiator*, the fins have a rather greener hue and not brown-spotted.

Hobson's Bay. (Klunzinger.)

1198. PLATYCEPHALUS MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch, 1879, tab. IV., fig. 2.

D. 1/8 12. A. 12. L. lat. 100. L. tr. 35. Head 4, height 9½ in the length.

Most like *P. inops*. Head broad and flat, particularly in front. Teeth villiform in a broad band in the upper jaw, narrower in the lower, vomerine teeth in two longitudinal stripes separated by a groove. Eye rather small. Ridges on head distinct but not prominent, with a few recumbent spines. A larger spine in front of the inner and upper angle of the eye. No spine on the præorbital. Only one of the spines of the præoperculum properly developed (the upper), and that is short, the inferior one is merely a small obtuse tubercle. Lateral line not conspicuous. Colour grey, the scales mostly with darker specks. Head above darker, brown marbled. Belly white or yellowish. Rays of dorsal fin with darker rings; the membrane light; pectoral fins light; ventrals above dirty brownish-grey; caudal with white and dark speckled rays, the lower margin and the upper extremity black.

Dr. Klunzinger gives no locality for this species.

1199. PLATYCEPHALUS MORTONI. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 206.
Lower Burdekin. Salt water.

1200. PLATYCEPHALUS SEMERMIS. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 285.
South Australia.

1201. LEPIDOTRIGLA MULHALLI. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII.
Outside Heads of Port Jackson.

Family. GOBIIDÆ.

1202. GOBIUS NEBULOPUNCTATUS. Cuv. and Val.

Gunth. Cat. III., p. 20.
D. $6/\frac{1}{9}$. A. 1/8. L. lat. 85.

"The height of the body is contained six times in the total length, the length of the head four times and two-thirds. The head is nearly as broad as high, its height being more than one-half its length. The diameter of the eye is one-fourth of the length of the head; it is situated entirely in the anterior half of the head, interorbital space very narrow. Snout as long as the eye, with the cleft of the mouth oblique, and with the jaws equal in length. The teeth in the jaws form a band, those of the outer series being somewhat enlarged. Dorsal fins separated from each other but close together; the first is lower than the second, the height of which equals that of the body. The upper pectoral rays silk like; caudal rounded; the anal is much higher posteriorly than anteriorly; its height being equal to that of the second dorsal fin. Greenish, clouded with brownish; head and body with longitudinal series of numerous white dots; fins uniform blackish, the first dorsal edged with white superiorly."

King George's Sound and Victoria. (Klunzinger.)

1203. Gobius Tamarensis. Johnston.

Proc. Roy. Soc. Tasmania, 1882, p. 120.

B. 4. D. $6\frac{1}{8}$. A. 1/8. L. lat. 32. P. 16-18. P. 18-19.

Height of body seven times in total length, the length of head four times, and the greatest breadth behind orbits six times. Head depressed; eyes approximating towards top of head, looking upwards and outwards. Snout obtuse, convex, one and a-half times breadth of eye, and contained three and a-half times in length of head; interorbital space, half the breadth of the eye; head and nape naked. Colour, when alive, greyish. Body and vertical fins marbled with very fine reddish-brown dots. The extremity of the rays of second dorsal and anal fins blackish. There are eleven scales between the anal and the first ray of the second dorsal fin; caudal fin rounded; dorsal and anal fin rays one and a-half times as long as the snout, when stretched they do not reach the caudal by a distance greater than their own length."

Abundant in the Tamar River. Length from 2 to $3\frac{3}{4}$ inches.

Mr. Johnson remarks that the species seems to closely resemble *G. lateralis*. Macleay.

1204. Eleotris Selheimi. Macleay.

Eleotris planiceps. Macleay. Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 69.

Palmer River, N. Queensland.

The specific name *planiceps* has been previously used by Count Castelnau for a species (525), from the Norman River.

1205. Eleotris aporocephalus. Macleay.

Eleotris planiceps. Macleay. Proc. Linn Soc., N. S. Wales. Vol. VIII., p. 206.

Lillesmere Lagoon. Burdekin River.

This I think is probably the species which Klunzinger refers to *E. porocephaloides.* Bleeker.

1206. Eleotris cyprinoides. Cuv. and Val.

Gunth Cat. III., p. 118. Klunz. Sitzb. der K. Akad. der Wissensch., 1879, tab. V. fig. 2.

D. $6/\frac{1}{9}$. A. 1/9-10. L. lat. 26-28.

Head entirely scaly. Body compressed, its height being nearly equal to the length of the head, and one-fifth of the total; the diameter of the eye is rather more than one-fourth of the length of the head, equal to the width of the interorbital space, and longer than the snout. Snout pointed, with the lower jaw longest; the maxillary does not extend to the vertical from the anterior margin of the eye. Teeth in villiform bands. Scales finely ciliated. Brownish-olive, with a blackish longitudinal band from the upper part of the base of the pectoral, below the lateral line to the caudal; dorsal and caudal fins with brown spots.

Murray River. (Klunzinger.)

1207. Eleotris reticulatus. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p. 385. Tab. 4, fig 3.

D. $6/\frac{1}{9}$. A. 1 10. L. lat., 28-30. L. tr. 10.

Height of body and length of head 5 times in the total length The caudal peduncle equals the length of the head. Colour yellowish or brownish, the dark margins of the scales giving the appearance of reticulate markings. Fins dark, marbled or speckled.

On the base of the caudal fin in its lower half, there is a darker spot, generally also one above the base of pectoral fin. Scales fine and equally toothed. 4 Ctm.

Port Darwin. (Klunzinger.)

1208. ELEOTRIS MACRODON. Bleek.

Gunth. Cat. III., p. 129. Klunz. Sitzb. der K. Akad. der Wiss., 1879, p. 385.

D. 6/10-11. A. 9. Lat. 90-100. L. tr. 30.

Thirty-three longitudinal series of scales between the origin of the posterior dorsal and the anal, sixty transverse ones between the anterior dorsal to the snout. The height of the body is contained four times and two-thirds or five times in the total length, the length of the head four times and a fourth. Head broad, depressed, with the snout obtuse; the lower jaw is somewhat prominent, and the maxillary extends to below the middle of the eye. Teeth of the outer series enlarged. The diameter of the eye is one-ninth of the length of the head, one half of that of the snout, and one-third of the width of the interorbital space. A small barbel on each side of the upper jaw. The head is covered with minute scales, the snout is naked. Dorsal and anal fins much lower than the body; the greater portion of the caudal is scaly; its length is about one seventh of the total. Brownish-olive (in spirits); dorsal and caudal fins dotted with brown, the other fins uniform. A blackish (in life reddish-brown) ocellus, edged with whitish, on the upper part of the base of the caudal.

Port Darwin. (Klunzinger.)

1209. ARISTEUS CAVIFRONS. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 70.

Palmer River.

Genus LEME. De Vis. Group *amblyopina*.

Proc Linn, Soc., N. S. Wales, Vol. VIII., p. 286.
Queensland.

1210. LEME mordax. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol VIII., p. 286.

1211. CALLIONYMUS ACHATES. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 620.
Queensland.

1212. CALLIONYMUS PHASIS. Gunth.

Zool. Voy. Challenger. Part 6., p. 28. Pl. 15, fig. C.
D. 4/9. A. 7. C. 10.

Præopercular spine considerably shorter than the eye, terminating in three curved spines, of which the two anterior are the larger, and directed upwards. Dorsal spines prolonged; second dorsal high; caudal long; the ventral fin extends somewhat beyond the origin of the anal. Gill-opening reduced to a small foramen on the upper side of the neck; lateral line single. The length of the head is one-third of the total length without caudal, or one-fourth with that fin. Eye very large, a little longer than the snout, one-third of the length of the head. Reddish-white with irregular broad blackish cross-bands on the back; first dorsals blackish, with some whitish zig-zag lines; second, variegated with greyish; the other fins white. Length of specimens 4 inches."

Twofold Bay. 120 fathoms.

1213. CALLIONYMUS LUNATUS. Schleg.

Gunth. Cat. 111, p. 146. Zool. Voy. Challenger. Part 6, p. 28.
D. 4/9. A. 9. V. 1/. P. 17. C. 10.

About 8 inches in length. The orifices of the gills, the nostrils, the pectorals, and ventrals as *C. Valenciennei*. The superior border of the orbit is prominent, and the space between the eyes very narrow and concave. Top of the head naked and rough. The osseous production of the præoperculum has a superior spine at right angles to a larger one. The two dorsals are of about equal height which is higher than that of the body; but the last three rays of the 2nd dorsal are longer than the others, the 1st spine of the 1st dorsal is twice the length of the others, and the membrane of the last dorsal spine is continued to the base of the 1st ray of the 2nd dorsal. The anal is one-third lower than the dorsals and its rays, with the exception of the last, are simple. The caudal is of elongate form, its length about 3½ in the total length. The pectorals are a little conical. Colour pale reddish brown, becoming white on the belly. The root of the caudal and the ventrals inclining to a deep brown. The anal has large blotches and the ventrals longitudinal streaks of pale brown. The membrane which unites the last dorsal spine to the back has a large black blotch bordered towards the base with white.

Port Jackson. (Gunther.)

Family. TRICHONOTIDÆ.

Genus. HEMEROCŒTES. Cuv. and Val.

Head depressed, pointed, trunk cylindrical, tail slightly compressed; cleft of the mouth wide, nearly horizontal, with the upper jaw longest; eyes rather large, directed upwards. Scales of moderate size, cycloid; lateral line continuous. One dorsal; all the rays articulated and not branched: ventrals jugular with one spine and five rays. Gill-opening very wide, with the gillmembranes scarcely united below the throat; seven branchiostegals; pseudobranchiæ. Villiform teeth in both the jaws, on the vomer, and on the separated pharyngeal bones; none on the palatines. Air-bladder and pyloric appendages none. A New Zealand genus.

1214. HEMEROCŒTES HASWELLI. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. VI., p. 575.

Port Jackson. Dredged in 10 fathoms at North Head

Family. BLENNÏIDÆ.

1215. SALARIAS MULLERI. Klunz.

Sitzb. der K. Akad. der. Wissensch., 1879, p. 388.

D. 12/20. A. 23-24.

Height 8, head 5½ in the total length. Rather elongate, low, crested on the neck; orbital cirrhus simple, shorter than the eye; profile of head perpendicular or even sloping inwards towards the snout. No canine teeth. Dorsal fin deeply notched; the 1st dorsal a little lower than the 2nd, a little over the height of the body, and as high as the anal fin; the second dorsal connected with the caudal fin which is rounded. Colour brownish, in the middle of the body numerous narrow transverse bands with dark margins, not quite reaching either the back or the belly, and becoming less distinct and somewhat undulating posteriorly. On the anterior part of the body there are some bluish transverse bands convex anteriorly. Belly and side of breast colourless. Crest of nape with black margin. Dorsal fin, with numerous oblique bluish streaks, anal with blue spots or streaks towards the margin in about four rows. Caudal with numerous white or blue spots. 7 Ctm.

Affinity to *S. geminatus*. All. and Macleay.

Hobson's Bay. (Klunzinger.)

1216. SALARIAS PUNCTILLATUS. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p. 389.

D. 12/20. A. 20. V. 2.

Height 5 and head 6 times in the total length.

Like *S. onyx*. Cuv. and Val. Profile of head in front vertical. Short small cirrhi round the eye, nostrils, and nape, those round the eye bifid, and about half the diameter of the eye, the others simple. Dorsal fin without notch, the first ray is only 1/3 higher than the last; it is connected with the caudal fin; the anal fin is not. The caudal is rounded. The lateral line is bent in front and terminates under the 8th dorsal ray. Crest of nape distinct but very low. Forehead nearly flat. Colour (in spirits) brownish, with indistinct darker or lighter specks which form transverse bands. The belly and breast whitish; dorsal fin greenish, indistinctly spotted; pectoral, anal and caudal fins monochromatic greenish. On the head there are white and blue spots and lines, and on the back posteriorly there are a few scattered small spots. 10 Ctm.

Port Darwin. (Klunzinger.)

Dr. Klunzinger alludes to the similarity of this to *S. Spaldingii* mihi; they are I think distinct.

1217. CLINUS MAMORATUS. Klunz.

Archiv. f. Naturg. XXXVIII., 1872. Sitzb. der K. Akad. der Wissensch., 1879.

D. 44. A. 30. P. 13. V. 3. C. 10.

Height (in front of the anus) 5 times in the length, length of head six times. Body elongate, compressed: profile of head parabolic; snout obtuse, short, teeth in both jaws, arranged in a band in front, and on the sides in a row short and blunt. Teeth on the vomer, none on the palatines; the maxillary reaches to below the middle of the eye; space between the eyes narrower than the orbit. Head and occiput nearly naked; body covered with small indistinct round scales. Lateral line only visible on the anterior part of the body. The dorsal fin begins over the operculum, and gets higher towards the caudal with which it is connected with a membrane; anal fin similar, also with simple flexible rays.

Colour brown with darker spots, marbled, throat sometimes white speckled; fins black speckled, marbled with some lighter spots; pectoral fins lighter with dark spots.

Allied to *C. cottoides* and *despicillatus*. Length, 15 Ctm.

Port Phillip. (Klunzinger.)

1218. CRISTICEPS TRISTIS. Klunz.

Archiv. f. Naturg., 1872, p. 31. Sitzb. der K. Akad. der Wissensch., 1879, p. 392.

D. 3/19 /5. A. 2/24. P. 11. V. 3. C. 9.

Height $5\frac{1}{2}$ in length. Body elongate, very much compressed. Profile of head nearly straight. Snout pretty long; lips much developed: jaws equal; on both and on the vomer a band of small hair-shaped teeth, broader in front of the præmaxillary. The maxillary reaches to below and rather behind the middle of the eye. Orbital cirrhus over the middle of the eye, flattish and fringed; nasal cirrhus small, tubular and with a flat flap above. Head and nape nearly naked and smooth. The first part of the dorsal fin is on the occiput over the præoperculum, it is higher considerably than the rest of the fin, with which it is connected by a membrane. The dorsal rays are pretty strong, and the fin membranes form a flap behind their apices; the fin membrane extends from the last dorsal ray to the base of the caudal fin. The anal fin commences under the 9th ray of the 2nd division of the dorsal fin; it is lower than the dorsal, and the fin membrane does not nearly reach the caudal. The pectoral fin is short and rather high, it extends to the anal fin; the middle ray of the ventrals also reaches to the anal. Scales small but distinct, leathery, shining, etenoid, only slightly imbricate. Lateral line marked with simple striæ; it ascends from the upper margin of the branchial aperture, then is strait to the 8th dorsal spine, then descends abruptly and then runs straight to the tail; caudal fin narrow and slightly rounded. Colour monochromatic dark brown. 16 Ctm.

Murray River. (Klunzinger.)

Family. SPHYRÆNIDÆ.

1219. Sphyræna strenua. De Vis.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 287.

Moreton Bay.

Family. ATHERINIDÆ.

1220. Atherina elongata. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p. 394, Tab. III. fig. 4.

D. 6-7/$\frac{1}{9}$. A. 1/11-12. L. lat. 40. L. tr. 7.

Nearly related to *A. pinguis* and *valenciennesii.* The body however is larger and the rays more numerous. The vomerine teeth are present. The 1st dorsal fin commences just behind the pectorals; the anal is a little longer than the 2nd dorsal, but terminates exactly opposite to it. Apophysis of the maxillary very short. Colour as usual in the genus, the silvery band is on the third line of scales. Fins hyaline. 7-8 Ctm.

King George's Sound. (Klunzinger.)

1221. Atherinichthys esox. Klunz.

Archiv. f. Naturg., 1872, p. 34.

D. 7|$\frac{1}{11}$. A. 1/12. P. 12. L. lat. 45. L. tr. 8.

Height 7 times in the length, length of head $3\frac{3}{4}$. Elongate, lancet shaped, rather compressed; profile straight; snout very prominent, pointed. Maxillary very protractile; head flat above.

Gape of mouth very oblique, extending only to the middle of snout. The narrow sword shaped upper jaw reaches to below the middle of the eye. A narrow stripe of small but distinct teeth in both jaws; the vomer is toothed, but not the palatines. Scales large, no distinct lateral line; spines of 1st dorsal fin weak and short; the 2nd dorsal and anal alike; the pectoral does not reach quite to under the 1st dorsal spine. The ventrals are inserted before the point of the pectorals, and extend nearly to the last dorsal spine, but not nearly to the anus. Caudal fin forked. Colour above dark, beneath silvery, a broad silvery blue band along the middle of the body. Length, 14 Ctm.

Port Phillip. (Klunzinger.)

1222. ATHERINICHTHYS MACULATUS. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 207.

Lillesmere Lagoon, Burdekin.

Family. MUGILIDÆ.

1123. MUGIL TADE. Forsk.

Mugil planiceps Cuv. and Val. Gunth. Cat. III., p. 428.

D. 4/$\frac{1}{8}$. A. 3/9. L. lat. 33-35. L. tr. 11. Cœc. pylor. 5.

The greatest depth of the body is nearly equal to the length of the head, and one-fifth of the total; the depth of the body below the origin of the spinous dorsal is contained twice and a third in the distance of the snout from the dorsal fin. The least depth of the tail is a little more than one-half the length of the head. Lips thin; the maxillary is bent downwards behind the angle of the mouth, its extremity not being covered by the præorbital. The space at the chin, between the mandibulary bones, is cuneiform. Eye with a narrow adipose membrane, which does not extend on to the pupil. There are twenty scales between the snout and the spinous dorsal. The eight, the tenth, or eleventh, the twenty-second or twenty-third scales of the lateral line correspond to the extremity of the pectoral, and to the origin of the two dorsal fins. The soft vertical fins scaly; the origin of the dorsal is in the vertical from the third soft anal ray.

Cleveland Bay. (Klunzinger.)

1124. MUGIL LONGIMANUS. Gunth.

Cat. III., p. 428.

D. 4 $\frac{1}{8}$. A. 3 9. L. lat. 35.

The height of the body is contained four times and two-thirds or five times in the total length; the length of the head five times or five times and a fourth. The width of the interorbital space is about one-half the length of the head. Eye with an adipose membrane anteriorly and posteriorly. Snout very convex, with the upper lip rather thick. The maxillary is entirely hidden when the mouth is closed. The two dorsal fins and the anal are nearly equal in height; pectoral about as long as the head: caudal truncated."

Cleveland Bay. (Klunzinger.)

1125. MUGIL GELATINOSUS. Klunz.

Archiv. fur Naturg., 1872. Sitzb. der K. Akad. der Wissensch, 1879, Tab. VIII., fig. 1.

D. 4/$\frac{1}{8}$. A. 2 8. P. 15. L. lat. 42. L. tr. 12.

Height of body 5$\frac{1}{2}$, and length of head 5 times in the total length. Body elongate, rather compressed. Profile of head at the snout a little convex; forehead transversely slightly convex; upper lip thick, on both lips small cilia, knot of the under jaw simple. Groove of the vomer deep. Lower margin of the præorbital straight without serrature. Maxillary narrow posteriorly, not hidden under the præorbital, and not reaching the anterior margin of the eye. The eye has highly developed anterior and posterior lids, with a gelatinous mass in front and behind. The space on the chin is of an elongate lance-shape. The margin of the operculum is simply curved. Scales large, conspicuous and striated, the striæ on the breast a little oblique. The 1st spine of the 1st dorsal is situated in the middle of the body (excluding the caudal fin) it is short and strong, the others are slender and flexible; the anal is situated a little nearer the head than the 2nd dorsal. Pectorals short, triangular, 1$\frac{1}{2}$ in the head; ventrals a little shorter; caudal deeply forked, forks pointed. Colour as usual, pectoral fin blackish behind, margin hyaline; 2nd dorsal and caudal blackish margined. 45 Ctm.

Hobson's Bay. (Klunzinger.)

1126. MUGIL MULLERI. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p 395.

D. 4/½. A. 3 8. L. lat. 38-40. L. tr. 14.

Height 4½ and head 4 times in the total length. Nearly related to *M. suppositus*. Gunth. but of different dimensions. Mouth in front angular, pointed; upper lip narrow; both lips with well developed cilia; keel of the under jaw simple; præorbital toothed on its posterior margin; the posterior small end of the maxillary not. Head scaly above as far as the lip; dorsal rays stiff but not thick. Eye without adipose membrane. Colour simple, silvery; fins without black magin; no axillary spot. 8 Ctm.

King George's Sound. (Klunzinger.)

1227. MUGIL NASUTUS. De Vis.

Pro. Linn. Soc., N. S. Wales, Vol. VII., p. 621.

Rockingham Bay.

1228. MUGIL RAMSAYI. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 208.

Burdekin River.

Family. CENTRISCIDÆ.

1229. CENTRISCUS GRACILIS. Lowe.

Proc. Zool. Soc., 1839, p. 86. Gunth. Cat. III., p. 521.

B. 4. D. 4-5/11. A. 18-19. P. 16. V. 5. C. 6 x 4 x 5 x 6.

The height of the body is contained twice and three-fifths to three times in the distance of the operculum from the base of the caudal fin. The second dorsal spine is rather strong, not (or very indistinctly) denticulated posteriorly, its length being one-fourth or two-ninths of the distance of the operculum from the caudal.

Port Jackson. (Macl. Mus.)

C. scolopax I have never seen here. Mr. Johnston's *scolopax* is probably this species,

Family. GOBIESOCIDÆ.

Genus GOBIESOX. Lacep.

Anterior part of the body very broad and depressed; skin tough. Snout very obtuse. Dorsal fin short, situated on the tail.

Posterior portion of the adhesive disks without free anterior margin. Distinct incisors in the lower jaw; those of the upper jaw are in several series, and the interior ones sometimes compressed. Gills three, pseudobranchiæ rudimentary; gill-membranes united under the throat, and not attached to the isthmus.

West Coast of South America, &c.

1130. Gobiesox cardinalis. Ramsay.

Proc. Linn. Soc. N. S. Wales. Vol. VII., p. 148.

Tasmania.

Family. TRACHYPTERDÆ.

Genus. Trachyterus. Gouan.

Body elongate, strongly compressed, naked; eye lateral; mouth small, dentition feeble. One dorsal fin occupying the whole back, with a detached anterior portion, composed of flexible rays. Ventrals thoracic, well developed, composed of several more or less branded rays. Gill-opening wide; pyloric appendages in very great number. Vertebræ numerous. Bones soft, muscles little coherent.

Coasts of Europe. Pacific Ocean South.

1231. Trachypterus altivelis. Kner.

Gunth. Cat. III, p. 303.

B. 6. D. 7/190. A. O. C. 6/4-6. P. II. V. 7.

"The greatest height of the body is above the ventral fins, equal to the length of the head, and one seventh of the total. Form of the head as in *T. tænia*. Eight teeth in the upper and six in the lower jaw. The anterior dorsal rays elevated; the longest of the second dorsal fin are not much lower than the body; dorsal rays rough, with a small spine at the base of each, Form of caudal fin and tubercles as in *T. tænia*. Silvery, with three large round black spots below the dorsal fin; a fourth near the abdominal edge, a little behind the first on the back."

A specimen taken at Spring Bay, East Coast of Tasmania, and now in the Museum, Hobart. (Johnston.)

Family. POMACENTRIDÆ.

1232. Pomacentrus trilineatus. Cuv. and Val.

Gunth. Cat. IV., p. 25. Bleek. Atl. Ichth. Pomac., tab. 7, fig. 1-6.

D. 13/15. A. 2/16. L. lat. 28. L. tr. 3/9.

"The height of the body is contained twice and three-fourths in the total length; præorbital denticulated, with two stronger teeth anteriorly. The dorsal spines increase in length towards behind; caudal emarginate, with the lobes rounded. Greenish-olive (in spirits brown); the base of the caudal itself yellowish, each scale with one, two, or three sky-blue dots; three or five very fine blue lines along the forehead, the outer of which are continued on the nape of the neck and sometimes along the base of the dorsal fin; a round dark spot above the operculum; a black spot edged with blue on the back of the tail, immediately behind the dorsal fin; young specimens with a second similar spot on the anterior third of the soft dorsal fin."

Port Darwin and Port Denison. (Klunzinger.)

1233. Pomacentrus tæniurus. Bleek.

Atl. Ichth. Pomac. tab. 9, fig. 2. Gunth. Cat. IV., p. 22.

D. 13/11. A. 2/11. L. lat. 28.

"The height of the body is contained $3\frac{3}{4}$ to $3\frac{1}{5}$ in the total length; præorbital not serrated. The posterior dorsal spines are nearly as long as the middle ones; caudal fin with the lobes pointed and produced. Violet-olive, each scale with a pearl-coloured spot; a blackish spot above the operculum and above the base of the pectoral fin. Dorsal and anal fins dark-violet, the posterior half of the soft portion and the pectorals orange-coloured, caudal orange-coloured, with a dark-violet longitudinal band on each lobe."

Port Denison. (Klunzinger.)

1234. Pomacentrus cyanospilus. Bleek.

Atl. Ichth. Pomac. tab. 4, fig. 5. Gunth. Cat. IV., p. 30.

D. 12/15. A. 2/13-14. L. lat. 26. L. tr. 3/9.

"The height of the body is contained twice and two-thirds in the total length. There is no notch between the præorbital and the other suborbitals, their lower or posterior margin being equally and finely serrated. The dorsal spines become gradually longer posteriorly. Caudal rather deeply emarginate, with the lobes rounded. Brownish, sides of the head and the scales above the anal fin with round bluish spots; anal and dorsal fins very dark posteriorly; axillary or dorsal spots none."

Port Darwin. (Klunzinger.)

1235. POMACENTRUS FASCIATUS. Cuv. and Val.

Gunth. Cat., IV., p. 19.

B. 5. D. 12-13/13. A. 2/12-13. L. lat. 27. L. tr. 3/9.

The height of the body is contained twice and three-fourths in the total length; præorbital denticulated. The dorsal spines increase in length posteriorly; caudal very slightly emarginate. Brown, lighter beneath, with four yellowish cross-bands; one from the neck to the operculum, the second from the front part of the dorsal fin to behind axil of the pectoral, the third from the posterior dorsal spines, and the fourth, spot-like, on the back of the tail; two parallel series of black spots from the opercle along the side of the trunk."

Port Darwin. (Klunzinger.)

1236. GLYPHIDODON MELANOPUS. Bleek.

Alt. Ichth. Pomac. tab. 8, fig. 7. Gunth. Cat. IV. p. 48.

D. 13/13. A. 2/13. L. lat. 28.

The upper profile of the head is convex; snout shorter than the eye; the width of the præorbital, above the angle of the mouth, is less than one-half of that of the orbit. Each jaw with about forty teeth. Yellow; most of the scales with a blue spot; the anterior portion of the ventral and anal fins black.

Port Denison. (Klunzinger.)

Species 680. *Heliastes hypsilepis*. Gunth.

Additional habitat. King George's Sound. (Klunzinger.)

Family. LABRIDÆ.

Genus PLATYCHŒROPS. Klunz.

A genus intermediate between *Chœrops* and *Heterochœrops*, with the latter it agrees in the number of dorsal spines (only 11) with the former in the great altitude of the præorbital. Peculiar, are the very flattened spines of the dorsal and anal fins, and the partially incisor like character of the front teeth; the scaley sheath for the dorsal and anal fins is highly developed.

1237. PLATYCHŒROPS MULLERI. Klunz.

Sitzb. der Akad. der Wissensch., 1879, p. 399. Tab. VIII. fig. 2.

D. 11/11-12. A. 3/11-12. L. lat. 36-38. L. tr. 8/12.

Height $3\frac{1}{2}$-$3\frac{3}{4}$, and head 4 times in the total length. The front teeth are flat, not conical, the lateral teeth as in Chærops. The upper lip is large and flat, leaf-shaped, the under similar but thicker. The scales of the cheeks are non-imbricate; the margin of the præoperculum, around the eyes, the forehead, the snout, the præorbital, the lips and the chin are naked. The scales of the nape are small, those of the operculum of medium size, and those of the body large. Lateral line continuous with slightly branched ramifications. Eyes small; dorsal spines flat, knife-shaped, except the 4 posterior ones and the two anterior anal rays. Ventrals shorter than the pectorals; caudal truncate; dorsal and anal rays higher than the spines. Of very robust form. Colour dirty grey-green, head brown, fins livid. 28 Ctm.

King George's Sound. (Klunzinger.)

1238. TROCHOCOPUS SANGUINOLENTUS. De Vis.

Proc. Linn. Soc. N. S. Wales, Vol. VIII., p. 287.

Cape Moreton.

1239. COSSYPHUS FRENCHII. Klunz.

Sitzb. der K. Akad. der Wissensch., 1879, p. 400.

D. 12/10. A. 3/11. L. lat. 35-37. L. tr. 4/12.

I give this species a place in my catalogue, but Dr. Klunzinger is very doubtful as to whether it is not identical with my

Trochochopus rufus. If it be the same fish, he is certainly not justified in changing the genus and name of the species. The differences in the descriptions are of the most trivial description.

1240. LABRICHTHYS DUX. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 287.
Moreton Bay.

Genus. NOVACULA. Cuv. and Val.

Body compressed, oblong, covered with scales of moderate size: head compressed, more or less elevated and obtuse, with the upper profile generally more or less parabolic; head nearly entirely naked, or with small scales on the cheek; lateral line interrupted. No posterior canine tooth. D. 9/12. A. 3 12, the two anterior dorsal spines sometimes remote or separate from the other.
Tropical Seas.

1241. NOVACULA JACKSONIENSIS. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. III., p. 198.
Port Jackson.

1242. CORIS SEMICINCTA. Ramsay.

Proc. Linn. Soc. N. S. Wales. Vol. VII., p. 301.
Broken Bay. Lord Howe's Island.

Species. 762. *Siphonognathus argyrophanes.*

Four specimens of this very curious fish were received lately by the Australian Museum from South Australia. In the character of the genus given by Dr. Gunther in his Catalogue, he has omitted to mention that there are no ventral fins.

Family. GADIDÆ.

1243. LOTELLA SWANII. Johnston.

B. 7. D. 4/60. A. 55. V. 8. P. 22-23. L. lat. 200. L. tr. 22/62.

Head contained $4\frac{3}{5}$ times in total length, and greatest depth $4\frac{1}{2}$ times. Length of snout equal to diameter of eye, and about one-fifth the length of the head. Distance between orbits half again as broad as diameter of eye. There is a series of 8 to 11 irregular teeth in upper and lower jaws. Scales small. Colour uniformly dark brown. Not common. (Johnston.)

Tasmania.

Genus. PHYSICULUS. Kaup.

Body elongate, covered with small scales. A separate caudal; two dorsal fins and one anal; ventral fins with a very narrow but flat base, composed of several rays. Teeth in the jaws in a band, small, villiform, of equal size; vomerine or palatine teeth none. Chin with a barbel. Branchiostegals seven; gill-rakers of the outer branchial arch short.

Madeira.

1244. PHYSICULUS PALMATUS. Klunz.

Archiv. fur Naturg., XXXVIII., 1872.

R. br. 7. D. 9/56. A. c. 50. L. lat. c. 120. L. br. c. 15/30.

Height of body and length of head $4\frac{1}{2}$ in the length. Elongate, elliptic; profile of head slightly parabolic, point of snout notched, forehead and præorbital scaly; under jaw retreating; a pointed barbel on the chin about as long as the eye; the maxillary reaches beyond the hind margin of the eye. There is a broad band of villiform teeth in both jaws, none on the vomer and palate. The 1st dorsal fin commences immediately behind the base of the pectoral, the 2nd dorsal opposite the anal; the caudal is quite separate and rounded. The ventrals are about half the size of the head, with the base narrow, but flat and not styliform. Colour brownish, dorsal anal and caudal fins brown-margined. Length, 50 Ctm.

Port Phillip. (Klunz.)

1245. PSEUDOPHYCIS BREVIUSCULUS. Richards.

Ramsay Proc. Linn. Soc., N. S. Wales, Vol. VI., p. 717.

Port Jackson.

Family. MACRURIDÆ.

1246. CORYPHÆNOIDES TASMANIÆ. Johnston.

Proc. Royal Soc. Tasman., 1882, p. 143.

B. 7. D. 15/103. A. 90. V. 8.

Snout short and obtuse, not projecting beyond mouth. Length nearly six times that of the head, which latter is longer than the greatest depth of body, and measures three times the length of snout. Diameter of eye scarcely equal to length of snout. Barbel rudimentary. Scales small, smooth, without ridges or spines. There are eight series of scales between anterior dorsal and the lateral line. The lateral line is composed of about 133 series of scales, the pierced scales being interrupted. The first dorsal is composed of 15 feeble jointed rays, the length about twice the diameter of the eye. The second dorsal commences near to the termination of the first dorsal. The anus is situated under the 17th ray of the second dorsal, and nearer to the snout than to the tail by twice the length of the snout. Uniform silvery plumbous, with a purplish shade. (Johnston.)

Seen in shoals at some seasons between Port Davey and Macquarie Harbour, known as the "Tasmanian Whiptail."

Family. PLEURONECTIDÆ.

Species 780. *Pseudorhombus Russellii.*

Klunzinger makes the *P. polyspilus* Bleek, regarded by Gunther as a synonym of *Russellii*, as a different species. He is probably right, the markings and the dentition are certainly a little different. He gives King George's Sound as its locality.

1247. Pseudorhombus Mulleri. Klunz.

Archiv. fur Naturg., 1872. Sitzb. der. K. Akad. der Wissensch., 1879, Tab. IX., fig. 2.

D. 90. A. 73. V. 6. L. lat. 66.

Body oval, elliptic; profile of head convex. Teeth in both jaws in one row, small, rather unequal. Mouth oblique, jaws equal; length of upper jaw 3 in length of head. Eyes close and directly above one another, the lower slightly in advance. The diameter of the anterior curved portion of the lateral line, $1\frac{1}{2}$ in the length of the head. The dorsal fin commences a little in front of the eye, the rays are of about the same height from the 10th to the 70th. Scales medium size, ciliated. Pectoral fin narrow, 1½ in the length of the head; ventral nearly 3 in length of head; dorsal and anal nearly join the caudal. Colour uniform dark brown. 15 Ctm.

Hobson's Bay. (Klunzinger.)

1248. Ammotretis zonatus. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. II., p. 367.

Port Jackson.

Genus. Pleuronectes.

Cleft of the mouth narrow, with the dentition much more developed on the blind side than on the coloured. Teeth in a single or double series, of moderate size; palatine and vomerine teeth none. The dorsal fin commences above the eye. Scales very small or rudimentary, or entirely absent. Eyes generally on the right side.

Temperate and Arctic Seas.

1249. Pleuronectes Moretoniensis. De Vis.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 370.

Moreton Bay.

1250. Solea uncinata. Klunz.

Sitzb. der. K. Akad. der Wissensch., 1879, p. 408.

D. 77. A. 50. V. dextr. 7, sin. 4. P. 10.

Height of body 2½, and length of head 3 times in the total length without caudal fin. L. lat. about 70; the highest dorsal and anal rays 3½ in length of body, Body oval, scales small, lateral line straight; pectorals of left side scarcely smaller than the other; lower eye much advanced; forehead small, protruding, scaly; snout curved backwards under the chin, the dorsal rays extending to the point; caudal fin long and rounded; left nostril small. Colour uniform, slate-grey to black. Resembles *S. liturata* Richards. 15 to 20 Ctm.

King George's Sound. (Klunzinger.)

1251. Solea fluviatilis. Ramsay.

Proc. Linn. Soc. N. S. Wales. Vol. VII. p. III.,

Hunter River.

1252. SOLEA LINEATA. Ramsay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 406.
Port Stephens.

1253. SOLEA (ACHIRUS) POROPTERA. Bleek.

Atl. Ichth. Pleuron. p. 24. tab. 15, fig. 2.
D. 67. A. 52. L. lat. 80.

Dorsal and anal fins simple, or bifid at the top only. The height of the body is contained twice and a half or twice and two thirds in the total length. Eyes subcontiguous. Colour greyish-brown with numerous small blackish dots; two brown blotches on the lateral line, and four others along the back. Probably the same as *Aehirus thepassii.* Bleek. Gunth. Cat. IV., p. 478.

Port Darwin. (Klunzinger.)

1254. SYNAPTURA FASCIATA. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 14.
Port Jackson.

1255. SYNAPTURA SELHEIMI. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 71.
Palmer River. Fresh water.

1256. SYNAPTURA FITZROIENSIS. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol., VII., p. 319.
Fitzroy River.

1257. SYNAPTURA CINEREA. De Vis.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 288.
Moreton Bay.

1258. PLAGUSIA NOTATA. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 288.
Moreton Bay.

Species. 799. *Plagusia guttata.* Macleay.

Klunzinger thinks this is the *Plagusia japonica* of Schlegel.

Genus. LOPHORHOMBUS. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 14.

This is without doubt the genus *Lophonectes* of Gunther. Report of Zool. of Challenger Exp. Part VI., p. 28.

Dr. Gunther's name has priority.

1259. LOPHORHOMBUS CRISTATUS. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 14.

Lophonectes gallus. Gunth. Report Zool. Chall. Part VI. p. 29 Pl. XV., fig. B.

Port Jackson.

Dr. Gunther's name has priority.

Genus. LÆOPS. Gunth.

Body oblong; head small; cleft of mouth very narrow, with the dentition much more developed on the blind side than on the coloured. Teeth villiform, in narrow bands; palatine and vomerine teeth none. Dorsal fin commencing above the front margin of the eye. Scales small, thin, deciduous. Eyes on the left side.

1260. LÆOPS PARVICEPS. Gunth.

Report of Zool. Challenger Exp. Part VI., p. 29. Pl. XV. fig. A.

D. 104. A. 86.

The height of the body is contained $2\frac{2}{3}$ in the total length (without caudal), the length of the head $5\frac{1}{3}$. The snout is very short. The eye rather large; its diameter being $3\frac{1}{3}$ in the length of the head. A very narrow ridge, longitudinally grooved, separates the two eyes, the lower being conspicuously in advance of the upper. The mouth is directed upwards, and the maxillary of the left side extends scarcely below the anterior margin of the eye. The dorsal fin commences opposite to the front margin of the upper eye and is continued to the root of the caudal, the rays being of moderate length. Caudal rounded. The left pectoral rather longer than the right, and as long as the postorbital portion of the head. The rays of the left ventral are arranged in the same line as the anal, the right ventral being entirely on the right side. The lateral line makes a very short semi-circular curve anteriorly, and is straight for the remainder of its course. The colour appears to have been uniform brown.

Off Twofold Bay. (Gunther.)

Genus. Cynoglossus. Ham. Buch.

Eyes on the left side; pectorals none, vertical fins confluent. Scales ctenoid; lateral line on the left side double or triple; upper part of the snout produced backwards into a hook; mouth unsymmetrical, rather narrow; lips not fringed. Teeth minute, on the right side only. Gill-opening very narrow.

Indian Seas.

1261. Cynoglossus quadrilineatus. Bleek.

Atl. Ichth. Pleuron. p. 32, tab. 14, fig 3. Gunth. Cat. IV. p. 497.

D. 102-112. A. 83-86. C. 10. V. 4. L. lat. 95.

Two lateral lines on each side, separated in the middle by about fourteen longitudinal series of scales. Two nostrils, one between the eyes, the other below the lower angle of the lower eye. The upper eye somewhat in advance of the lower. Lips not fimbriated. The length of the snout is contained twice and two-thirds in that of the head. The rostral hook just covers the symphysis of the mandibles. The height of the body is somewhat less than one-fourth of the total length, the length of the head one-fifth. Uniform brownish; fins yellowish; a black spot on the operculum.

Cleveland Bay. (Klunzinger.)

Family. SILURIDÆ.

1262. Cnidoglanis Mulleri. Klunz.

Sitzb. der K. Akad. der Wissensch. 1879, p. 411.

D. 1/5. Height of body 7 and length of head 6 in the total length. Snout a little projecting; underlip thick and covered with warts, without fringe, not pendent. Side fringes on the angle not threadshaped; the nasal barbel reaches a little beyond the head, but not to the dorsal fin; the maxillary barbels are much shorter, only reaching just beyond the eye; the outer mandibulary barbels reach to the branchial aperture, the inner about half the distance. Five short canine teeth on each side of the lower jaw. 1st dorsal fin as high as the body and a little shorter than the head; pectoral spine a little shorter than the dorsal. Colour uniform brownish. Allied to *C. microcephalus*, 15 Ctm.

Port Darwin. (Klunzinger.)

Family. HAPLOCHITONIDÆ.

Genus. Haplochiton. Jenyns.

General habit of the trout, but completely naked. The dorsal fin occupies a position somewhat posterior to that of the ventrals. which are in the middle of the length of the body, and composed of seven rays. Adipose fin small; caudal forked; anal of moderate length. The nostrils are somewhat remote from each other. Eyes of moderate size. Teeth small, curved, in a single series, in the upper and lower jaw and on the palatine bones. Tongue broad, with a series of curved teeth on each side. Gill-openings rather wide, the gill-membranes not attached to the isthmus; the outer branchial arch with lanceolate gill-rakers. Pseudobranchiæ well developed. Air-bladder simple, grown to the walls of the abdomen. Stomach thick and muscular; pyloric appendages none. The urogenital organs of both sexes are produced into a cylindrical tube, which lies concealed in a groove before the anal fin.

Tierra del Fuego and Falkland Islands.

1263. Haplochiton Sealii. Johnston.

Proc. Roy. Soc. Tasman., 1882, p. 128. *The Derwent Smelt.*

B. 6. D. 8-9. A. 19-20. V. 7. P. 9-12. Vert. 56-57.

"Body naked. Total length 5·3 times length of head and nearly 10 times the height of the body. Head somewhat broad, depressed; interorbital space wide. Teeth in a single series, small, hooked, on maxillary and mandible, minute on the palate. Eye relatively large, diameter equal to length of snout, which latter is contained in head 3·2 times. Maxillary extending to a vertical line drawn through centre of eye; posterior end slightly enlarged, and curved downwards. Lower jaw slightly longer. Dorsal situated rather in advance of vent and behind ventral fin. Belly rounded. Adipose fin membranous, rudimentary, broadly deltoid. Body ornamented with extremely minute dots; from the ventrals forward these minute dots form two parallel interrupted lines, which gradually approach and unite at an acute angle under the mandibles. Silvery band along sides. Length 1 to 2 inches.

Upper Derwent River. Tasmania.

Family. SCOPELIDÆ.

1264. SAURIDA FEROX. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 177.
Port Jackson.

Family. GALAXIDÆ.

1265. GALAXIAS ROSTRATUS. Klunz.

Archiv. fur Naturg., 1872, p. 41.

R. br. 6. D. 11. A. 14. P. 14. V. 7.

Height of body $8\frac{1}{2}$ and length of head $5\frac{1}{2}$ in the total. Body very slender; forehead broad and flat. Jaws equal, each with a row of slightly hooked teeth, the same on the palate; those on tongue in two rows. Eye shorter than the snout; the maxillary reaches to below the middle of the eye. The dorsal fin commences at the beginning of the last third of the body, and a little in front of the anal fin. The free part of the tail is as long as the anal fin; the caudal is slightly emarginate; the ventrals are situated midway between the base of the caudal and the front margin of the eye; the pectorals are of the same length as the ventrals and are much shorter than half the distance between the two fins. Colour uniform brownish-yellow, fins bright; across the base of the tail a dark cross-band on spot. Length 13 Ctm. Murray River. (Klunzinger.)

1266. GALAXIAS FINDLAYI. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. 107.
Mount Kosciusko.

1267. GALAXIAS AURATUS. Johnston.

Proc. Linn. Soc. Tasman, 1882, p. 131. "*Lake Trout.*"
B. 9. D. 11-12. A. 14. P. 16. V. 1/7.

"The height of the body is contained five times in the total length; the length of head nearly four times. The head is very much depressed. Interorbital space wide, having three pairs of pores over each eye. About seventy distinct pores, mostly in pairs, along usual course of lateral line. Head blackish. Body of a bright transparent golden hue. Spots very large, rounded and sometimes confluent above lateral line. No blackish bars across shoulder. Ventrals tipped with black; base and tips of anal and dorsal blackish. Pectoral reaches half the distance from root of ventral. Total length 9¾ inches."

Hab. Great Lake, alt. 4000 feet. Tasmania.

1268. GALAXIAS WEEDONI. Johnston.

Proc. Royal Soc., Tasman., 1882, p. 131. "*Mersey Jolly-tail.*"
D. 11. A. 14. P. 15.

Body somewhat compressed. Length of head scarcely exceeding the depth of body, and contained four and a half times in the total length. Pectoral reaches half the distance to root of ventral. Head and body brownish black; back and sides marbled with irregularly transverse wedged-shaped streaks, and bands of darker hue. Caudal bifurcate. Length 4½ inches."

Mersey River, Tasmania.

1269. GALAXIAS ATKINSONI. Johnston.

Proc. Roy. Soc., Tasman., 1882, p. 131. "*Pieman Jolly-tail.*"
B. 9. D. 11. P. 13. A. 14. V. 8.

"Length 4⅓ times that of the head, and the latter is equal to 1½ the height of the body. Diameter of eye equal to length of snout and $\frac{1}{4}$ of head. Pectoral reaches more than half the distance to root of ventral. The depth of caudal peduncle not half the length of distance between dorsal and caudal fins. Colour darkish brown, sides with 16 to 18 regular transverse bands of a deeper shade composed of microscopic dots, larger dots are distributed along the lines of vertebræ and ribs. Length $2\frac{1}{2}$ inches.

Pieman River, Tasmania.

Family. SCOMBRESOCIDÆ.

1270. BELONE GRŒNERI. Klunz.

Sitzb. der K. Akad. der Wissensch. 1879, p. 414.

D. 19-20. A. 20.

Height of body $1\frac{1}{4}$ in the length of the pectoral fin. Head above with a shallow but distinct groove ; tongue rough ; length of head a little more than one-third of the total length without the caudal fin. In other respects this species is like *B. robustus.* Gunth. A slight keel of skin on the tail which is higher than broad ; posterior dorsal and anal rays low ; the lower margin of the maxillary only visible ; scales small, adhering, caudal fin forked. *B. charan* has the posterior dorsal and anal rays longer, and is also different in its dimensions and fin formula. *B. liuroides* has larger scales and larger head. The colour in this species is like the rest of the genus, Dr. Klunzinger thinks that this species is also quite distinct from *B. gavealoides* of Castelnau, but he complains that that species has been very inadequately described. 60 Ctm.

Port Darwin. (Klunzinger.)

Family. CLUPEIDÆ.

1271. EUGRAULIS CARPENTARIÆ. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol. VII., p. 320.

Norman River.

1272. ENGRAULIS HETEROLOBUS. Rüpp.

Gunth. Cat. VII. p. 392., Klunz. Archiv. fur Naturg. 1872, p. 42.

B. 12. D. 14. A. 17-18. L. lat. 42.

The height of the body is two elevenths of the total length, the length of the head one-fourth ; head not quite as long as deep. Snout pointed, much projecting below the lower jaw ; maxillary very finely toothed, rather pointed behind, extending somewhat beyond the mandibulary joint. Origin of the dorsal fin midway between the end of the snout and the root of the caudal fin. Anal commencing immediately behind the dorsal. Abdomen compressed in front of the ventrals, with several scutes. A well defined silvery band along the side.

Cleveland Bay and Hobson's Bay. (Klunzinger.)

1273. ENGRAULIS MYSTAX. Bl. Schn.

Gunth. Cat. VII., p. 397. Bleek. Atl. Ichth. Clup., p. 132. Tab. 3. Fig. 2.

B. 12. D. 13-14. A. 34. L. lat. 42.

The height of the body is contained $3\frac{1}{3}$ or $3\frac{1}{2}$ in the total length (without caudal), the length of the head 4 times. Snout, short, obtuse, much projecting below the lower jaw. Teeth present in both jaws, minute. Maxillary much prolonged, extending to, or nearly to, the ventrals ; it has a short dilatation above the mandibulary joint. Gill rakers not very fine, about 16 on the lower branch of the outer branchial arch, the longest as long as the eye. Origin of dorsal fin somewhat nearer to the end of the snout than the root of the caudal Anal commencing shortly behind the last dorsal rays. Abdomen compressed, the spine scutes extending to the gill-opening. Sometimes a blackish spot across the nape down to the scapula.

Queensland. (Klunzinger.)

1274. ENGRAULIS HAMILTONII. Gray.

Gunth. Cat. VII., 395. Macleay. Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 209.

E. poorawah Cuv. Bleek. Atl. Clup. tab. 1, fig. 5. *E. Grayi* Kner. Voy. Nov.

B. 13. D. 13. A. 36-40. L. lat. 47.

The height of the body is contained $3\frac{1}{2}$ or $3\frac{3}{4}$ in the length (without caudal.) The length of the head $4\frac{1}{4}$ or $4\frac{1}{2}$. Both jaws with minute teeth ; the maxillary dilated above the mandibulary joint, its posterior tapering portion extends to or nearly to, the root of the pectoral fin. Origin of dorsal midway between the end of the snout and root of the caudal. Anal commencing immediately behind the last dorsal ray. Entire abdominal ridge serrated. Scapulary region with black venules. Gill-rakers rather strong, distant, 13 on the horizontal branch of outer branchial arch, the longest rather shorter than the eye.

Lower Burdekin in Shoals. (Macleay.)

1275. Chatoessus elongatus. Macleay.

Proc. Linn. Soc. N. S. Wales. Vol. VIII., p. 209.

Lagoons. Mary River.

Species. 887. Chatoessus Erebi.

Klunzinger regards *C. erebi* of Castelnau as identical with the above species, and *C. Richardsoni* Castelnau as the true *C. erebi* of Richardson.

Family. MURÆNIDÆ.

1276. Anguilla amboinensis. Pet.

Gunth. Cat. VIII., p. 34.

Origin of the dorsal fin twice as far distant from the pectoral fin as from the vent. The length of the head one third of the distance of the vent from the end of the snout. Angle of the mouth below the hind margin of the eye. Teeth small, in broad bands, that of the vomer rather narrower than that of the maxillary. Yellowish-brown, spotted with dark brown.

Port Phillip. (Klunzinger.)

1277. Anguilla marginipinnis. Macleay.

Proc. Linn. Soc.. N. S. Wales, Vol. VIII., p. 210.

Lillesmere Lagoon, Burdekin River.

1278. Murænicbthys macropterus. Bleek.

Atl. Ichth. Mur., p, 31, tab. VII , fig. 3. Gunth. Cat. VIII., p 52.

Origin of the dorsal fin nearer to the gill-opening than to the vent. Snout pointed, the greater part of the teeth biserial. The cleft of the mouth extends somewhat behind the eye. Length, 14 inches.

Port Phillip. (Klunzinger.)

Family. SYNGNATHIDÆ.

1279. SYNGNATHUS CINCTUS. Ramsay.

Proc. Linn. Soc., N. S. Wales, Vol. VII., p. III.

Port Jackson, in 17 fathoms.

1280. SYNGNATHUS SUPERCILIARIS. Gunth.

Report Zool. Exp., Challenger, part VI., p. .

D. 23. Osseous rings. 20 x 38.

Snout as long as the postorbital part of head, with a median ridge above, terminating on the interorbital space, neck compressed into trenchant ridge; operculum without keel and with fine radiating striæ. Shields without spines; lateral line passing into the lower caudal edge; base of the dorsal fin not elevated, standing on three body and three caudal rings. Tail twice as long as the trunk. A very conspicuous filament above each eye. Pectoral and caudal fins well developed. Brownish-grey, with indistinct darker cross-brands, and finely marbled with darker and lighter spots; snout and lower half of head with oblique vermiculated brown lines. Length, 3 to $6\frac{3}{4}$ inches.

Port Jackson. (Gunther.)

1281. SYNGNATHUS CARETTA. Klunz.

Sitzb. der K. Akad. der Wissensch. 1879, p. 419.

S. modestus Klunz. (nec. Gunth.) Archiv. fur Naturg., XXXVIII., 1872.

D. 24. Osseous rings, 17 x 42-44.

Head $8\frac{1}{2}$-9 in the length; snout $2\frac{1}{4}$ in length of head; trunk half the total length. Operculum with a short longitudinal ridge in front only. Two nape shields with a longitudinal crest in middle. The lateral line is distinct as far as the anal shield. On the caudal shields it is either wanting or indistinct and interrupted. The dorsal fin commences on the anterior part of the anal ring ; pectoral and caudal fins distinct, anal rudimentary. Body anteriorly a little higher than broad, nearly square. Colour brownish on the back, with lighter shield like transverse marks or bands at varying distances, and about 12 in number. 10 Ctms.

Port Phillip. (Klunzinger.)

1282. SOLENOGNATHUS FASCIATUS. Gunth

Report Chall. Exp. Zool. Part VI., p. 30, pl. XIV., fig. B.

D. 41. Osseous rings, 27 x 55.

This species is most closely allied to *Solenognathus spinosissimus*, having the same rough and spiny scutes, but the forehead is somewhat broader, the dorsal longer and composed of more numerous rays, and the back of the trunk ornamented with seven narrow blackish cross-bars. Also the præanal region is blackish. Length of specimen, 11 inches, (tail $5\frac{1}{2}$ inches.

Twofold Bay. 120 fathoms. (Gunther.)

Family. GYMNODONTES.

1283. TETRODON RETICULARIS. Bl. Schn.

Gunth. Cat. VIII., p. 296. *T. testudineus* Bleek. Atl. Gymnod, p. 71, pl. 8, fig. 3.

Very small spines cover the whole body from the nostrils to the root of the caudal fin ; those on the abdomen with two, three, or four roots. Snout short and obtuse, about one-third of the length of the head, and two-thirds of the width of the broad and flat interorbital space. Length of the caudal fin equal to its distance from the front margin of the dorsal. Abdomen with rather numerous brown or black longitudinal bands, obliquely ascending over the cheeks to the upper part of the head, and passing on the side into a brown network, the meshes enclosing round whitish spots. On the back the brown is the ground colour, with round whitish spots. Caudal fin with round yellowish spots, separated by a blackish network. Vert. 8/10.

Lower Burdekin. Salt water. (Macleay.)

Family. CARCHARIDÆ.

1284. Carcharias crenidens. Klunz.

Sitzb. der K. Akad. der Wissensch. 1879, p. 426. Taf. VIII., fig. 3

Of the subgenus *Scoliodon.* Teeth in both jaws serrated on the outer edge of the base, oblique, and without middle tooth in the lower jaw; no serration on the inner margin. The teeth in the upper jaw 12 1/12, in the lower 12/12. The fold of the upper lip is very distinct, therein differing from *C. acutus*, and is a little longer than the under one. The fold of the upper lip occupies ⅓ of the half of the lip, that of the lower 1/4 of the half of the lower lip. Snout long, obliquely obtuse in front, the distance between the outer angles of the nostrils is much greater than that between the nostrils and the snout; the length of the snout from the anterior margin of the mouth is equal to the distance of the eye from the anterior gill-opening. Pores on the head as in *C. acutus.* The length of the base of the anal fin is equal to half its distance from the ventral. Colour as in *C. acutus*, pectorals whitish margined behind; the back of the caudal dark. 60 Ctm.

Queensland. (Klunzinger.)

Family. LAMNIDÆ.

Genus. Selache. Cuv.

The first dorsal fin opposite to the space between the pectoral and ventral fins, without spine; the second and the anal fin very small; a pit at the root of the caudal fin, which is provided with a lower lobe. Side of the tail with a keel. No memtrana nictitans. A very small spiracle above the angle of the mouth. Gill-openings extremely wide. Teeth very small, numerous, conical, without serrature or lateral cusps.

Arctic Regions.

1285. Selache maxima. Gunn.

Gunth. Cat. VIII., p. 394. Basking Shark of Northern Europe.

This is the only species known of *Selache*, so that the generic characters sufficiently describe the species. It has hitherto been believed to inhabit only the Arctic Regions, but the recent discovery of one by Professor MacCoy on the Coast of Victoria, seems to point to the conclusion that it is also an inhabitant of Antarctic Seas.

The Victorian specimen caught at Portland Bay, measured over 30 feet in length and 20 feet in girth.

Family. SCYLLIDÆ.

1286. CROSSORHINUS ORNATUS. De Vis.

Proc. Linn. Soc., N. S. Wales. Vol VIII., p. 289.

Moreton Bay.

Family. RAIIDÆ.

1287. RAJA AUSTRALIS. Macleay.

Proc. Linn. Soc., N. S. Wales. Vol. VIII., p. 461.

Outside Port Jackson in 50 fathoms.

1288. RAJA NITIDA. Gunth.

Report Chall. Exp. Zool. Part VI., p. 27. Pl. XIV., fig. A.

Angle of snout obtuse, with a very thin median papillary projection. Width of interorbital space a little less than the length of the orbit, and distance between the outer margins of the nostrils, less than their distance from the extremity of the snout. Teeth with very small points, almost obtuse. Outer pectoral margin obtusely rounded, the greatest width of disk being equal to the distance of the snout from the extremity of the ventral. All the upper parts covered with minute asperities, one or two curved spines in front, and behind the orbit, one in the middle of the back, and a series along the median line of the tail. Above light brown marbled with dark brown blotches which are ornamented with small round yellowish ocelli.

Twofold Bay, 120 fathoms.

1289. RAJA DENTATA. Klunz.

Archiv. fur Naturg., XXXVIII., 1872.

Breadth $1\frac{1}{2}$ in the total length. Length of disk (to the end of the base of the pectoral fins) $1\frac{1}{3}$ of the breadth of the disk. Tail nearly as long as the disk, which is twelve times as long as the eye. Disk irregular, rhombic, its length not much less than its breadth. The snout is obtuse and not projecting. The front side of the pectoral fins rectilinear, the posterior slightly curved with rounded sides and backward angle. Eyes moderate, their longitudinal diameter equal to the breadth of the forehead. This last is concave. The snout cartilage is narrow, expanding towards the forehead. The distance between the nostrils is the same as their distance from the end of the snout. The back of the disk is everywhere covered with minute spines, with stronger ones disposed as follows:—One row along the supercilliary ridges in a curve, one row in the middle line of the back, extending to the tail where they are arranged in alternate irregular double rows. There are also large spines on the side of the tail, especially at the base; there is also a group of smaller spines on the cartilage of the snout. The teeth are in 42 longitudinal rows and are not acute. The ventral fins are long, their outer margin lobed, the front part with projecting points. Tail very depressed, a slight fold along the side, and compressed at the extremity, no distinct caudal fin. The two dorsal fins are close together, close to the tail, equal in size and rounded; the short space between these two fins bears a few spines. Colour grey, underneath white. 50 Ctm.

Port Phillip. (Klunzinger.)

1290. TRYGON SEPHEN. Forsk.

Gunth. Cat. VIII., p. 482. Macl. Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 212.

Tail with a broad cutaneous fold below, but without one above, about thrice as long as the disk. Disk rhombic, with obtuse angles. The upper parts densely covered with flat scale-like tubercles; several large globular tubercles in the median line of the scapulary region. Coloration uniform.

Lower Burdekin. Salt water. (Macleay.)

1291. TÆNIURA MORTONI. Macleay.

Proc. Linn. Soc., N. S. Wales, Vol. VIII., p. 212.

Lower Burdekin. Salt water.

On some new Batrachians from Queensland.

By Charles W. De Vis, M.A.

Limnodynastes lineatus.

Habit rather slender, but with powerful hind limbs. Tongue oval, with its free hind edge scarcely emarginate. The line of the vomerine teeth extends somewhat beyond the choanæ, and is but slightly interrupted; each half is dilated in the middle, has its anterior edge convex, and its posterior rather concave. The choanæ are small and obliquely elliptical. The head is as broad, or nearly as broad as long. The snout is rounded, longer than the orbit, and as long as or longer than the interorbit. The nostrils are equally distant from the orbit and tip of the snout. The loreal region is concave, the tympanum indistinct. The first finger is shorter than the second; the second in the female is broadly fringed. There are three metacarpal and one metatarsal tubercles, the latter small and blunt. On protraction of the hind limb the ankle reaches the front edge of the orbit. The skin is entirely smooth.

Measurements:—

Total length…… ….	18 lines	Osseous interorbit ..	2-3 lines
Length of head…….	8 ,,	Hind limb…………	16 ,,
Breadth of head……	7½-8 ,,	Foot…………………	9 ,,
Snout ………………	3 ,,	Forelimb ………….	10½ ,,
Orbit ………………	2½ ,,		

The ground colour is olive green to olive brown. A black longitudinal line commencing in a spatulate marking on the interorbit runs on each side of a narrow vertebral line of the ground colour. External to this, a broad black band runs along the side of the back. A third proceeds from the tip of the snout over the canthus rostralis and the eye to the shoulder, or is continued on to the body, where it breaks up into spots. Flanks and limbs on their front and back surfaces mottled with chestnut brown. Lower surface of thighs rufous, chin and throat mottled with brown. A black spot on the upper lip.

Four specimens collected at Mackay, by Mr. H. Ling Roth. Approaching near to *L. Peronii*, the present is sufficiently distinct from that species. Its chief differences are a shorter hind limb and a well-defined continuity in its dorsal stripes.

LIMNODYNASTES OLIVACEUS.

Habit stout, with short strong hind limb. Tongue orbicular, with the free hind edge slightly nicked. Vomerine teeth in an interrupted series, each half slightly curved, extending a little beyond the choanæ, which are round. Snout rather longer than the orbit, which is longer than the bony interorbit. Nostril equally distant from the eye and tip of the snout. Tympanum invisible. Canthus rostralis rounded. Loreal region shelving, rather concave. Three metacarpal and two metatarsal tubercles; the inner metatarsal small, the outer long and low. On protraction of the hind limb, the ankle reaches the hinder angle of the eye. Skin of back and upper side of limbs covered with strong tubercules.

MEASUREMENTS :—

Total length	18 lines	Osseous interorbit....	2 lines
Length of head	7½ ,,	Hind limb to ankle...	14½ ,,
Breadth of head......	7½ ,,	Foot	9 ,,
Snout..........	3½ ,,	Forelimb..............	9 ,,
Orbit	3 ,,		

Colour olive green, with yellowish bars on the lips and snout. One example collected at Mackay by Mr. H. Ling Roth.

HYLA ROTHII.

Habit slender, with a slender hind limb. Tongue oval, with its free hind edge rather deeply emarginate. Vomerine teeth in two small groups between the choanæ. Choanæ rather large, angular. Head small. Snout subacute, longer than orbit or interorbit—the latter equal. Nostril much nearer the tip of the snout than to the eye. Loreal region shelving, rather concave. Tympanum distinct, two-thirds of orbit. Fingers half-webbed, but fringed to the disks; disks about two-thirds of tympanum. Toes entirely webbed, with small disks. On protraction of the hind foot, the ankle reaches between the eye and the nostril. No distinct tarsal fold. A faint fold over the wrist.

MEASUREMENTS :—

Total length.........	20 lines	Osseous interorbit. .	3 lines
Length of head	7½ ,,	Hind limb to ankle...	18½ ,,
Breadth	6½ ,,	Foot	9 ,,
Snout	4 ,,	Fore limb, entire......	10½ ,,
Orbit	3 ,,		

Colour variable, lead grey, olive or reddish brown, uniform or mottled with darker. In one example, a faint trace of a dark line on each side the back, and a fine dark line from the nostril to the eye, curving down to the upper lip. In all the axil is black; the groins have large black spots which may run together into a line between the groin and the axil. On the foreside of the thigh a long irregular black stripe breaking up into spots distad. Posteriorly, a similar black line enclosing more or less completely one or two large yellow spots Lower surface of thigh purplish-red. Generally a black crescentic band across the wrist.

Four specimens collected at Mackay by Mr. Ling Roth.

OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE NEIGHBOURHOOD OF SYDNEY. No. 6.

BY E. HAVILAND.

This paper is the result of observations and notes that I have made, from time to time during the past six months, on some species of the genus *Darwinia.* That most common in the immediate neighbourhood of Sydney is *D. fascicularis.* I have, however, found one or two plants of *D. taxifolia.* The two species closely resemble each other; the leaves of *D. taxifolia* being a little more flattened than in *D. fascicularis;* and the flowers in each head fewer. Its specific name, *taxifolia*, was given to it by Allan Cunningham. Schauer, however, described it as *D. laxifolia*; and seems to have considered the name *taxifolia* a misprint; for Bentham adds a note to his description in the "Flora Australiensis" (Vol. 3, p. 12), in which he says, "Schauer was mistaken in supposing that Allan Cunningham's specific name of *taxifolia* was a misprint; it was intended to allude to the pecular bifarious arrangement of the leaves, in luxurious branches." In the third volume of the "Flora Australiensis," in which the genus *Darwinia* is described, only twenty-three species are enumerated. Von Müeller, however, in his census recently published, gives thirty-seven species. It must not be forgotten that most of the volumes of the "Flora Australiensis" were published many years ago. This third volume, for instance, eighteen years. Perhaps then, I may be allowed to refer here to the great debt of gratitude that I think is owing by all botanists, but especially by Australian botanists, to Baron von Müeller, by whose untiring energy they have been kept acquainted with all discoveries of new genera and species, since the publication of that work.

Darwinia fascicularis, of which species I speak more particularly in this paper, is very common about our coast line, being especially plentiful between Coogee and Botany. It belongs to the order *Myrtaceæ*; and is a low-lying, half decumbent shrub; having its leaves heath-like, crowded and nearly terete; its infloresence in terminal heads of ten to twenty flowers; presenting a rather curious appearance by having, often on the same head, some of its flowers white, while the others are red; the red colour, however, extends only to the limb of the corolla, the tube, in all cases, being white. If, as suggested in my last paper, the corolla is slit open, and spread out by small pins on a flat piece of cork, its five pointed lobes, with its ten stamens and shining black, gobular anthers, alternating with ten staminodia, which are often tipped with crimson rudimentary anthers, give it, especially under a low microscopic power, a very beautiful and gem-like appearance.

The genus, even if not otherwise interesting, will always be so by bringing to memory the name of one of the most illustrious naturalists of our time; but indeed, even confining my remarks to *Darwinia fascicularis*, I may say that it is a plant possessing great interest to all engaged in the study of vegetable life. In my last paper I brought under your notice a plant, *Myrsine variabilis*, which appeared to me to have its flowers always closed to *ensure* self-fertilization. Here, however, I speak of a plant whose flowers, or nearly all of them, appears to be always closed to *prevent* it. There is, however, this difference between them, that in the former case, both anthers and stigma are shut in the corolla together; while in the latter, the anthers are shut in, while the stigma is shut out, so that there can be no communication between them. Here and there, however, in *D. fascicularis*, an open flower is found without this separation of the fertilizing organs; but I think I am within bounds when I say that of a hundred of its flowers, ninety-five never open. I do not make this assertion from the inspection of a few flowers, but as the result of long and careful watching. Indeed, it was not until I had been studying the plant for some time that I could find any open flowers; and so under the impression that all were closed, having the anthers and stigma completely separated, I was at a loss to conceive how the plant was fertilized. Thinking that perhaps the corolla opened either during very bright sunlight, or perhaps as *Œnothera*, and many other flowers, in the early evening or at night, I have during this summer marked many flowers, and have watched them at all hours during both bright and cloudy days, and have also made special visits to Coogee at night for that purpose; but in no instance have I found flowers open except in the very few cases where they were so from the first. In one instance I marked a branch bearing three heads, consisting in all of forty-two flowers. Of these none were open; none of the styles projected more than a quarter of an inch beyond the closed corolla, shewing that the flowers were but little beyond the condition of buds. In four days I again visited this plant; none of the flowers were open, but the styles all projected more than an inch beyond the corolla. Nearly all the stigmas were mature and ready to receive pollen. In a week I made another inspection, finding the flowers still all closed. Of the three heads, one, comprising fourteen flowers, had pollen of on four the stigmas. A second, having twelve flowers, had no pollen on the stigmas. The third, which contained sixteen flowers at first, but now only thirteen, three having withered, had pollen on seven of the stigmas.

I think the fact that, in the whole of these flowers, the anthers were closely shut up within the corollas, while the stigmas were outside at some distance from them, and that no communication could possibly take place between them ; proves, beyond doubt, that they were cross-fertilized ; or that, at least, the pollen on the stigmas came from some other flowers. It also proves, I think, that if my estimate of the proportion of closed and open flowers is correct, ninety-five per cent. of them are entirely dependent on the remaining five per cent. for their fertilization. While sitting at a little distance from this plant, trying to think out how it could have been fertilized—for up to that time I had seen no open flowers—I noticed two or three small bees hovering about one particular part of it. If I frightened them away they invariably returned to the same place ; and, upon searching there, I found a head of ten flowers, three of which were open ; the anthers were fully exposed, and the pollen exuding from them. I revisited it several times, but, from first to last, the same three flowers only had opened.

The stigma is very small, being merely the point of the style ; but there is one feature in the plant which I consider of great importance. Immediately below the stigma is a ring of stiff hair-like glands, which secrete an adhesive fluid copiously. This secretion is greater in the young than in the mature flower. Indeed, if a bud is opened, it will be found so copious that a broad band or ligature is formed of it, extending from the style across to the inner surface of the corolla. As the flower approaches maturity, although the secretion is not so copious, it collects in considerable quantity, forming a globule close under the stigma ; and not only often creeping up to it, but running down the style In the course of time it dries into a smaller mass.

Considering that only about five per cent. of the flowers open, and consequently that that proportion of the pollen only is available for the fertilization of the plant, and that the anthers do not open by slits, as is most usual; but by two very minute pores, thus giving out the pollen grudgingly; that the pollen, even in the anther, is by no means abundant, but rather the reverse; taking, too, into consideration that each flower produces but one seed, one cannot help feeling surprise that the plant is so abundant. I think, however, this may be accounted for to a great extent, by the presence of the secretion of which I have spoken. The fact of its being more copious in the younger flowers while the styles are comparatively short, and the secreting glands are near the surface of the head of flowers, renders it almost impossible for an insect to crawl about the stage, formed by the compact head, without becoming so smeared with it, that on visiting an open flower much of whatever pollen might be exposed, would adhere to it, and be carried away by it; and for the same reason upon its visiting the mature stigmas of the closed flowers, a little only of the pollen, but quite sufficient, since there is only one ovule to be fertilised, would be left on each; the greater part remaining adhering to the insect, who would carry it from one flower to another. Thus it is not unlikely that by the pollen obtained by one visit to an open flower, very many of the closed ones would be fertilised.

Studies on the Elasmobranch Skeleton.

By William A. Haswell, M.A., B.Sc.

[Plates I. and II.]

In his well-known memoirs "Das Kopfskelet der Selachier" * and "Die Brust-Flossen der Fische,"† Gegenbaur has treated very exhaustively of the structure and homologies of these parts

* Untersuchungen zur vergleichenden Anatomie der Wirbelthiere. Heft 3.
† Op. cit. Heft. 2.

of the skeleton in the Selachoidei. There was an absence, however, in the material at his disposal, rich though it was, of certain southern forms of some little importance; and a study of some of those has enabled me to observe several points of some theoretical interest. The following is the list of the species examined:—

Heptanchus indicus....................	Complete skeleton.
Heterodontus (Cestracion) Phillipi ...	do.
Carcharodon Rondeletii	do.
Crossorhinus barbatus	do.
Cheiloscyllium furvum.....	do.
Squatina angelus	do.
Pristiophorus cirratus	do.
Trygonorhina fasciata	do.
Trygon pastinaca	do.
Urolophus testaceus................. ..	do.
Hypnos subniger	do.
Galeus canis	dried skull.
Scyllium stellarius	do.
Lamna cornubica	do.
Scymnus circaeensis	do.
Mustelus lævis..........................	do.
Zygaena malleus	do.

The skeletons of the Australian species were all examined in the fresh state, and the drawings made from them (with the aid of the camera and sometimes of photographs), while in that state or after preservation in glycerine jelly after Prof. T. J. Parker's method, so that little or no distortion or alteration had taken place.

One of the principal objects which I have had in view has been to ascertain how far a comparison of all parts of the skeleton would bear out the deductions as to the affinities of the various groups, based by Hasse* on the structure of the vertebræ; and I have added at the close of the paper a synopsis of the anatomical characters of the skeleton in the principal sub-divisions, showing how far this has been carried out.

* Morphologisches Jahrbuch, II., III., IV., and Supp. to IV.

The following is a short general summary of the leading points in the skeletal anatomy of the Plagiostomata.

The *vertebral column* of the Plagiostomata varies considerably in the degree to which the vertebræ become marked off from one another, and the embryonic tissue becomes ossified. In some (*Notidanus*), no ossification takes place in the centra, and the segments are not very clearly separated from one another. In others (*Spinacidæ, Læmargidæ* and *Echinorhinidæ*), each centrum presents a double osseous cone with the apices meeting in the middle and the cavities of the cones turned towards the anterior and posterior faces of the vertebra.* In the greater number of Sharks there is added to this double cone a series of osseous rays traversing the cartilaginous zone which forms the outer layer of the centrum. In one case only (*Squatina*) the rays are replaced by a series of concentric lamellæ surrounding the double osseous cone. In some sharks (*Notidanus* for example), each vertebra in the caudal region bears two neural arches. In the Rays ossification of the vertebral column is more perfect than in the Sharks, and the anterior portion of the spinal column becomes fused into a continuous bony and cartilaginous mass. In all the caudal vertebræ are distinguishable by the presence of inferior arches enclosing the caudal vessels. The first vertebra has its anterior surface modified for articulation with the occipital region of the cranium. In *Hexanchus*, in which the separation between adjacent vertebræ is very imperfect, the cartilage of the first vertebra is perfectly continuous with the cartilage of the cranium. In most other Selachii, however, the first vertebra developes lateral articular processes which articulate with the apposed surfaces of the occipital region of the skull. These lateral articulations are more markedly developed in the Rays, in which the median prolongation of the centrum of the first vertebræ fits into a deep excavation in the *basis cranii*, its apex being connected with the latter by a mesial ligament containing the rudimentary

* This structure seems first to have been noticed by Home: *See* "On the nature of the intervertebral substances in Fish and Quadrupeds," Phil. Trans., 1809, pp. 177-184.

prolongation forwards of the notochord, while its sides articulate with the occipital condyles.

In the caudal region of Sharks the hæmal spines become specially produced to afford support to the ventral half of the broad caudal fin; closely related to the dorsal surface of the vertebræ in this region, but not continuous with the neural arches and supporting the dorsal half of the fin are a series of cartilages which, though resembling produced neural spines, are not continuous with the neural arches, and do not agree in number with the latter; and in the trunk the dorsal and anal fins possess cartilaginous supports which sometimes present the appearance of modified neural and hæmal spines. Frequently, however, the skeleton supporting these unpaired fins is entirely unconnected with the vertebral column, and, though in some cases the correspondence in position of its elements with the segments of the vertebral column seems to indicate some developmental relationship with the latter, in others, the skeleton of the fin becomes so modified by the formation of plate-like basal cartilages that this apparent correspondence is no longer traceable.

The *cranium* of the Plagiostomata is formed of an undivided mass of cartilage, strengthened in many cases by the deposition of superficial layers of bony matter. It consists, in essence, of a cartilaginous case into the sides of which are incorporated the cavities or capsules that serve to protect the three pairs of organs of special sense, the ear, the eye, and the nose; in the walls of which are apertures for the egress of the cerebral nerves; and from which project certain processes which serve for the attachment of muscles or for connection with the anterior visceral arches. In the middle line behind is the aperture of the foramen magnum, the plane of which is usually inclined from below and behind upwards and forwards; its lower lip is deeply excavated in the Rays for the reception of the mesial process of the first vertebra; and on either side of this is one of the condylar surfaces which are articulated with the lateral articular processes of the first vertebra. In some sharks (*Notidanidæ*), the occipital region presents certain characteristics which assimilate it to the vertebral column; in the middle above is a ridge seeming to prolong forwards the line of the dorsal spines; on each side is another ridge apparently continuous with the transverse processes, and a row of small foramina (through which pass divisions of the vagus nerve), which seem to continue forwards the row of spinal nerve-foramina. In a few other sharks (*Spinacidæ*) these peculiarities are traceable in a less decided form; but in the majority the mesial and lateral occipital ridges disappear. In front of the occipital is the auditory region of the skull, in which are contained the various divisions of the membranous labyrinth, and with which articulate laterally the hyo-mandibular cartilages. In the lower forms among the Plagiostomes the surface of the auditory region takes its form to some extent from that of the enclosed parts of the auditory apparatus, and elevations marking the position of the anterior and posterior semi-circular canals and of the vestibule are very prominent on the surface; in higher forms these elevations become less marked, and in some exceptional instances they may become so obscured as to be barely traceable. On the upper surface of this segment of the skull are the two small apertures of the *aqueductus vestibuli*; in the Sharks these two apertures are closely approximated to one another, and are situated at the bottom of a common pit or groove—the *parietal groove*. In the Rays, on the other hand, the two apertures are separated from one another by a distinct interval and do not lie in any common groove.

The articular surface for the hyo-mandibular in the lateral wall of the auditory region varies greatly in its form and position. In form it varies from a simple concavity to a complex articular surface, sometimes divided into two parts; it may be excavated on the lateral wall of the auditory region, or may be borne out from the general surface on prominent processes of the postero-lateral region of the cranium. In the Rays it is placed nearer the base of the cranium than in the Sharks, and is more elongated antero-posteriorly. Behind it in the Rays is sometimes a small articular surface for the first branchial arch.

In front of the auditory region is the orbital region, which presents on either side a deep concavity for the reception of the eye.

In most Sharks the orbital cavity is bounded below by a plate of cartilage—the *basilar plate;* but this is absent in all the Rays. It is frequently bounded in front and behind by præ- and post-orbital processes; and its wall is perforated by apertures for the egress of the facial, trigeminal, abducent and oculo-motor nerves. A shallow groove passing forwards from the aperture for the trigeminal marks the course of the ophthalmic branch of that nerve, and a series of foramina in the roof indicate the points at which the supra-orbital branches of the same nerve penetrate towards the roof of the skull. In front near the upper border of the orbit is a canal or notch by which the ophthalmic nerve reaches the upper surface of the skull; and in front of the orbit is a canal or notch (the *ethmoidal canal* or *notch*), by which it again passes downwards towards the lower lateral region of the olfactory capsule.

In front of the orbits are the olfactory capsules, which are more or less completely enclosed in cartilage, and are usually solidly connected with the rest of the cranium. Related to the olfactory aperture is a small cartilage, the *olfactory cartilage* usually of the form of an incomplete ring.

Between the nasal capsules the mesial portion of the skull is usually produced forwards into a longer or shorter rostrum, which may be single and contain a canal continuous with the cranial cavity, or may be composed of three solid bars of cartilage, a mesial and two lateral, which coalesce anteriorly. Directly or indirectly related to the skull are the palato-quadrate, Meckelian, hyoid and branchial arches.

At the sides of the gape are the labial cartilages, of which there are usually two pairs above and one below. In the Rays labial cartilages, as a rule, are absent.

The upper and lower jaws of the Elasmobranchii consist of the palato-quadrate and Meckelian cartilages respectively, the substance of the cartilage being usually deeply impregnated with osseous matter. The palato-quadrate is distinguishable in the Sharks into an anterior, palatine, and a posterior, quadrate, portion. It presents in *Notidanus* a process for articulation with the post-orbital process. In the *Notidanidæ* the palatine cartilages of opposite sides are widely separated from one another by an interval occupied by ligamentous fibres, but bearing teeth. The two halves are more closely approximated in other Sharks; in some *(Cestracion, Scymnus)* they are very intimately connected. In the Rays the palatine and quadrate portions are usually not well marked off from one another, and the two halves are intimately united together in the middle line. In the Sharks a palatine process is developed for articulation with the *basis cranii*, but this is absent in the Rays. The articulation between the palato-quadrate and lower jaw may be single, but, more usually, is divisible into two parts.

In most Sharks the two halves of the lower jaw, or Meckel's cartilage, are freely movable on one another, *Cestracion* being the most important exception; in the Rays the movability is much less than in the Sharks, and the two rami may be united into a rigid bar.

In the simplest arrangement to be observed in the Elasmobranchii, the upper elements of the *hyoid arch* are similar in function and in relation to the arch to those of the succeeding branchial arches. They serve, that is to say, solely to suspend the ventral portion of the arch, and the union with the side of the cranium is slight and unimportant. In a further stage, such as is represented in *Cestracion*, these elements become a little more important and come into relation, slightly at first, with the palato-quadrate cartilage and lower jaw, which they help to suspend, still, however, being mainly related to the hyoid; in a yet more advanced stage (most Sharks) the cartilage becomes thicker and longer, its articulation with the skull becomes more complete, and by its distal extremity, which develops a special mandibular process, it is mainly related to the palato-quadrate and mandible, the relation to the hyoid having now become a subsidiary one; the *epi-hyal* has now become a *hyo-mandibular*. In a further stage (Rays) the hyoid undergoes a degeneration, loses its distinctness from the branchial arches, and is attached to the base of the hyo-mandibular, or is no longer directly related to it, but articulates separately with the side wall of the cranium. Finally (as regards this degeneration), in *Hypnos* and *Trygonorhina* the hyoid, now become quite similar to the succeeding arches, is connected with the skull only through the epibranchial of the first branchial arch.

Related to the hyo-mandibular is the spiracular cartilage, a thin usually four-cornered plate supporting the wall of the spiracle.

The lower or distal portion of the hyoid arch consists of two lateral pieces on each side, and of a mesial cartilage or copula. The lateral pieces (as well as the hyomandibular) may bear rays similar to those of the branchial arches; the mesial piece may be a broad plate or a narrow band of cartilage, or, as, in many Batoidei, may become altogether aborted.

The *internal branchial arches*, which support the gill-pouches, are always five in number, except in *Hexanchus*, which has six, and *Heptanchus* which has seven. Each branchial arch, when typically developed, consists of a dorsal *basal* cartilage usually thin and leaf-like, and lying free close to the ventral aspect of the spinal column, sometimes styliform and articulating with the spinal column by a distinct joint (some Rays); of two *mesial* cartilages, a dorsal and a ventral, usually with deep grooves on their inner surface for the insertion of muscle; of a *copulare*, and of a mesial ventral *copula*. In most, however, the copulæ become greatly reduced and may form a single basibranchial plate as in the Rays; in *Myliobatis* and *Trygon* the copularia are likewise amalgamated with this basal-plate. The fifth arch has no copulare and no basal—its dorsal mesial articulating with the basal of the fourth: very often it is connected by articulation with the pectoral arch.

The *outer branchial arches*, which are a series of cartilages bounding the branchial apertures and situated at the extremity of the branchial rays, are more rudimentary in *Hexanchus* and *Heptanchus* than in other Sharks; they are best developed in *Cestracion*. They are absent in the Rays, though Gegenbaur found rudiments of them in *Rhynchobatus* and *Trygon*.

The *pectoral arch* is a stout cartilage, the lateral portions of which are curved backwards and inwards towards the vertebral column, with which they may articulate (Rays). The ventral portion of the arch is divided in the middle line in Sharks, (except *Squatina* and *Heterodontus*), by a mesial more flexible region which permits of a good deal of motion of the two halves upon one another; but in the Rays the two halves are quite continuous with one another, the ventral portion of the arch forming (except in *Torpedo*), a rigid bar. Borne on the lateral portions of the arch towards its ventral aspect are the articular surfaces for the pectoral fins. Of these there are usually three, often placed in a horizontal line. Near the articular surfaces are the foramina for the transmission of the brachial nerves. The skeleton of the fin proper consists, when typically developed, of three basal cartilages—the *propterygium*, *mesopterygium* and *metapterygium*—and of a number of *rays*. In some Sharks (*Heterodontus*) the propterygium is absent, and in *Scymnus* the mesopterygium also; in Rays the mesopterygium is always small, and some of the radial cartilages may articulate with the shorter-girdle directly, while the propterygium and metapterygium are greatly elongated. In Sharks the pectoral fins are of moderate extent and do not articulate with the cranium; in Rays, on the other hand, they are greatly expanded, extend far forwards as well as backwards, frequently completely encircling the head, and the propterygium is, except in the *Torpedinidæ*, connected with the olfactory region of the skull, through the intermediation of an *ant-orbital* cartilage.

The *pelvic arch* is a straight or slightly curved bar of cartilage, with the outer extremities of which the pelvic fins are articulated. Usually it is perforated by two nerve-foramina on each side, and may develope longer or shorter processes or cornua in front of and behind the articular surface. Each pelvic fin contains usually only two basal cartilages, the hinder being much the more important, and having the greater number of the rays articulated to its outer border; connected with its distal extremity are the cartilages which form the skeleton of the clasper of the male.

The structure of the fins of the Elasmobranchii has been minutely studied in connection with the subject of the origin and nature of limbs. A detailed knowledge of the anatomy of these fishes seems first to have been brought to bear on this question by Gegenbaur,* who came to the conclusion that the primitive limb-skeleton or Archipterygium resembled generally that of *Ceratodus.*† From this primitive form he traced the various modifications of the fin of fishes and the limbs of the higher vertebrates. The Elasmobranch fin, with which we are immediately concerned, he regards as having been developed from the Archipterygium by the suppression of the post-axial series of fin-rays—the metapterygium representing the axis of the archipterygium, and the mesopterygium and propterygium, together with the rays connected with them, having been derived from certain rays which he supposes to have been directly connected with the shoulder-girdle in the primitive fin. The archipterygium itself he regards as having been developed from a branchial arch and its connected rays. A similar view of the relations of the Elasmobranch fin to that of *Ceratodus* and the Crossopterygian Ganoids was embraced by Professor Huxley, and maintained by him as late as 1876,‡ but Huxley regarded the axis of the archipterygium as being represented by the mesopterygium, not the metapterygium, and does not give his adherence to the theory that the limbs are modified branchial arches.

Balfour § has shown more recently (1878) that the paired fins of *Scyllium* originate in two pairs of lateral ridges of epiblast, the embryonic limbs of each side being connected for a time by a low continuous ridge, which, however, soon disappears. In the messoblast subsequently growing into these folds of epiblast is developed a longitudinal bar of cartilage. The outer side of this is connected with a plate which extends into the fin and becomes segmented to form a series of parallel rays situated at right angles to the longitudinal bar. In front this longitudinal bar is continuous with the limb-arch. From these observations has been

* Grundriss der Vergleichenden Anatomie.
† See Günther, Description of Ceratodus, Phil. Trans., 1871.
‡ On *Ceratodus Forsteri*, with Observations on the Classification of Fishes, P.Z.S., 1876, pp. 24-59.
§ Monograph on the Development of Elasmobranch Fishes, pp. 101-104; Comparative Embryology, Vol. II., p. 49, (1881.)

deduced the theory that in their simplest form the paired fins of fishes are simply continuous lateral folds similar in their derivation to the unpaired fins, the continuous fold of each side becoming subsequently differentiated into the anterior and posterior fins.

From the formation of the pelvic plexus, some of the nerves going to which in Elasmobranchs are derived from vertebral segments situated considerably in front of the fin, Davidoff * deduced the conclusion that the limbs had moved backwards from an orginally anterior position, and regards the facts which he adduces as favouring Gegenbaur's hypothesis. If, he supposes, the paired fins were derived from continuous lateral folds, they would be developed in the place they were ultimately to occupy, and there would be no trace of any previous shifting backwards or forwards. Gegenbaur † also has endeavoured to show that the discovery of the lateral ridges supports rather than overthrows his theory,—the ridges being persistent embryonic structures marking the passage backwards of the pelvic fins.

Thacher (Proc. Connecticut Academy),‡ and, independently of him, Mivart (Trans. Zool. Soc. IX.) have sought to prove that a comparative study of the structure of the median and paired fins of adult Elasmobranchs and Ganoids leads to the same conclusion as the study of development, viz., that the paired and unpaired fins are strictly homologous structures, and are not developed by the modifiation of any pre-existing portion of the skeleton.

In a subsequent memoir § Balfour discusses the general bearings which he regards his embryological observations on *Scyllium* to possess upon the theory of the nature of limbs, pointing out that these observations are much more favourable to Thacher's and Mivart's views than to those of Gegenbaur and Davidoff.

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* Beiträge zur vergleichenden Anatomie der hinteren Gliedmasse der Fische, Morphol Jahrbuch, V., pp. 450-520 (1879.)

† Zur Gliedmassen-Frage, Morph. Jahrb. V., pp. 521-526 (1879.)

‡ I only know this memoir as quoted by Mivart, Balfour, and Davidoff.

§ On the Development of the Skeleton of the Paired Fins of Elasmobranchii considered in relation to its bearings on the Nature of the Limbs of the Vertebrata, P.Z.S., 1881, p.p. 656-670.

"If Gegenbaur's view were correct we should expect to find in the embryo, if anywhere, traces of the second set of lateral rays; but the fact is that, as may easily be seen by an inspection of figures 6 and 7, such a second set of lateral rays could not possibly have existed in a type of fin like that found in the embryo. With this view of Gegenbaur's it appears to me that the theory held by this anatomist to the effect that the limbs are modified gill-arches also falls, in that his method of deriving the limbs from gill-arches ceases to be admissible, while it is not easy to see how a limb formed on the type of the embryonic limb of Elasmobranchs could be derived from a gill-arch with its branchial rays."*

He also points out that Huxley's view that the proximal piece of the axial skeleton of the limb of *Ceratodus* is the mesopterygium, and that the fin of the Elasmobranchs is derivable from that of *Ceratodus* by the drawing in of the axis, is negatived by the proof afforded by the facts of embryology of the secondary character and late development of the mesopterygium. He shows also that the arrangement of the nerve-plexuses as described by Davidoff does not necessarily require the explanation given by that anatomist. The fact that some of the nerves which go to form the pelvic plexus are derived from vertebral segments in front of the position of the fins may be explained by a previously greater extent of the fin, just as well as by its movement backwards.†

Finally Owen (Proc. Zool. Soc, 1883) has recently given a short summary of his views on the subject of the homologies of the vertebrate limb, and has shewn how his theory of the origin of limbs from lateral appendages of hæmal arches gains support from Balfour's investigations on the development of the fins of the Elasmobranchii.

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* l. c. p. 669.

† I have ventured (On the Structure of the Paired Fins of *Ceratodus*. Proc. Linn. Soc., N.S.W., Vol. VII., p. 10.) to make the very obvious suggestion that the derivation of the pectoral and pelvic plexuses from a number of spinal nerves was a strong piece of evidence in favour of Balfour's theory and against that of Gregenbaur; but I am now inclined to think, in view of certain facts observed by Fürbringer (Morphologisches Jahrbusch, IX.) as to the origin of the nerves supplying the pelvic fin in some Teleostei with thoracic or jugular pelvis fins, that the position of the spinal nerves from which the plexuses are derived is too plastic a factor to support any wide generalisation at all.

CARCHARODON RONDELETII.

Plate I., Figs. 1-4.

Skull and Visceral Arches.

The upper surface of the occipital region of the skull (Plate I. fig. 1) is horizontally directed, and is continuous without interruption with the upper surface of the periotic and ethmoidal regions. The occipital crest is not well marked behind, but in front forms an elevated, though rounded, ridge, ending between the auditory foramina in a nearly vertical border. The parietal groove is shallow and open, and is excavated on the hinder part of a prominent parieto-frontal crest, which reaches as far forwards as the frontal foramen. A small median foramen lies in its front portion. On either side of the parietal groove, running forwards and slightly outwards, is a rounded elevation, which stops short a little way in front of the auditory foramen, and behind does not quite reach to the posterior margin of the skull. The anterior and posterior portions of this correspond to the elevations of the anterior and posterior semi-circular canals respectively. The vestibular prominence is not well marked.

The articular surface for the hyo-mandibular (Plate I., fig. 2, Ar.), is borne outwards and backwards from the cranium on a very prominent process, which is produced into three prominent angles, one directed backwards, a second upwards, backwards, and a little outwards, and a third, the shortest, forwards and outwards. The posterior portion of the process projects far behind the plane of the foramen magnum, and bears a large aperture for the glosso-pharyngeal on its upper and posterior surface at some distance from the posterior angle, but behind the plane of the foramen magnum and of the orifice of the vagus; below it reaches to the plane of the base of the skull; and the anterior and upper portion reaches as high as the middle of the foramen magnum. The articular surface itself consists of two portions—a hinder, much larger, which is a shallow concavity and is bounded below by a slight raised ridge;

and an anterior, smaller, saddle-shaped, and placed in front of and above the other, from which it is not distinctly separated. This large and prominent articular surface distinguishes the present genus very markedly, though modifications in the same direction are to be observed in the case of *Galeus* and *Scymnus*.

There is no second foramen near that for the glossopharyngeal such as occurs in some genera. The orifice for the facial nerve is situated far forwards, separated by a considerable interval from the articular surface for the hyo-mandibular and near the trigeminal.

The orbit is covered above by a wide lamellar roof produced behind into a post-orbital process *(Po O)* which is likewise lamelliform, and is curved downwards and backwards; the latter does not come into direct relation with the palato-quadrate cartilage. In front, the roof bends down towards the base of the skull and bounds the orbit anteriorly, forming a distinct though not prominent præ-orbital process. Below, the orbit is bounded by a cartilaginous lamella which slopes downwards and outwards from the *basis cranii*. This lamelliform process or basal plate (*Ba*), is interrupted in front by a deep irregular incision, and behind there is a large oval foramen.

On comparing the skull of *Carcharodon* with a dried skull of *Lamna cornubica*, I can find little difference between the two. In both are the same postero-lateral processes for the articulation of the hyo-mandibular; in both the auditory foramina lie in a groove which runs along a broad central ridge; in both thin lamellæ of cartilage overarch the orbits; and both have the same form of three-barred rostrum. As, however, the structure of the skull in the family to which both these genera belong has never been described, I have entered with some minuteness into the above description.

The palato-quadrate is suspended, as in most Plagiostomes, by means of a hyo-mandibular, which is large and articulates with skull by a broad articular surface. Attached to the hyo-mandibular and hyoidean cartilages are about twenty irregular rays, with a number of smaller intercalary cartilages towards their extremities; three of the rays on either side of the articulation between the hyo-mandibular and the hyoidean coalesce at their bases.

The copulare of the first branchial arch articulates with the hyoid copula; that of the second arch is united with its fellow by the intermediation of a small copula; it is connected externally with both the first and the second arches, as often occurs. The fifth arch has no copular. The basal plates of the first three arches are large and triangular; the third is bilobed at the apex; the mesial plates are deeply grooved internally near their proximal ends for the attachment of the strong adductors. The first arch has sixteen rays, the second thirteen; the third twelve. The fourth basal is confluent with the upper mesial of the fifth, their being no representative of the fifth basal.* The mesials of the fourth arch are deeply grooved for the adductors like those of the preceding three which they resemble in form; it has twelve rays. The fifth has no muscular grooves; it has no rays, but presents a strong continuous ridge on its outer surface in a position corresponding with that of the rays in the preceding arches.

The Shoulder-Girdle.

The mesial portion projects very strongly ventrad, forming a fold, and its front margin is greatly elevated towards the middle. The lateral halves are united by continuous cartilage; except at the dorsal extremities and the mesial uniting portion, they are strongly impregnated with osseous matter. The whole girdle is very broad, much broader than in *Carcharias*, slightly contracted near the line of junction, and narrowing slightly towards the dorsal extremity. There is no articular process or surface for the branchial skeleton. The articular surface for the pectoral fin is directed downwards and slightly backwards and outwards; it is of long, narrow form, constricted in the centre. The arrangement of the nerve apertures is in some respects peculiar, and very different from that to be observed in *Carcharias*.† The aperture of

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* A similar arrangement occurs in *Raja*, *Rhynchobatus*, *Scyllium*, and *Galeus*. Vide Gegenbaur, Untersuchungen, II., i., "Schultergurtel der Wirbelthiere."

entrance is situated nearly directly behind the articular surface about the middle of the arch; from this two canals lead, the one short and wide, passing outwards and a little forwards and downwards to open on the outer surface, the other narrow, and passing upwards, forwards, and slightly outwards to end above and behind the articular surface on the inner aspect of the cartilage close to the anterior border. The upper canal described by Gegenbaur in *Scyllium*, *Galeus* and *Pristiurus* is indicated on the right side only by a slight depression.

THE PECTORAL FINS. (Plate I., fig. 3.)

As in *Carcharias*,* the pro- meso- and meta-pterygia are all well developed and the latter is greatly elongated, having a large number of rays articulating with its pre-axiad border; but the mesopterygium is not quite distinct from the metapterygium, in fact is completely coalescent with it at the base, whereas in *Carcharias* the two cartilages remain quite separate. Articulating with the distal extremity of the propterygium is a lateral cartilage, formed, as in *Scyllium*, *Pristiurus* and *Carcharias* by the coalescence of the bases of three posterior propterygial rays, but not continuous with the latter—being separated from them by an articulation or interval of fibrous tissue; the front ray, which is very short, remains distinct and articulates separately with the propterygium. The propterygium and mesopterygium are relatively more important than in *Carcharias*, nine rays in all articulating with them; the bases of the last four mesopterygial rays are coalescent for a short distance. The elongated metapterygium articulates at its distal extremity with two accessory cartilages, the posterior of which is much the longer and bears nine rays, while the anterior bears three. The bases of four of the rays which articulate with the metapterygium are coalescent in pairs for a short distance at the base.

The arrangement of the basal cartilages described above seems to place the pectoral fin of *Carcharodon* in an intermediate position

* Gegenbaur, "Untersuchunger zur vergleichenden Anatomie der Wirbelthiere." Heft, 2, 2te. Abschnitt, Brustflosse der Fische, p. 142, Tab. IX., fig. 5 (1865.)

between that of *Carcharias* and that of *Callorhynchus* *—the basal elements in the latter being reduced to two, of which the posterior may be regarded as the homologue of a coalescent meso- and metapterygium.

The whole of the long pointed fin of *Carcharodon* is supported by a framework of cartilaginous rays which extend nearly to its apex and are closely united into a continuous triangular plate. The middle rays, *i.e.*, those which reach nearly or quite to the apex of the skeleton of the fin, broaden out considerably distally, and sometimes divide. Between the distal portion of adjacent rays in the front half of the apical part of the fin are intercalated a series of accessory rays, an arrangement which I have not met with in any other form, though a rudiment of it is traceable in *Heterodontus Phillipi.*

The Pelvic Fins.

The pelvic cartilage presents a large oval aperture in its outer half near the anterior border; its outer extremity is produced into a process with which no fewer than six rays articulate. The basal cartilage is strong and curved, convex above, flat below; at its distal extremity are two small cartilages with which the long tapering flexible cartilage of the clasper articulates. The last ray, which is very short, is attached exclusively to the base of the cartilage of the clasper.

The Dorsal fins. (Plate I., fig. 4.)

The dorsal fin is supported by a cartilaginous skeleton which is separated by a fibrous interval from the spinal column. It consists of about twenty-eight rays, which slope for the most part backwards and upwards. The first ray is very short, but presents traces of division into three segments. The second, which is a little longer, divides into two branches; the third is simple, and consists of three segments, of which the basal is much the longest; the fourth is bifurcated, and each of the branches presents two articulations. The next six rays are either distinctly bifurcated near

* Vide Mivart, l. c.

the extremity or have intercalated rays between them; none of the rest of the rays are distinctly branched. The last five or six rays, which are very short, are supported on a series of irregular basal cartilages. The arrangement of the articulations is such that there are three more or less complete antero-posterior horizontal lines of them; that situated nearest the base is confined to the last eleven rays; the middle one stretches completely across the fin from side to side and the distal one, situated not very far from the middle, extends in an irregular line from the seventh ray to the eighteenth. The second dorsal and anal fins are very small, and consist of a few irregular rays without basal plates, and separated by a well-marked interval from the vertebral column.

The Caudal Fin.

The caudal fin is supported both by supra-vertebral and by sub-vertebral cartilaginous rays, of which the latter are more highly developed than the former. The latter begin a little in front of the upward bend of the spinal column. The first is a short triangular piece articulating movably with two of the hypurals. The following five, which become successively longer, likewise articulate with the hypurals, but the remainder, which gradually decrease in size from before backwards, coalesce with the latter at their bases without the intervention of any articulation. The supra-vertebral rays begin a little behind the commencement of the sub-vertebral; none of them coalesce with the neural arches. In front, where they are more irregular and more or less coalescent with one another, a few of them are separated from the neural arches by a slight interval occupied by fibrous tissue. In many cases a pair of rays may coalesce with one another; otherwise they correspond in number with the vertebræ.

HEPTANCHUS INDICUS.

Plate I., Fig. 5.

Skull and Visceral Arches.

The occipital region is characterised by the presence of three ridges—a central one continuous with the spinous processes of the vertebræ, and two lateral ones continuous with the transverse processes. Its upper surface slopes obliquely upwards and forwards to the parietal groove, which is a deep pit continued forwards for a short distance by a rapidly shallowing concavity. The elevations for the anterior and posterior semi-circular canals are well marked and prominent. The articular surface for the hyo-mandibular is simple and not raised from the general surface The orbit is bounded behind by a very prominent post-orbital process with which the palato-quadrate articulates. There is no basal plate ; in front of and below the orbit and projecting downwards and outwards, is a prominent pointed process, the extremity of which is free ; this, according to Gegenbaur, corresponds to the ant-orbital cartilage in Rays ; it is not, however, related to the wall of the nasal capsule, but is placed behind the latter and arises from the contiguous portion of the base of the skull. The rostrum is represented by a pair of short processes of the ethmoidal region not extending beyond the level of the nasal cartilage. The walls of the nasal capsule are formed of cartilage only behind internally, and above, with a short external rim. The nasal cartilage is ring-shaped, with two short horns directed downwards. Below the orbit there is, as in *Hexanchus griseus* and *Heptanchus cinereus,* an extensive vertical articular surface for the palato-quadrate.

The hyo-mandibular is a long, narrow, curved and flattened cartilage bearing the hyoid at its distal extremity, and suspending also the palato-quadrate, though chiefly related to the hyoid. The hyoid cornua are very large: they bear a few delicate rays ; distally they articulate with the hyoid copula. The first branchial arch has no *copulare* ; its ventral mesial cartilage is connected with the postero-external angles of the hyoid copula The following five arches have all well-developed copularia ; the second and third have distinct though small copulae ; the fourth has no separate copula, the latter having become fused with the left copulare. The fifth and sixth copularia unite with the basibranchial plate. The seventh arch has no copulare as well as no basal, its ventral is broad and flattened, and unites with the basibranchial plate. The basibranchial plate is broad and leaf-like in front, while behind it is produced into a rather slender process. This arrangement of the copulae differs from that observed in *Heptanchus cinereus* as described by Gegenbaur* in the absence of an independent copula for the fifth arch. In the first to the fifth branchial arches the basals of opposite sides touch one another in the middle dorsal line, the basals of the first being united with one another by cartilage. The basals of the sixth do not reach to the middle line. There are small but distinct muscular grooves on the dorsal and ventral mesial cartilages.

The external branchial arches are represented only by two pairs of cartilages in each; the one is connected with the external end of the basal; the other, which is much longer, with the ventral end of the ventral cartilage. The free ends of these two slender cartilages bend round the outer edge of the gill-partition towards one another, but do not meet. These obviously represent modified rays, and their presence would seem to indicate that the more highly developed external branchial arches of other Selachians are derived from greatly elongated rays which ultimately lose their connection with the internal arches.

The Pectoral Fins.

The pectoral fin is very similar to that of *Hexanchus griseus* as described and figured by Gegenbaur. The propterygium is small and bears no rays, articulating distally with the mesopterygium. The mesopterygium and the metapterygium bear a nearly equal number of rays, a few of them being bifurcate. The metapterygium bears a small articular cartilage at its extremity, and the latter sustains about four rays.

The shoulder-girdle is remarkable for the presence in the middle ventral line of a distinct four-sided lozenge-shaped cartilage let in to the arch, as it were, in front. This is a condition which I have not observed or seen described in any other form: it does not seem to occur either in *Heptanchus cinereus* or

* l. c. p. 136, pl. XVIII., fig. 1.

*Hexanchus griseus.** The intercepted cartilage is temptingly like a presternal, but the absence of such an element in the skeleton of any group nearer than the Amphibia seems to preclude this explanation.

THE PELVIC FINS. (Plate I., fig. 3.)

In the pelvic fin of *Heptanchus indicus* there are three distinct basal cartilages articulating with the pelvic girdle and bearing rays; these represent the præ- meso- and meta-pterygia of the pectoral fin. The first (*p. pt'.*) is the equivalent of the so-called pre-axial fin-ray. It is a small, pointed cartilage articulating with the anterior facet on the pelvic girdle, curving forwards and outwards and ending in a pointed extremity. By its outer posterior border it gives attachment to the four anterior fin-rays, of which the first two have their bases coalescent. The mesopterygium (*m. pt'.*) is a small quadrate cartilage articulating with the middle facet of the pelvic arch, and giving attachment to two fin rays † The remainder of the rays are attached along the outer border of the metapterygium (*mt. pt'.*) The latter is a long narrow cartilage, somewhat curved outwards. Distally it gives attachment to two cartilages; of these that situated more dorsad is a small nodule, articulating with which is a long narrow ray-like cartilage; the latter is applied closely to the dorsal surface of the cartilage of the clasper and strongly united with it by means of fibrous tissue; the more ventrally placed of the two cartilages articulating with the extremity of the metapterygium continues the axis of the fin, gives attachment at the base of its outer border to the last of the fin-rays, and distally is succeeded by a smaller cartilage with which the principal cartilage of the clasper articulates. The axial cartilage of the clasper is a slender, slightly curved cartilage, which presents no appearance of the longitudinal groove found in *Crossorhinus*. Distally it supports two small, blade-like freely movable ossified cartilages which are attached to its apex about the middle of their

* Gegenbaur, Schultergurtel der Wirbelthiere, Op. cit. Heft. 2.

† If this middle basal cartilage is present in the European species it has escaped notice. (See Davidoff, Morph, Jahrb. V.; Mivart, l.c.p. 444, pl. LXXV., fig. 4.)

length. The latter support the end of the groove of the clasper, and by their rotation can open or close it.

The pelvic arch is narrow from side to side and very long antero-posteriorly—the greatest breadth being only about twice the length—convex ventrally, convave dorsally.

Unpaired Fins.

The dorsal fin is very simple, consisting of two broad and thin sheets of cartilage, an anterior and a posterior; the former much the larger, having about 17 few-jointed rays united with their upper edge. Several of these rays are obscurely bifurcate. This is very similar to the dorsal fin of *H. cinereus*,* except that the posterior basal cartilage in the latter is very small.

The anal fin is similar to the dorsal, but smaller and with fewer and shorter rays.

CROSSORHINUS BARBATUS.

Plate I., Figs. 6-8 and Plate II., Fig. 13.

Skull and Visceral Arches.

The cranium is very wide and depressed, as in *Scyllium catulus*, the interorbital breadth being relatively much greater than in *Chiloscyllium*. A noteworthy point in comparison with related genera is the much greater relative antero-posterior extent of the post-orbital region. The occipital surface slopes upwards and forwards, and meets the upper surface in a rounded ridge, in front of which the not very deep parietal groove is situated. The upper surface of the skull in front of this is marked by a shallow mesial longitudinal depression, the continuation forwards of the parietal groove; it is bounded externally by a continuous raised border as far as the pre-orbital process.

The occipital region is not produced in the middle line behind. As in *Scyllium*, *Mustelus*, *Galeus*, and *Scymnus*, the lateral posterior

* Mivart, l. c., p. 443, pl. LXXV., fig. 2.

processes which articulate with the first vertebra are prominent, the first vertebra being wedged very closely into the median recess between them and very closely united to the skull, except in the middle line above, where a considerable interval occupied by fibrous tissue intervenes between the hinder part of the skull and the neural arch.* The apertures for the vagi, which are very large, are placed immediately above and in front of these lateral processes, and above and a little external to them are a pair of smaller apertures of unknown function. There is no trace of a median occipital crest. In the auditory region the elevations corresponding to the anterior and posterior semi-circular canals are prominent, though rounded, and less sharply marked off than in some nearly-related forms; between the anterior elevation and the lateral border of the skull is a rather deep hollow. The postero-lateral angles of the skull are somewhat curiously modified, the arrangement being more like that observed in *Carcharodon* than in *Scyllium*. The angles are drawn out into prominent processes, each of which exhibits three divisions, an antero-superior, an antero-inferior, and a posterior. The antero-superior is continued into the very prominent vertical ridge which separates off the upper surfaces of the cranium from the lateral. The antero-inferior forms the hinder portion of a ridge which bounds superiorly the articular surface for the hyo-mandibular. The posterior, which extends outwards and backwards, is grooved above for the glossopharyngeal, the aperture of exit of which is situated at its base; below it developes a ridge with which some of the ligaments for suspending the lower jaw appear to have been connected; this ridge occurs also in *Cheiloscyllium*: it runs forwards and inwards and ends some distance behind the basal angle. The articular surface for the hyo-mandibular differs from that of all forms with which I am acquainted † in being a very deep, almost conical hollow, which is situated below and a little in front of the antero-inferior process already mentioned. It is in the

* A similar arrangement occurs in *Cheiloscyllium*.

† The corresponding articular surface in *Cheiloscyllium* is a wide and shallow concavity without any definite upper border, but with the lower border rather prominent, and formed by the ridge mentioned above as giving attachment to ligaments.

same transverse plane as the point of junction of the anterior and posterior semi-circular canals, and therefore excavated in the side of the cranium proper and not on the postero-lateral process. The opening of the facial is directly in front of this articular cavity, and is separated by a broad ridge from that of the trigeminal. The supra-orbital ridge is very prominent and forms to some extent a roof to the inner part of the orbit; it ends behind and in front in prominent post- and præ-orbital processes. There is a very broad and thin lamellar basal plate, nearly horizontal in position, but inclined slightly downwards externally; it presents a rather small oval opening in its hinder portion close to the lateral wall of the cranium.

The palato-basal articulation takes place through the intermediation of a very thick and short ligament inserted immediately in front of the orbit, where there is a small but well-marked articular surface looking outwards and forwards.

The ethmoidal canal is not even represented by a notch.* The præfrontal opening is large and its lateral borders diverge anteriorly unlike those of *Scyllium*. In front of it the *basis cranii* rises up and is extended into three thin lamellar processes, of which the middle one or rostrum is nearly straight and ends in a free extremity between the nasal capsules, while the lateral become rather expanded, and, their anterior ends curving downwards, form a part of the roof of the corresponding nasal capsule. Immediately behind the frontal foramen is a slender process which passing outwards and forwards, becomes greatly expanded at its extremity to form the outer and inferior wall of the nasal capsule.

The labial cartilages form a chain of three strong bones on either side, forming a nearly complete ring round the mouth only interrupted by a space in the middle above and below.

The proximal extremity of the hyomandibular presents anteriorly a stout peg-like process corresponding to the deep articular cavity of the side of the skull. Distally it presents a broad surface for the

* This is a marked point of distinction between the present form and *Scyllium* and *Chiloscyllium*.

palatoquadrate. The hyoid is a stout, gently curved, cartilage more than half as long again as the hyo-mandibular. The rays are connected with the hyo-mandibular only near the skull, and with the hyoid for a short space some distance from the proximal end; the two sets curve round and meet, leaving a wide opening opposite the articulation between the two cartilages; they coalesce and subdivide in a highly complex manner. The spiracular cartilage is a delicate lamella of oblong shape with the two inner angles and the antero-external produced into short processes.

The body of the hyoid is rather narrower than the branchial copula and strongly arched forwards. Externally it presents two cornua an anterior short and stout for articulation with the hyoid and a posterior, rather longer for the copulare of the first branchial arch.

The ventral mesials of the first four branchial arches are longer but narrower than the dorsals; they both have deep excavations for the adductor muscles, those of the dorsal cartilages being the larger, and being perforated. The first arch bears ten rays, the second likewise ten, the third eight, the fourth six; a number of the rays have hooked extremities. On the posterior border of each ventral mesial cartilage, in continuation of the row of rays, is a lamelliform process, very prominent in the first arch, becoming very low in the fourth. A slender cartilage represents the dorsal end of an external branchial arch, and in the second, third, and fourth arches, but not in the first, an irregular flattened cartilage represents the ventral portion; the first of these ventral cartilages of the external branchial arches is not connected with the internal arch; the others articulate with the ventral mesials. The dorsal portion of the fifth arch coalesces as usual with that of the fourth. The dorsal mesial of the fifth is deeply excavated for the muscle; the ventral slightly. The latter is much thicker than these of the preceding arches; it presents two conical processes; the one on its inner, the other on its outer surface, the latter nearly corresponding in position to the rays of the preceding arches.

The first branchial arch has a short and thick copular which articulates with the hinder angles of the body of the hyoid. The copularia of the second arch are very long, and with those of the third articulate with the anterior border of a broad common copula. The latter, which is twice as broad as long, has a strongly convex anterior border, and a waved concave posterior border; its outer border is directed slightly back as well as out, and with it the fifth arch articulates. It presents a trace on one side of a longitudinal division into three parts, the outer of which may represent the copular of the fifth. With the posterior border of the copula is articulated a short arrow-head-shaped urobranchial cartilage.

Pectoral Fins. (Plate II., fig. 13.)

The shoulder-girdle is characterised, in accordance with the general form of the animal, by its very great breadth—its transverse being much greater than its dorso-ventral extent—and also by the solidity of its texture—there being no mesial connecting portion of more flexible cartilage uniting the lateral halves as in other Sharks. The mesial or transverse portion of the arch is but slightly angulated ventrad in the middle. The articular surfaces are placed on prominent processes, the long axis of which is antero-posterior, or nearly so. In front of each of them, as in *Cestracion*, is a very prominent crest, and between the articular surface and the crest is a very large foramen; the second foramen is situated on the other side of the articular process, between it and the inner edge of the cartilage, at the ventral extremity of a wide shallow groove on the under surface of the lateral portion of the girdle; a little on the ventral side of this opening is a conical tubercle. The lateral portions of the arch are strongly incurved, but their dorsal extremities are still widely separated from one another; they end in a blunt point.

In the skeleton of the fin itself the propterygium is well-developed, and consists of two nearly equal cartilages, the more distal of which has a narrow accessory cartilage running along its outer border. But the propterygium has no direct relation to any of the fin-rays. The mesopterygium consists of one elongated, slightly curved cartilage which bears on the distal half of its outer border a series of eight fin rays. The metapterygium is long and narrow, and bears eleven rays, a twelfth being borne by the small accessory cartilage at the apex. The meso- and metapterygia are separated from one another throughout a considerable part of their length by a well-marked space. The rays are likewise separated at their bases by well-marked intervals; distally, however, they expand and become closely apposed, except in the case of about six of the inner rays, each of which becomes shortly bifurcated. The skeleton of the pectoral fin in the nearly related *Ginglymostoma* differs from that of *Crossorhinus* in the basal cartilages being relatively smaller. In the existence of the interval between the *mesopterygium* and the *metapterygium*, the latter bears some resemblance to *Cheiloscyllium ocellatum*, as described and figured by Mivart (l. c., p. 448, pl. LXXVI., fig. 4), but the space is very much larger in the latter.

Pelvis and Pelvic Fin. (Plate I., fig. 8.)

The pelvic cartilage is nearly straight, flattened from above downwards, and a little expanded at either end. The anterior basal cartilage is small and unimportant; there is no mesopterygium, several rays articulating directly with the pelvis.

The skeleton of the clasper consists of a long ossified cartilage marked on its dorsal aspect by a deep groove, the lips of which are closely approximated; this axial cartilage ends distally in a strong pointed spine, articulated around the base of which and ensheathing it are four more or less scale-like pointed bones capable of being divaricated from the axis of the appendage so as to spread out in a radiating manner from the base of the spine.

Unpaired Fins.

The dorsal fins are of nearly equal size; the anterior contains fourteen, the posterior fifteen rays, each, except the first two or three, with an expanded upper or distal piece, and each, with the exception of the last two or three, with a short basal element. In general structure these fins bears a close resemblance to the corresponding parts in *Ginglymostoma* (Mivart, l.c., p. 446, pl. LXXVI., fig. 1), except that the rudimentary basal plate is not represented. The anal fin is smaller than the second dorsal, with fifteen rays of similar shape to those of the dorsals.

There are fifty-five pairs of well-developed ribs. Of these a good many are divided into two segments.

The caudal portion of the vertebral column is but slightly curved. Its neural rays, about forty-five in number, are nearly twice the length of the hæmal rays.

Of the peculiarities in the structure of the skeleton of *Crossorhinus*, the most noteworthy are the form of the articular cavity for the hyo-mandibular, the abnormal shape of the rostrum, the absence of the external branchial arches, and the rigid nature of the ventral portion of the pectoral arch. These, besides other less important characteristics, definitely mark off the genus from the *Scyllidæ* with which it was previously placed. A characteristic feature of the skeleton of *Crossorhinus* is the presence throughout all the cartilages of innumerable small bony centres, giving the skeleton a remarkably hard and rigid texture.

PRISTIOPHORUS CIRRATUS.

Plate I., Figs. 9-12.

Skull and Visceral Arches. (Plate I., fig. 9.)

In general form the skull, were the rostrum removed, would not be unlike that of *Heterodontus*. The plane of the occipital foramen is vertical. The surfaces of articulation for the hyo-mandibular are antero-posteriorly elongated and placed low down near the base, as in Rays. The auditory apertures are placed close together near the middle line, and are placed at the bottom of a deep excavation which is continued in front into a short shallow open groove. The post-orbital processes are not conspicuous. The palato-basal articulation is placed far back on a level with the hinder boundary of the orbit. The rostrum is formed of a mesial and two lateral parts; the former being a prolongation of the roof and floor of the cranium, and containing a canal continuous with the cranial cavity and running forwards to the end of the snout. The lateral parts are continuous behind with the cartilage of the olfactory capsules; they form thin plates bordering the mesial part and perforated by numerous apertures. The hyoid arch, as in Sharks generally, articulates above with the distal extremity of the hyo-mandibular; ventrally it unites with a copula which has the form of a very narrow curved bar. Both the hyo-mandibular and the hyoid cartilages are provided with rays.

The hyoid copula is represented by a transverse band. There is a common branchial copula without any trace of transverse division. The first branchial arch is connected not with this, but with the hyoid copula The second, third, and fourth arches have well-developed copularia, which decrease in size from before backwards. The muscular excavations on the first four arches are perforated by foramina. The external branchial arches are represented by slender cartilages.

Pectoral and Pelvic Fins. (Plate I., figs. 11 and 12.)

In the pectoral arch the hinge-like central portion found in other Sharks is not well marked, the two halves being capable of very little motion upon one another. As in the Sharks generally the dorsal ends of the arch are wide apart from one another and have no articulation with the spinal column. The propterygium is only represented by a slender, ray-like cartilage; the mesopterygium and metapterygium on the other hand are well-developed, and contribute nearly equal shares to the support of the rays; the metapterygium bears at its extremity a polygonal accessory cartilage with which a few short irregular rays articulate.* There is nothing in the

* In the general arrangement of the cartilages there is a close resemblance to *P. japonicus*, as described and figured by Mivart (l. c., p. 453., pl. LXVIII., fig. 1.)

structure of the pectoral fin presenting in any way an approximation to the Rays.

The pelvic arch is a nearly straight bar, slightly arched forwards in the middle, with short, broad, anteriorly directed processes at either end. There is a short pre-axial ray or propterygium, with which three short rays are connected ; there is no representative of a mesopterygium, but none of the rays articulate directly with the pelvic arch, the long narrow metapterygium supporting all the rest.

Unpaired Fins.

The unpaired fins present broad plate-like basal cartilages closely united with the vertebræ.

The vertebæ of *Pristiophorus* present solid, deeply biconcave centra, which on a mesial transverse vertical section exhibit, as in the case of *Selache*, two pairs of cartilaginous tracts passing from near the centre to the supero-lateral and infero-lateral parts of the vetebræ.

TRYGON PASTINACA.

Plate II., Figs. 10-12.

Vertebral Column. (Plate II., figs. 10 and 11.)

The anterior vertebral plate presents a very prominent, continuous, spinous ridge. In the hinder half of the plate the transverse processes are likewise developed on each side into a wide thin lamina perforated at its base by 9 or 10 irregular apertures. In front this lamina is developed into a free flap. Behind it is continuous with a plate of cartilage which stretches horizontally across the middle line, becoming synchondrosed with the spinous ridge. The horizontal plate corresponds to the horizontal bar found in a corresponding position in *Hypnos*, but, differs from the latter in being closely united with the spinous ridge. It is connected externally, as in *Hypnos* also, with the pectoral arch, the connection being effected by means of a somewhat complicated articulation. Each lateral lamella, formed apparently as above noted by the transverse processes, developes just below the part where the mesial bar arises from it, a thick, laterally projecting process with a truncate terminal face; above and a little behind this is a wide aperture in the root of the horizontal lamella into which the dorsal end of the pectoral arch fits, while the truncate lateral process articulates with a concave oval surface on the inner border of the arch at some little distance below. There is a considerable resemblance between this arrangement and that already described as occuring in *Trygonorhina*, except that in the latter there is no connection between the horizontal bar and the lateral laminæ, and the articulation with the pectoral arch is effected entirely through the former, which is a development from the spinous ridge.

Another peculiarity which the anterior vertebral plate of *Trygon* presents is the presence of a series of articular facets for the branchial arches. The chief of these articular surfaces is that for the fifth branchial arch; this is situated on a little angular projection on the lateral border of the vertebral plate, close to the front portion of the lateral lamina. In front of and a little internal to this on the ventral surface of the plate is a pair of short triangular ridges; these articulate or are synchondrosed with the basal plates of the fourth branchial arch. In front of and a little external to those, near the lateral borders of the plate, is a pair of small elevations which articulate with the third branchial arch. There are no ribs attached to any part of the spinal column.

Skull and Visceral Arches. (Plate II., fig. 12.)

In the skull the plane of the foramen magnum is very nearly vertical. The occipital condyles lie a little behind, on projecting processes. The orifice for the vagus is close to the foramen magnum. The elevations for the anterior and posterior semi circular canals are tolerably well marked. The orifices of the auditory organs are situated far apart, and are not connected by any common groove or depression. The articular surface for the hyoid is an antero-posteriorly elongated surface placed close to the base of the skull. In front of it is a wide bridge of cartilage for the protection of the facial. Behind it are the two small articular facets with which the hyoid and first branchial arches articulate. These are borne on a rather conspicuous ridge, which in front forms the posterior and upper boundary of the articular surface for the hyo-mandibular, and behind is continuous with the processes bearing the occipital condyles. The post-orbital process takes the form of a long and broad, thin lamina of cartilage stretching outwards and forwards from the post-orbital region of the roof of the skull. The cavity of the cranium dilates considerably in front towards the region of the olfactory capsules, which are greatly elongated transversely and connected together in the middle line. The præ-frontal foramen is very wide, and is continuous behind with the supra-cranial fontanelle. The præorbital process has the form of a short pointed projection. The ant-orbital cartilages are vertically compressed. blade-like laminæ articulating with the lateral angles of the olfactory capsules and directed backwards and outwards.

The hyo-mandibular is made up, as in most Rays, of two distinct segments, of which the distal is much the smaller.

In *Trygon*, as in many of the Batoidei, the ventral elements of the hyoidean arch are not connected with the hyomandibular. In *Trygon pastinaca* they articulate directly with the periotic region of the skull just behind the surface of articulation for the hyo-mandibular. The hyoid is intimately connected with the first branchial arch, and the latter in turn also articulates with the auditory region of the skull behind the articulation for the former.

The hyoid arch, as in Rays generally, has but a slender copula, and articulating with the ventral extremity of each ventral mesial is a flattened bar of cartilage, which passes almost straight forwards to end in a free extremity; this seems to represent the copulare.

Pectoral Fins.

The pectoral arch is characterised by the solidity of its structure and the massiveness of its lateral portions. The upper and lower nerve-foramina are very large ; there are no accessory foramina as in *Trygonorhina.* The articular surfaces for the fin are placed on a horizontal ridge, at the extreme anterior and posterior ends of which are placed the surfaces for the propterygium and the metapterygium respectively ; the former is a long oval with the long axis vertical and the surface directed outwards ; in the intermediate ridge is a concavity for the mesopterygium. Close to the inner lateral border of the arch is the articular surface for the fifth branchial arch, which is double and somewhat raised above the general surface. The propterygium has articulating with its distal extremity a stout ray with which are connected a number of fin rays. The mesopterygium is very small but occupies all the interval between the propterygium and the metapterygium; none of the rays articulate directly with the shoulder girdle. The metapterygium is divided into four segments.

The pelvic arch is a strongly curved cartilage which is produced behind over the acetabular facet into a strong spine ; a little in front of this it develops a prominent angular ridge on its outer surface. The metapterygium bears distally two very short cartilages which continue the axis of the fin and give origin to a few short rays ; the mesopterygium is not represented.

UROLOPHUS, sp. ?

Plate II., Fig. 14.

The main difference between the skeleton of this species and that of *Trygon pastinaca* consists in the presence between the nasal cartilages of a pair of very slender, crescentic, cartilaginous cornua, attached to, but not continuous with, the cartilage of the front of the skull. These are inclined downwards and backwards and may represent upper labial cartilages, or may perhaps be regarded as representing a rudimentary rostrum.

The anterior vertebral plate presents laterally very broad and long wings representing the coalescent and produced transverse processes In the middle it presents a prominent vertical lamina formed of the coalescent spinous processes. This ends some distance in front of the position of the shoulder girdle, with which it has no connection. There are thirty pairs of ribs, of which the majority are of considerable length.

HYPNOS SUBNIGER.

Plate II., Figs. 6-9.

Skull and Visceral Arches. (Plate II., figs. 6 and 7.)

In general shape the skull recalls to some extent that of *Heterodontus*. It is long, rather narrow and high, broadest behind in the occipital and auditory regions, narrower between the orbits and becoming broader again in front in the olfactory region. The foramen magnum is very large; its plane is very oblique, and a large space occupied only by membrane intervenes between the upper border of the foramen and the commencement of the neural arches of the vertebræ. The condyles, as in *Torpedo*, are placed close to the foramen magnum. As in *Torpedo*, also, the aperture for the vagus is very large. Immediately above and a little in front of it is a short but well-marked process directed outwards; this is rudimentary in *Torpedo*. Below and behind the foramen the postero-external angle of the skull is drawn out into a dorso-ventrally compressed process with the extremity of which the basal cartilage of the first branchial arch articulates. This is an arrangement which seems, so far as I have observed, to be peculiar to this genus. As in *Torpedo*, the articular surface for the hyomandibular is long, narrow, and nearly horizontal, situated low down nearly on a level with the base of the skull. The elevation marking the position of the posterior semi-circular canal, which is absent in *Torpedo*, is well-developed in the Australian genus.

Neither the præ-orbital nor the post-orbital processes are developed, and the orbit is devoid of basal plate. There is neither ethmoidal notch nor foramen.

The olfactory region resembles that of *Torpedo* but there are no distinct præorbital processes, and the fins articulate with the anterior extremities of the nasal capsules.

The hyo-mandibular is a long cartilage, longer than the greatest width of the skull, dorso-ventrally compressed and broad proximally, but narrowing distally; it is divided into two by a distinct transverse suture (as in many Rays) the outer piece being much shorter than the inner. Both upper and lower jaws are extremely slender. The hyoid arch is small, and quite similar to, though smaller than the branchial arches; above it is incomplete, and not in any way connected either with the skull or with the hyo-mandibular, its dorsal end articulating with the *basal of the first branchial arch*, which articulates with the postero-external process of the skull in the manner already noticed. Though this arrangement of the anterior visceral arches is not, as will subsequently be seen, peculiar to the present form, it is a modification which has hitherto escaped notice. In the Sharks the hyoid arch proper (which is much more important and much more sharply marked off from the branchial arches than in the Rays) is suspended from the skull by means of the hyo-mandibular, with which it articulates towards its distal extremity. The hyo-mandibular cartilage is thus in the Selachoidei a true hyo-mandibular suspensorium. But in the majority of the Rays, as pointed out by Gegenbaur, it has no such dual function, the hyoid arch being but slightly, if at all, connected with it, and its sole function being that of a mandibular suspensorium. In *Torpedo* the basal of the hyoid arch unites with the postero-lateral angle of the skull; it is free below except where a short cross-piece unites it with the ventral end of the first branchial arch. The first branchial arch is attached to the ventral end of the second, and the second and third have each distinct copular pieces uniting with the basilar plate.

The arrangement of the rest of the branchial apparatus in *Hypnos* is likewise peculiar. The copular elements of the hyoid and of the first, second, and third branchial arches are united below on either side to a thick longitudinal bar of cartilage which unites behind to the basi-branchial plate, close to its fellow, but diverges in front so as to leave a considerable triangular space, and ends in a free thickened extremity some little distance in front of the hyoid arch. Though these bars present no trace of longitudinal division they seem to correspond to the copularia of the hyoidean and three anterior branchial arches. The fourth and fifth branchial arches unite dorsally, as very commonly occurs, the basal of the fifth arch not being represented; from their point of union a long process passes inwards and backwards. The fifth arch has an articulation with the shoulder girdle.

Pectoral Fins. (Plate II., fig. 8.)

The shoulder-girdle is distinguished by the slenderness of its mesial ventral portion, which, as in Rays generally, is formed of one continuous bar, not interrupted by any fibrous interval such as occurs in *Torpedo*. It bears externally the lateral masses of cartilage with which the pectoral fins articulate, and an upwardly directed process of each lateral mass is movably articulated with a dorsal bar of cartilage which runs inwards towards the middle line of the dorsal surface. The dorsal ends of these two bars are united by a flattened mesial cross-piece, which is placed well above the vertebral column, not being connected with it save by fibrous tissue. Such an entire absence of cartilaginous connection between the pectoral arch and the spinal column is found in no other Ray with the exception of *Torpedo*. (Vide Gegen. Unters. II., 1, p. 81.) The three facets for the pectoral fin are borne on three short processes. The propterygium is made up of no less than nine joints which decrease in size distally, the whole having much the appearance of a magnified fin-ray. The mesopterygium is a small cartilage shorter than the propterygium, and is divided into seven segments. Each of the rays of the fin is bifurcate at the tip.

The cephalic fin consists of two curved cartilaginous styles connected with the skull as above noticed, having a series of short irregular rays attached along their anterior border, and of a series of irregular rays between them. The latter are not directly connected with the skull, and do not form a rostral prolongation of it as in *Torpedo*.

Pelvic Fins. (Plate II., fig. 9.)

The pelvic arch is a straight, rather narrow bar, continued externally into a pair of long, pointed, lateral processes directed forwards and outwards. The axial cartilage of the fin is narrow and pointed. Nearly all the fin-rays are bifurcate. The anterior rays articulate directly with the pelvic girdle, the first being shorter than the rest and representing the pre-axial fin-ray; there is no basal cartilage representing the mesopterygium.

There are two distinct dorsal fins of about ten to twelve rays each, placed close to one another on the short tail. The caudal fin itself is very small.

TRYGONORHINA FASCIATA.

Plate II., Figs. 1-5.

Vertebral Column.

The anterior vertebral plate presents a very strong odontoid process with a crescent-shaped articular surface at its extremity, and at the base of the odontoid process two concave articular surfaces for the occipital condyles. The spinous processes of the anterior vertebral plate are combined into a very prominent mesial ridge, and the transverse processes are likewise amalgamated, as in Rays generally, and develope about the middle of the length of the plate on either side a strong vertical process which reaches nearly as high as the spinous ridge. The spinous ridge ends some distance in front of the hinder extremity of the vertebral plate, and behind it is a much smaller lamella which develops lateral projections embracing the dorsal extremities of the pectoral arch, so as to form sockets for the reception of the latter.

There are about twenty-five pairs of rather long slender ribs.

SKULL AND VISCERAL ARCHES. (Plate II., figs. 1 and 2.)

In general form the skull is somewhat expanded laterally and depressed dorso-ventrally, distinguished by its elongate rostrum and large olfactory capsules.

The plane of the foramen magnum slopes slightly forwards. Below it is the deep mesial excavation for the reception of the odontoid process, the concave articular surface for which is nearly as wide as the foramen. The condyles are borne on short lateral processes. The vagus foramen is separated by a considerable interval from the foramen magnum. Immediately in front of and external to it is a slender bridge of cartilage.

The articular surface for the hyo-mandibular is long and narrow, placed, as in *Hypnos*, close to the base of the skull and extending on to the postero-lateral process. The auditory foramina are very large, and are placed well apart from one another, only a very slight depression connecting them.* The elevations marking the position of the anterior and posterior semi-circular canals are very well-marked. Behind the orbit is a distinct post-orbital process, and in front of it are the very large and laterally projecting olfactory capsules. As in the Batoidei generally there is no basal plate. The foramen for the trigeminal is separated from that for the facial by a slight interval; behind the latter as in *Rhynchobatus* is an obliquely-placed bridge of cartilage. With the outer and posterior angle of the olfactory capsules is connected a compressed, curved, pointed cartilage, which represents the lateral process of the ethmoidal region of *Rhynchobatus*.

* The absence of a deep parietal groove seems to be characteristic of the *Batoidei*.

The rostrum is a long spout-like structure, the concavity in which is continuous behind with the cerebral cavity. In front it gradually narrows, the excavation becoming shallower, and expands at the extremity into a thin sheet with a truncated terminal border; near each angle of the flattened terminal portion of the rostrum is a small rounded aperture.

The hyo-mandibular begins above in a broad extremity which articulates with the surface already noticed on the auditory region of the skull. Dorsally it presents a prominent ridge. The hyoidean arch is incomplete dorsally and becomes articulated to the dorsal mesial of the first branchial arch. The latter developes a short process which, as in *Hypnos*, articulates with the occipital region of the skull behind the surface of articulation for the hyo-mandibular. The copulare of the hyoid is produced anteriorly into a prominent flattened process. The hyoid copula is represented by a very long, slender, rib-like cartilage, which is not expanded into any broad mesial plate. The basal of the first branchial arch is in very close relationship to the ventral surface of the spinal column. The mesials of this and the three following arches present very deep and wide muscular fossæ which pass into one another across the articulation. The ventral mesial cartilage of the first branchial arch developes a flattened anterior process which articulates with the hyoid capula; behind it articulates with the second branchial arch at the point of junction of the ventral mesial and the copulare. The second arch has a strongly curved ribbon-like copulare; those of the third and fourth are united; the fifth arch has no copulare. The copularia of the second, third, and fourth arches, and the ventral mesial of the fifth articulate with a very wide basi-branchial plate. The ventral mesial of the fifth articulates with the shoulder girdle.

Pectoral Arch and Pectoral Fins. (Plate II., figs. 3 and 4.)

The pectoral arch is remarkable on account of the size and form of its lateral masses. The whole girdle has the form of an oval hoop, with the long axis transverse, the ventral side straight and the lateral portions greatly expanded. There is a narrow dorsal interspace, the pointed dorsal extremity of each half of the arch being received into a socket formed for it by a produced portion of the spinous ridge of the anterior vertebral plate in such a way that motion is only possible round a transverse axis passing through the two joints. The outer border of the transversely expanded lateral portion of the girdle gives origin behind nearly at right angles to an extremely prominent lamella, concave inwards and convex outwards and directed outwards as well as backwards. This lamella presents externally four horizontal ridges, the most prominent being the third reckoning from above downwards. This ridge connects the articular surfaces for the pro- meso- and metapterygia, and between the two last itself gives attachment directly to a number of fin-rays. The articular surface for the propterygium is placed on the produced border by which the expanded part of the hoop and the lateral lamellæ unite. A little behind it is the less prominent articular surface for the mesopterygium. Between the two are two large nerve foramina, the one above and the other below ; these pass directly from within outwards. The articular surface for the metapterygium is placed on the posterior border of the lateral plate at the extremity of the prominent ridge ; it is a little less conspicuous than that for the propterygium. About midway between the ridge which bears the articular surfaces and the one above it is a horizontal row of fine small pores. The articular surface for the branchial arch is an ovate elevation situate close to the inner border of the lateral portion of the arch. The ventral bar is deeply grooved below. Among described forms the shoulder-girdle of *Trygonorhina* approximates most nearly to that of *Rhinobatus* (Gegenbaur, l. c. II., p. 82, pl. V., fig. I.A.)

The propterygium consists of a stout proximal portion with four short distal joints, with the extremity of the last of which three irregular rays articulate. The mesopterygium is small ; between it and the metapterygium is a wide interval where the fin rays articulate directly with the shoulder-girdle itself. The metapterygium is smaller than the propterygium ; two short cartilages are added to its extremity. The majority of the fin-rays of the pectoral fin bifurcate at their extremity.

PELVIC FINS. (Plate II., fig. 5.)

The pelvic arch is very slender and very wide from side to side, as in Rays generally. Its lateral extremity presents two articular surfaces, one for the propterygium (pre-axial fin-ray) the other for the metapterygium. The mesopterygium is not represented. In front of the articulation a strong compressed process extends forwards and outwards, and behind on the dorsal surface just over the two articulations is a very prominent, slender, curved process which extends backwards and upwards. The propterygium consists of a long and three short joints, the last bearing several rudimentary fin rays. The metapterygium consists of a long basal joint and three shorter distal segments ; it bears twenty-four rays none of which are bifurcated.

UNPAIRED FINS.

The dorsal fin is small, with about fourteen rudimentary rays supported on two elongated, laterally compressed cartilages, the continuity of which with the spinous processes is manifest. The anal is very similar to the dorsal. The caudal is rudimentary.

The dorsal fin is described and figured by Mivart, l. c., p. 454, pl. LXXVIII., fig. 6.

SUMMARY.

In the following summary are enumerated the principal characteristics of the skeleton in such families of the *Plagiostomi* as I have had the opportunity of examining. The division of the Selachoidei into two principal sub-orders—the *Palæoselachii* and the *Neoselachii*—seems to me to follow as a necessary conclusion from the researches of Gegenbaur on the anatomy of the skull. The prefixes have reference, I need hardly add, not to the relative geological age of the two groups, but to their relative degree of specialisation ; the structure of *Notidanus* is certainly much more archaic than that of any other Shark.

SELACHOIDEI.

In the skull the post-orbital processes are usually well developed, the orbit is usually provided with a cartilaginous floor formed of the basal plate; there is always a palato-basal articulation; the rostrum usually consists of three bars with large foramina at the base. There are a series of external branchial arches; the first branchial arch never articulates with the skull; the hyoid arch is supported by the hyo-mandibular; the copula of the hyoid has the form of a broad plate connected with its distal extremity. The pectoral fin is not connected with the skull by means of an ant-orbital cartilage; the ventral portion of the pectoral arch is divided in the middle by a more flexible portion into two lateral halves usually slightly movable on each other, and the dorsal extremities do not articulate with the spinal column. The pro- and meta-pterygia of the pectoral fin are never greatly elongated, and usually have the form of relatively broad plates.

PALÆOSELACHII.

(NOTIDANIDÆ.)

The vertebral column is scarcely ossified. There are two neural arches for each centrum, at least in the caudal region.

The occipital region of the skull is not so sharply marked off from the spinal column as in other *Elasmobranchii;* it presents above a mesial ridge continuous with the spinous processes, and at the sides ridges continuous with the line of the transverse processes. The plane of the occipital region is vertical or inclined from below upwards and backwards. There is no lateral occipito-vertebral articulation. The principal vagus foramen is placed far from the foramen magnum; the lower roots of the nerve pass out by from three to five distinct canals which are in line with the foramina for the spinal nerves. The vestibulum forms a distinct eminence on the surface of the infero-lateral portion of the auditory region. The articular surface for the hyo-mandibular is simple and not sharply marked off from surrounding parts. The post-orbital process presents an articular surface for the palato-quadrate. The orbit has no cartilaginous floor. There is an ethmoidal canal. There is no tri-radiate rostrum. Representing the ant-orbital cartilage of Rays is an ant-orbital process. There are either six or seven branchial arches ; the external arches are incomplete. There is only one dorsal fin ; its rays are supported by a broad basal cartilage.

NEOSELACHII.

The centra of the vertebræ are well ossified.

The occipital region is well marked off from the vertebral column. The plane of the foramen magnum is vertical or slopes forwards. The principal vagus foramen is usually approximated to the foramen magnum, and there is never a row of accessory foramina in line with the foramina for the spinal nerves. There is no distinct elevation on the surface of the skull marking the position of the vestibule. The articular surface for the hyomandibular is complex. The post-orbital process never presents an articular surface for the palato-quadrate. The orbit has a cartilaginous floor. There is no process representing the ant-orbital cartilage of the Rays. There are never more than five branchial arches. There are two dorsal fins which may or may not present broad basal cartilages.

CESTRACIONTIDÆ.

The centra of the vertebræ present radiating bony lamellæ.

There is only a small tubercle representing the occipital crest, and the occipital region is sharply marked off from the vertebral column. The principal vagus opening is placed close to the lateral occipital process, and there is no row of accessory foramina. The elevation marking the position of the posterior semi-circular canal is placed on the posterior aspect of the cranium ; there is no distinct elevation for the vestibule. There is an ethmoidal canal. The auditory foramina open at the bottom of a fossa which is continued forwards into a groove excavated on a longitudinal mesial ridge. The orbit has a cartilaginous roof. There is no prominent rostrum ; the ethmoidal region is longer than in other

Selachoidei, and the olfactory capsules are remote from the orbits. The hyo-mandibular takes a comparatively unimportant part in the suspension of the lower jaw and palato-quadrate.

There are two dorsal fins, and these possess broad plate-like cartilages, and are closely related to the spinal column.

LAMNIDÆ.

The centra of the vertebræ present radiating lamellæ.

The articular surface for the hyo-mandibular is simple, but borne on a projecting portion of the postero lateral region of the skull. The post-orbital process does not articulate with the palato-quadrate. The orbit has a cartilaginous floor. There is no ant-orbital process representing the ant-orbital cartilage of the Rays. The external branchial arches are well-developed. There is a well developed three-rayed rostrum. The hyo-mandibular bears a series of cartilaginous rays. The hyoid copula is a broad plate. The meso- and metapterygia are partly coalescent; the primary rays of the pectoral fins have intercalated among them a series of accessory rays which do not reach the basal cartilages. The dorsal and anal fins possess no broad basal cartilages and do not articulate with the spinal column.

SCYLLIOLAMNIDÆ.

The centra of the vertebræ present radiating lamellæ.

The articular surface for the hyo-mandibular is a deep conical hollow into which fits a peg-like process of the latter cartilage. The rostrum is single, and does not advance much beyond the level of the olfactory capsules. There is a basal plate forming a floor for the orbit. There is neither ethmoidal canal nor notch. There are rays on the hyo-mandibular as well as on the hyoid arch. The hyoid copula is a broad plate. The external branchial arches are rudimentary. The pectoral arch presents no ventral mesial flexible interval as in other Sharks. All the three basal cartilages of the pectoral fin are well-developed. The unpaired fins do not present expanded basal plates.

SCYLLIDÆ.

The centra of the vertebræ present radiating lamellæ.

The articular surface for the hyo-mandibular is situated in great part on a postero-lateral process of the skull; it is saddle-shaped, and not very deep. There is no ethmoidal canal. The rostrum is three-barred. The dorsal fin has no broad basal cartilages.

RHINIDÆ.

The centra of the vertebræ are devoid of radiating lamellæ.

The post-orbital process is produced forwards and unites with the præorbital process. The shoulder-girdle resembles that of the Rays in presenting a rigid ventral portion; and the skeleton of the pectoral fin has the pro and meta-pterygia elongated in an antero-posterior direction as in the Rays. The skeleton of the dorsal fin presents wide basal cartilages apparently continuous with the neural spines, and has no distinct rays.

PRISTIOPHORIDÆ.

The centra of the vertebræ are devoid of radiating lamellæ of bone.

The ethmoidal region of the skull is produced forwards into a long, dorso-ventrally compressed rostrum, perforated by a longitudinal canal, which is continuous behind with the cranial cavity. The copula of the hyoid is reduced to the form of a narrow strip of cartilage. There are rays on the hyo-mandibular as well as on the hyoid arch. The propterygum is very small. The dorsal fins are supported by broad thin plates continuous with the neural arches of the vertebræ.

BATOIDEI.

The post-orbital processes are small or absent; the orbit is devoid of cartilaginous floor. There is no palato-basal articulation. The rostrum, when present, is usually imperforate at the base. There are no external branchial arches; the first branchial arch is sometimes directly connected with the skull. When the hyoid arch is supported by the hyo-mandibular the articulation takes place near the proximal extremity of the latter. The ventral portion of the pectoral arch forms a continuous and rigid bar; the dorsal extremities of the arch are connected either with the spinal column or with one another. The pro- and metapterygia of the pectoral fins have the form of elongated narrow bars, and the mesopterygium is insignificant. The anterior portion of the pectoral fin is connected by a cartilage—the antorbital cartilage—with the ethmoidal region of the skull.

Pristidæ.

The ethmoidal region of the skull is prolonged forwards into a very long, straight, dorso-ventrally compressed rostrum, traversed by a median and two pairs of lateral longitudinal canals. The first dorsal fin has broad basal cartilages apparently continuous with the neural spines, and a series of short rays.

Rhinobatidæ.

The ethmoidal region of the skull is produced into a rather long rostrum. The first branchial arch articulates with the skull. The hyoid arch is not connected with the hyo-mandibular. The copulari of the branchial arches are distinct from the copulæ. The dorsal fin has broad basal cartilages, apparently continuous with the neural spines, and a series of short rays. The pectoral arch articulates directly with the spinal column. The pro- and metapterygia are segmented; between the mesopterygium and the metapterygium a number of the rays articulate directly with the shoulder-girdle. There are well-developed ribs.

Torpedinidæ.

The ethmoidal region is not produced into a rostrum. The articular surface for the hyo-mandibular is not wide. The copularia of the branchial arches are distinct from the copulæ. The hyoid arch is not connected with the hyo-mandibular. The pectoral arch is not directly connected with the spine; it is not so rigid in the middle ventral line as that of other *Batoidei*. The anterior portions of the pectoral fins are detached, and articulate with the front of the ethmoidal region of the skull. None of the rays articulate directly with the shoulder-girdle. There are well-developed ribs.

Rajidæ.

The articular surface for the hyo-mandibular is borne on a prominent process of the postero-lateral region of the skull. The ethmoidal region is produced into an undivided rostrum. The hyoid arch is connected with the base of the hyo-mandibular. There is only one branchial copula; the copularia are not amalgamated with it it. The pectoral arch articulates directly with the spinal column. The *propterygium* articulates with the skull by means of an ant-orbital cartilage; the pectoral fin is interrupted in front, with no detached cephalic fin. Short ribs are present. Some of the rays of the pectoral fin articulate with the shoulder-girdle.

Trygonidæ.

There is no distinct rostral prolongation of the skull. The articular surface for the hyo-mandibular is elongated antero-posteriorly; it is situated near the base of the skull, and not borne on a prominent process. The branchial copula is coalescent with the copularia. The hyoid arch sometimes articulates with the proximal extremity of the hyo-mandibular, sometimes with the cranium directly. The pectoral fins are continuous in front; the pectoral arch articulates with the spinal column. None of the rays of the pectoral fin articulate directly with the pectoral girdle. There are no ribs.

Myliobatidæ.

The cranium is elevated in front. There is no distinct rostrum. The articular surface for the hyo-mandibular is a tolerably deep hollow, situated elose to the base of the skull, but not so much elongated as in most other Rays. The branchial copularia coalesce with the copulæ. The hyoid arch is not related to the hyo-mandibular nor to the skull, but articulates with the base of the first branchial arch, which articulates with the skull behind the hyo-mandibular. The pectoral fins unite in front of the skull; the pectoral arch articulates with the spinal column. There are no ribs.

Explanation of the Plates.

Au—Auditory apertures in parietal groove. *Ar*—Articular surface for hyo-mandibular. *PSC*—posterior semi-circular canal. *ASC*—anterior semi-circular canal. *Po O*—post-orbital process. *Pr O*—præ-orbital process. *fo*—fontanelle. *or*—foramen of exit of ophthalmic nerve from the orbit—*op*[1] foramen by which the ophthalmic nerve passes downwards and outwards towards the nasal capsule (posterior opening of the ethmoidal canal) *R*—rostrum. *Ol*—Olfactory capsule. *Vg*—foramen of exit of the vagus nerve. *II*—foramen for the optic nerve. *Bp*—Basal plate. *Pl*—palato-quadrate. *Mck*—Meckel's cartilage. *HM*—hyo-mandibular. *Hy*—hyoid arch. Br^1, Br^2, etc.—Branchial arches. *p pt*—propterygium. *m pt*—mesopterygium. *mt pt*—metapterygium. *p*—pectoral arch *pl*—pelvic arch. *ppt'*—anterior basal cartilage of pelvic fin. *m pt'*—middle basal cartilage of pelvic fin. *mt pt'* posterior basal cartilage of pelvic fin. *cl.*—axial cartilage of clasper.

Plate I.

Fig. 1. Skull of *Carcharodon Rondeletii* from above.
,, 2. The same from the side.
,, 3. Pectoral fin of the same.
,, 4. Dorsal fin of the same.
,, 5. Pelvic fin of *Heptanchus indicus*. *M pt'*—mesial basal cartilage.
,, 6. Skull of *Crossorhinus barbatus* from above.
,, 7. Pectoral fin of the same.
,, 8. Pelvic fin of the same.
,, 9. Skull of *Pristiophorus cirratus* from above.
,, 10. Branchial skeleton of the same.
,, 11. Pectoral arch and pectoral fins of the same.
,, 12. Pelvic arch and pelvic fins of the same.

Plate II.

Fig. 1. Skull of *Trygonorhina fasciata* from above.
,, 2. Branchial skeleton of the same.
,, 3. Lateral view of pectoral arch of the same. *Sf*—superior nerve-foramina. *if*, inferior nerve foramina, *p*, facet for propterygium. *m*, facet for mesopterygium. *mt*, facet for metapterygium.
,, 4. Pectoral fin of the same—*r*—rays articulating directly with the pectoral arch.
,, 5. Pelvic arch and pelvic fins of the same.
,, 6. Skull of *Hypnos subniger*.
,, 7. Diagram showing the connections of the hyo-mandibular, the hyoid, and the first branchial arch with the skull in *Hypnos subniger*.

Fig. 8. Pectoral fin of the same.
,, 9. Pelvic arch and pelvic fin of the same.
,, 10. Coalescent anterior vertebræ of *Trygon pastinaca* seen from below,
,, 11. The same from above. *a*—process for articulation with the pectoral arch. *b*—tubercles with which the branchial arches articulate. *c*—nerve foramina.
,, 12. Skull of the same species.
,, 13. Pectoral arch of *Crossorhinus barbatus*.
,, 14. Nasal and labial (?) cartilages of *Urolophus*, seen *in situ* from the front.

NOTES AND EXHIBITS.

Mr. Macleay exhibited for Mr. James Macdonald, who was unable to be present, a specimen of a very curious little fish, which his nephew, Master John D. Wilson, had captured at the North Shore in an empty shell. Mr. Macleay said that it was a species of *Salarias*, and as far as he had been able to examine it, thought it was new.

Mr. Pedley exhibited three specimens of *Centriscus gracilis*, an extremely rare fish in Port Jackson.

WEDNESDAY, 27TH FEBRUARY, 1884.

The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., in the chair.

MEMBER ELECTED.

Dr. R. von Lendenfeld.

DONATIONS.

A number of pamphlets, chiefly on Ornithology. By Dr. Otto Finsch. From the author.

"Transactions of the Entomological Society of London." Part 4, for 1883. From the Society.

"Journal of the Royal Microscopical Society." December, 1883 From the Society.

"Report on the Botanic and Zoological Gardens, Singapore." For 1882. From the Government of the Straits Settlements,

"Transactions, Proceedings and Report of the Royal Society of South Australia." Vol. IV., for 1882-83. From the Society.

"Feuille des Jeunes Naturalistes." No. 159. January, 1884. From the Editor.

"Abhandlungen herausgegeben von der Senckenbergischen Naturforschende Gesellschaft, Frankfurt a/M." XIII Band, 1 and 2 Heft, 4to, 1883. And "Bericht," for 1882-83. From the Society.

"On the structure and affinities of the Tabulate Corals of the Palæozoic Period." By Dr. H. Alleyne-Nicholson. 8vo, 1879. From Professor W. J. Stephens, M.A.

"Science." Volume III., Nos. 45 to 48. From the Editor.

"The Victorian Naturalist." Vol. 1, No. 1, January 1884. From the Field Naturalists Club of Victoria.

"Memoir and Correspondence of Sir J. E. Smith, F.R.S., &c." 2 Vols., 8vo., 1832. From Thomas Whitelegge, Esq.

PAPERS READ.

A MONOGRAPH OF THE AUSTRALIAN SPONGES.

By Dr. R. von Lendenfeld.

1.—Introduction.

During the two years I have spent in the colonies for the purpose of investigating the Cœlenterata of our shores, I have collected and studied a great many sponges. I was entrusted with the identification of the sponges belonging to the Museums in Dunedin, Christchurch and Adelaide; and I perform a pleasant duty in thanking the Directors, von Haast, Haake and Parker, for the great liberality with which they assisted me in obtaining the specimens and information which I sought for.

The material and experience at my disposal would probably have remained obscure and useless had it not been for our Hon. Secretary, Through the well-known generosity of the Hon. W. Macleay, I shall be enabled to work out my subject exhaustively, and lay before the scientific world an extensive Monograph on my subject. Taking as a model O. Schmidt's "Spongien des Adriatischen Meeres."

THE NAME.

The word "Sponge" is derived from the Greek σπογγια which name was accepted by the Romans without an alteration: *Spongia.* The same root σπογγ is met with in most languages: *sponge, spongea, spynge* Anglo-saxon, *spunge* Old English, *sponge* English, *spongie* Old Hollandish, *spons* Hollandish, *esponge* Old French, *éponge* French, *spogna, spogna* Italian, *esponga* Spanish, *esponja, esponga* Provence. The German *schwamm,* Old German *schwamm,* and the Norwegian *Swamp* are not related to the Greek word. The same is the case with the Russian *gubak,* Hebrew *ekba* and Chaldaic *Akuba.*

Before entering into our subject, I shall give a brief account of our knowledge of the sponges, and cite the most important works on the subject, so as to enable any one of my readers who might wish to study the sponges, to find the references he requires.

It is always interesting to know, how any special science or branch thereof, has been developed, and I shall therefore give a short historic introduction,—an Embryology of Spongiology.

HISTORY OF OUR KNOWLEDGE OF THE SPONGES.

I.—From Aristoteles to Belon, 350 a.C.—1553. Classical Period.

As in nearly every other branch of Natural Science, so we find also here the first scientific description of Sponges in Aristoteles (384—322 a.C.) He described three species of Ceraospongiæ (1) "ἔστι δὲ τῶν σπόγγων τρία γένη, ὁ μὲν μανός, ὁ δὲ πυκνὸς, τρίτος δ ὃν καλοῦσιν 'Αχίλλειον λεπτότατος καὶ πυκνότατος καὶ ἰσχυρότατος"

The three sponges referred to by Aristoteles, doubtless belong to the family of the Spongidæ of F. E. Schulze (2).

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(1). Aristoteles. περὶ ζώων ἱστορίας. Liber V, Cap. 16., § 76.

(2). F. E. Schulze. *Ueber den Bau und die Entwickelung der Spongien, VII. Die Familie der Spongidæ.* Zeitschrift für wissenschaftliche Zoologie Band, XXXII.

Besides these, Aristoteles describes (3)., another genus, which according to O. Schmidt (4). is a Sarcotragus O. S.; ἔστι δ'ἄλλον γένος ὃν καλοῦσιν ἀπλυσίας διὰ τὸ μὴ δυνασαι πλύνεσθαι." Aristoteles mentions that the sponges contract in rough weather, so as not to be torn from the rocks by the breakers. Because they are covered with dirt when brought to the surface, he thinks that they live on organic substances, which fall on them by chance. He knew that sponges can be propagated by cuttings, a subject we shall have to dwell on in detail further on. At least he mentions that sponges, which have been broken off grow out again (5). He thought that the sponges were animals and not plants, which appears evident from the fact that he lays great stress on their *similarity to plants*, which of course he would not do if he thought that they *were* plants.

Aristoteles is the only man of the ancient time whose writings on this subject are worth recording. Plinius (6), (23—79, p. C.), Dioscorides (7), and Claudius Aelianus (8), (about 180, p. C), only copied Aristoteles' works without mentioning his name. They add to the correct statements of Aristoteles a lot of foolish myths.

Present Time.

II.—From Belon to Grant, 1553—1826.

During the dark time of the middle age when the Church prosecuted and burnt all men of science, no one attempted to augment our knowledge of Biology, so that we have to pass over those ages which are a stain to humanity, from the old Aelianus 180, p. C, to Wotton, 1552, without being able to record a single paper on our subject.

Full 1400 years passed away without leaving any trace in history of our knowledge of Spongidæ.

(3.) Aristoteles. περὶ ζώων ἱστορίας. Liber V., Cap. 16, § 89.
(4). O. Schmidt. *Die Spongien des Adriatischen Meeres*, Seite 35.
(5). Aristoteles. περί ζώων ἱστορίας· Liber V., Cap. 16, § 77.
(6). Plinius Secundus C. *Historia Naturalis* Liber IX., Cap. 45.
(7). Dioscorides P. περί ὕλης ἰατρικῆς Liber V.
(8). Aelianus Claudius, περὶ ζώων· Liber VIII. Cap 16.

The earliest writings of the present era are those of Wotton (9) (1552), and Belon (10) (1553). Both of these copied Aristoteles' writings. I will not trouble the reader with a list of the names, the bearers of which wrote on Sponges at the end of the sixteenth and beginning of the seventeenth Century, some declaring them to be animals, others to be plants, and others again taking them for concentrated spray (Gerarde (11) (1633). There is a great similarity between Aphrodite and a sponge!

Of greater interest to us appears an essay of Nieremberg (12) (1635), in which for the first time we find an *Australian* Sponge mentioned. He says that the Hindoos call an Australian Sponge Amacpalli: "Amacpalli seu manum coccineam appellant Indi quoddam Spongiae marinae genus in *Australi* pelago."

In Ray's (13) (1686) works, we find eight species of sponges described, which together with some Corals (Alcyonium), are placed among the fungi as "Plantae imperfectæ." At that time the sponges were considered as plants, and we find several authors placing them in the vegetable kingdom.

One of these authors, Tournefort (14), describes the sponges with the following diagnosis: "Herbæ marinæ aut fluviatiles, quarum flores et fructus vulgo ignorantur." Also the famous Anthony von Leeuwenhoek (15), appears to have held similar opinions. Carl von Linné (16), shared at first the error of his contemporaries, and described the sponges as Cryptogamic plants.

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(9). E. Wotton. *De differentiis animalium.* Liber, X., Parisii, 1552.
(10). P. Belon. *De Aquatilibus.* Liber II. Parisii, 1553.
(11). T. Gerarde. *The Herball.* London, 1633.
(12). T. E. Nieremberg. *Historia Naturæ.* Antverpiæ, 1635. Liber XIII. Cap. XXXII., p. 292.
(13). T. Ray. *Historia plantarum* Londini, 1686, 1693, 1704, and Synopsis meth. stirp. Britann. Londini, 1690.
(14). T. P. Tournefort. *Institutiones rei herb.* Vol. I. Parisiis, 1700.
(15). A. von Leeuwenhoek. *Microscopical observations*, Philosophical Transactions. XXIV. (1706), p. 2158.
(16). Carl von Linné. *Flora Lapponica*, Amstelædami, 1737, and *Hortus Cliffort.* Amstelædami, 1737.

An essay of a much higher scientific standing than any of those mentioned above, and where we for the first time meet with higher philosophical ideas, was published by Donati (17), in 1750.

According to Donati, there exists in nature a *continuous series* of living beings, so that the animal and vegetable kingdom are not separated. In his book he lets the "Polipari" containing the sponges follow on the plants, they form the "primo grado con cui la Natura fa passagia in Mare dalle Piante agli Animali."

The second grade are the "Piantianimali," which are divided into three groups.

He describes some sponges very accurately, and mentions for the first time the existence of *spicules*, "spine . . . di sostanza d' osso." Rumpf (18), describes some sponges from the Banda sea, but it is not possible to identify them with our North Australian sponges with any certainty. Only one, his "Nidus vesparum marinus" I shall probably be able to identify with one of them.

After Peyssonel (19) and others had been induced by worms and other animals, which sometimes live in sponges, to believe that they were *produced* by these commensales, Ellis (20) examined living sponges in an Aquarium, and discovered that these animals had nothing to do with the sponge, and that the sponges were animals *sui generis*.

Besides this, Ellis (l.c.) discovered, that currents of sea water passed through the body of the sponge; "when we examined these in glasses of sea water, we could plainly observe these little tubes to receive and pass the water too and and fro." These openings he took for the mouths of the sponge. There is therefore no doubt that he is the discoverer of the Pores and Oscula, and their functions.

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(17). V. Donati. *Della storia naturale marina dell' Adriatico*. Saggio. Venezia, 1750

(18). G. E. Rumpf. *Herbar. Amban. Tom.* VI. Amstælodami, 1750.

(19). T. A. Peyssonel. *New observations on the worms that form sponges*. Philosophical Transactions. Vol. L, 2 (1758), p. 590.

(20). T. Ellis. *On the Nature and formation of Sponges*. Philosophical Transactions. Vol. LV. (1766) p. 280.

Our knowledge of the species of sponges was greatly increased by Pallas (21). He describes 28 species of sponges, as belonging to the genus Spongia, and there are also some sponges in his genus Alcyonium. He accepts Ellis's discoveries as correct, and places the sponges—doubtless animals—under the Zoophyta, genus Spongia. "Animal ambiguum crescens, torpidissimum. Stirps polymorpha, e fibris contexta, gelatina viva obvestitis. Oscula oscillantia (?) seu cavernæ cellulaeve superficiei."

In the twelfth edition of Linné's (22) Systema Naturæ, the sponges are for the first time described as animals.

Several species of sponges are described by authors of this period without advancing our knowledge of the Anatomy and Physiology at all.

After Ellis's death, Solander set to work to publish the papers of Ellis, but he also died over the work, which was then taken in hand by Ellis's daughter. In this book (23), Ellis's and Solander's discoveries are united to a whole. It contains a lot of valuable information.

Alcyonium and Spongia which have hitherto been considered very nearly related, or even to be the same, are strictly separated.

The genus Spongia is defined in the following manner: "Animal, fixum, flexile, polymorphum, torpidissimum, contextum vel e fibris reticulatis, vel e spinulis, gelatina viva vestitis; osculis seu foraminibus superficiei aquam respirans."

Esper (24) and Olivi (25), who devoted much time and trouble to the sponges, did not render so much service to our Science as their English contemporaries.

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(21). P. S. Pallas. *Elenchus Zoophytorum.* Hagae Comit., 1766.
(22). Carl von Linné. *Systema Naturæ.* Ed. XII. Vol. 1, 2. Holmiae, 1767.
(23). T. Ellis and D. Solander. *Natural History of many curious and uncommon Zoophytes.* London. 1786.
(24). Esper. *Die Pflanzenthiere* and *Fortsetzung der Pflanzenthiere.* Nurenberg, 1791—1806.
(25). L. Olivi. *Zoologia Adriatica.* Bassana, 1792.

De Lamarck (26), who deserves our attention as a general Biologist through his work "Philosophie Zoologique," in which he expounded our present ideas of the variability of species, and of the descent of one form of animal life from another; also devoted some of his energy to the sponges. In his "Système des Animanx sans Vertèbres," he describes and figures 54 species, but unfortunately also he mixes the sponges up with the Alcyonarians. He believes, namely, that all sponges possess polypes. and that it is only in consequence of deficient observation, that they had not been seen in all species, he goes so far as to call the sponges "Polypiers."

Lamouroux (27) already describes 168 species, and he, although copying Lamarck in many respects, states that the sponges are very, and fundamentally different from the Alcyonarians. His work is the best of the time.

Cuvier (28) treated the sponges very superficially, and without taking any notice of the former works of Ellis, Solander, Lamarck, and Lamouroux.

Of greater importance is A. T. Schweigger's (29) essay on sponges. He was the first to use the anatomical structure for classificatory purposes, and to point out the difference between calcareous and other sponges. The prevailing opinion of his time, that sponges contain polypes, which had as yet not been discovered, he treats ironically, although in consequence of the deficient methods of his time he is of course not able to prove their non-existence. He also observed the movements of the Oscula, which changed their diameter whilst he observed them.

T. E. Gray (30) considered the sponges as plants, and stated, that all sponges possess spicules. His observations were made on

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(26). M. De Lamarck. *Histoire des animaux sans vertèbres.* Paris. 1816.
(27). T. Lamouroux. *Histoire des polypiers coralles flexibles.* Cæn, 1816.
(28). G. Cuvier. *Règne animal.* Vol. IV., 1817,
(29). A. T. Schweigger. *Beobachtungen auf Naturhirtorischen Reisen.* Berlin, 1819, and *Handbuch der Naturgeschichte skelettloser ungegliederter Thiere* Leipzig, 1820.
(30). T. E. Gray. *On the situation and rank of sponges in the scale of Nature.* Zoological Journal, I., 1824, p. 46.

Spongilla and a few other sponges from which he thought himself justified to conclude that all sponges were Monactinellae, in Spongilla he saw green bodies, and therefore considered it as a plant. A short time afterwards, and after his ideas had been adopted by several Zoologists, Gray changed his opinion and declared the sponges to be animals.

III.—From Grant to F. E. Schulze, 1826-1875.

Till Grant, so little was known about the Anatomy and Physiology of the sponges, that it appeared advantageous to review the papers of that period in their chronological order without reference to the contents.

In the period of progress initiated by Grant, a division of the papers under three headings becomes necessary, and we shall commence with the papers referring to the

Anatomy and Histology

of the sponges. In this branch of Spongiology, we have now happily got over the dark age; and having worked our way through innumerable papers of little value, come to a series of publications, with which, as I can safely say, our knowledge of the sponges practically commences.

The author of these papers is R. E. Grant. He states that the sponges consist of a soft mass with or without a skeleton. This mass contains throughout ramified channels, through which water is continually passing. The water enters through small holes in the surface, Pores, and leaves the body of the sponge by means of the Oscula, which our author calls fæcal orifices. The current of water runs always in the same direction, and is never reversed as former authors stated. He considered swinging cilia to be the cause of the current, although he did not observe them. He says that no classification of sponges is possible without the knowledge of their anatomical structure, and states that some sponges have a fibrous skeleton, consisting of horny fibre only, whilst in others, spicules are contained in the fibres (31). He figures and describes the three forms of calcareous spicules (32). He observed the ova, the ciliated Embryo, and also, that this Embryo, after swimming about for some time, affixes itself (33).

He considers Spongilla to be nearly related to the siliceous marine sponges. (34.)

Like Lamarck, Grant (35) partly indulged in the views we now call "Darwinian."

Darwin says in his introduction to the "Origin of Species" that "Grant, in the concluding paragraph in his well-known paper on the Spongilla, clearly declares his belief that species are descended from other species and that they became improved in the course of modification."

Nardo (36) appears to have arrived at similarly sound conclusions as Grant, without knowledge of the latter's essays. Dujardin (37) discovered the amœboid movement of certain cells in sponges in 1838. Laurent (38) two years later described the propagation of Spongilla very minutely.

In this period we find Huxley's and Owen's names in the records of Spongiology, who, together with many other authors, are building up a good foundation for future work.

Dobie (39) discovered in 1852, the cilia on all the free surfaces of a calcareous sponge. We can trace the improvements of the

(31). R. E. Grant. *Observations and experiments on the structure and function of the Sponge*, Edinburg. Philosophical Journal. Vol. XIII., and XIV.

(32). R E Grant. *Remarks on the structure of some calcareous Sponges.* Edinburg. New Philosophical Journal. Vol. I.

(33). R. E. Grant. *Observations on the spontaneous motions of the ova, etc.* Edinburg., New Phil. Journal. Vol 1.

(34.) R. E. Grant. *On the structure and nature of Spongilla fluviatilis.* Edinb. Phil. Journal. Vol. XIV.

(35.) R. E. Grant, (l c.). Vol. XIV., p 283.

(36.) J. Nardo. *Classification der Schwämme.* Isis., 1833. 1834.

(37.) F. Dujardin. *Observations sur les éponges.* Annales des Sciences Naturelles, Tom X., 1838, p. 5.

(38) T. Laurent. *Recherches sur la Spongille fluviatile.* Comptes rendus. Tome. XI., 1840, p. 1048.

(39.) W. Dobie. *Note on the observation of cilia in Grantia.* Ann. Mag. 1832. Vol. X., p. 317.

Microscope very clearly in the discovery of all the minute details in the anatomy of our animals.

In 1856, Lieberkühn (40) published an excellent paper on the development of spongilla. Afterwards Carter (41) wrote on the same subject, and without being acquainted with Lieberkühn's paper, arrived at nearly identical results.

Bowerbank (42) drew in 1858, attention to the great variety of the siliceous spicules in shape, particularly those anchorate and stellate forms, which we find in some of the siliceous sponges (Stelletta O.S., Ancorina O.S., &c.) He, as Grant had done before him, considered at that time the *shape* of the spicules as the principal thing to be considered in classifying the sponges. We shall find that he afterwards abandoned that idea to some extent, but that the recent researches of Zittel on fossil sponges show the correctness of it.

Lieberkühn (43) extended his observation to the marine sponges, and published in 1859, an excellent paper on their anatomy. He describes the canal system and the *ciliated chambers*, which, as we shall see, are peculiar and all important to the sponges.

Carter (44) arrived at the same time at very different results. He states that the ciliated chambers are not chambers as described by Lieberkühn, but *solid masses of cells which bear cilia on their external surface*, and he points out their similarity to Volvox. In another paper (45) he dwells on the similarity of the gemmulæ of Spongilla, to the winter ova of many simple algæ; and states that they contain starch granules.

(40.) N. Lieberkühn. *Beiträge zur Entwickelungsgeschichte der Spongillen.* Müllers Archiv., 1856.
(41.) H. Carter. *On the ultimate structure of Spongilla,* Ann. Mag. Vol. XX. (1857), p 21.
(42.) Bowerbank. *On the Anatomy and Physiology of the Spongida.* Trans. Roy. Soc., Vol 148, p 279.
(43.) Lieberkuhn. *Neue Beiträge zur Anatomie der Spongien.* Archiv. für Anatomie und Physiologie, 1859.
(44.) Carter. Ann. Mag., Vol. III. (1859), page 12.
(45.) Carter. Ann. Mag., (1859), Vol. III., p. 331.

In 1860, Max Schultze (46) published a paper on Hyalonema, which at that time, when deep sea dredging was unknown, was very rare, and described it as the skeleton of a sponge affixed to the bottom of the sea by the long glassy threads which grow out from one extremity of it.

By many naturalists the Hyalonemas were considered as artificial products, made by the Japanese out of glass. Ehrenberg (47) held that opinion amongst others, and attempted to prove the inefficiency of Schultze's paper. In the subsequent controversy the animal nature of these Hexactinellid sponges was proved, although Ehrenberg himself never acknowledged that he had made a mistake.

With the year 1862 we enter into the modern and most fruitful period of the study of sponges, and we can safely say that everything published before that year, since Aristoteles, is not of such value as the discoveries made in every one of the years, from 1862 to 1884.

Bowerbank (48) publishes a series of valuable observations on the Anatomy of the sponges, and dwells in detail on the spicules, which are accurately figured and described.

Lieberkühn (49) continues his observations on Spongilla; among the important results of his investigations, I will mention the fact, that he thinks he has observed, that the ciliated Embryos of Spongilla sometimes multiply by fission, a statement of great importance.

Kölliker gives a preliminary notice of his histological investigations, in the same year. A full account of this most important

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(46.) Max Schultze. *Die Hyalonemen, ein Beitrag zur Naturgeschichte der Spongien.* Bonn., 1860.
(47.) C. Ehrenberg *Berträge zur Beurtheilung der Gattung Hyalonema.* Monatsberichte der Akadem. Berlin 1860, p. 173.
(48). T. J. Bowerbank. *On the Anatomy and Physiology of the Spongiadæ.* Phil. Trans. Roy. Soc. Vol. 148, p. 279. Vol. 152, p. 830. Vol. 152, p. 747. Vol. 152, p. 1082.
(49). N. Lieberkühn. *Ueber Bewegungserscheinungen bei den Schwämmen.* Müllers Archiv., 1863. Seite, 717.

work (50) appeared two years later. Köllikers observations on the Histology of the Sponges, can be considered as the foundation of our present knowledge of that subject. He discovered fibrous cells which he correctly considers as muscles. He pointed out that the horny skeleton of many sponges, as well as the calcareous and siliceous spicules are to be considered as productions of gland cells, and grow by apposition, a statement which has recently been proved by F. E. Schulze (51) and myself (52). He observed in many cases a cuticle on the surface of the sponges in continuity with, and of the same substance, as the horn fibres.

The correctness of this observation was doubted by F. E. Schulze (l. c.) I have been able (l. c.) to prove that Kölliker's statements on this point are perfectly correct, because, as we shall see hereafter, sponges attain such a cuticle, when sick; and it is highly probable that Kölliker had studied only sponges that had not been treated with the modern refinements of histological investigation.

F. E. Schulze's statement that such a cuticle does not exist is perfectly correct for the healthy living sponge, and for specimens treated in such a manner that they are killed before they have time to get sick.

O. Schmidt (53) published in 1865 his first supplement to the Adriatic Sponges, in which his views on the Histology are expressed. They differ from those of Kölliker.

Lieberkühn (54) dwells on the anatomical structure of the calcareous sponges. He described in 1865 the configuration of the canal system very accurately.

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(50). A. von Kölliker. *Icones Histologicæ*, 1. Abtheilung Protozoen Leipzig, 1869.

(51) F. E. Schulze. *Ueber den Bau und die Entwickelung der Spongien. Die Familie der Spongidae.* Z. f. w. Z. Band 32, Seite, 593.

(52). R. von Lendenfeld. *Cœlenteraten der Südsee II., Neue Aplysinidæ.* Z. f. w. Z Band 38. Seite, 234.

(53). O. Schmidt. *I. Supplement zu den Spongien des Adriatischen Meeres*, 1864.

(54). N. Lieberkühn. *Beiträge zur Anatomie der Kalkspongien.* Müller's Archiv., 1865, p. 732.

In the still continuing dispute between M. Schultze and Ehrenberg, about the root of Hyalonema, Bowerbank (55) enters with the statement, that the apertures (Cloaca) were to be found at the base of the sponge. He declares, namely, the Coral (Polythoa) which generally overgrows the Hyalonema, as part of the sponge, and considers the holes in it—where the Polypes had been situated—as the Oscula of the Hyalonema.

Haeckel (56) published in 1870 his observations "über die sexuelle Fortpflanzung und das natürliche System der Schwämme" where he describes the Spermatozoa, the fructification of the ovum and the early stages of development of the embryo.

Classification and systematic position.

Just as Grant opened up the Anatomy and Physiology, Johnston (57) laid the foundation for the classification. During twenty years his "History of British Sponges and Lithophytes," was the main work of reference on our subject, and has only been surpassed by the recent monographs of Bowerbank and O. Schmidt. The excellent plates in this work were drawn by Mrs. Johnston. In this period we meet also with the first essays on sponges by Bowerbank (58) and Carter (59), the latter of whom is the Nestor among the present spongiologists. Carter was at that time surgeon in Bombay, and described some Indian fresh water sponges.

Leukart, (60) whose classical works in other branches of zoology make his opinion valuable, already in 1854 pointed out, that the

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(55). T. Bowerbank. *Hyalonema mirabile.* Proc. Zool. Soc., 1867, p. 18' 350.

(56). Ernst Hæckel. *Ueber die sexuelle Fortpflanzung und das natürliche System der Schwämme. Jenaische Zeitschr. VI. Seite.* 641.

(57). G. Johnston. *History of British Sponges and Lithophytes. Edin.* 1842.

(58). J. S. Bowerbank. *Observations on a Keratous Sponge, from Australia.* Ann. Mag., Vol. VII. (1841), p. 129.

(59). H. T. Carter. *Notes on the species of the freshwater Sponges of Bombay.* Ann. Mag., Vol. I. (1848), page 303.

(60). R. Leukart. Archiv. für. Naturgeschichte, Band II.

sponges were related to the corals and hydroids, of course in a very different sense from that in which Lamarck and his contemporaries united them with the Alcyonarians. Althoughthese views have been disputed ever since, all men of science of the present day nearly agree to the correctness of Leukart's statement. Huxley (61) at that time considered the sponges to be colonies of Protozoa, and called them "unicellular" organisms. In the sense which Huxley applies to the word "unicellular" all animals would have to be termed so, because all can be considered as colonies of simple cells—Protozoa.

In the same year Gray (62) described, among others, two sponges, Carpenteria and Dujardinia, which, according to Gray, hold an intermediate position between the sponges *and the Polythalamia.*

Lieberkühn (63) classifies the sponges according to the anatomy of their skeletons, and divides the whole of the sponges, in the way Grant had insinuated, into four groups: *Halisarcina*, without skeleton; *Spongina*, with a skeleton, consisting of horny fibre; *Calcispongina*, possessing spicules composed of carbonate of lime, and *Halichondria* possessing spicules composed of silica.

This classification has been adopted, more or less, by Bowerbank and O. Schmidt, and has been taken by Zittel, whose classification is now almost universally recognized, as the foundation of his own system.

In 1862, O. Schmidt (64) published his well-known "Spongien des Adriatischen Meeres," and described and figured very accurately a great many species from the Adriatic; since then for the last 22 years he has devoted all his time to the systematic description of sponges, and the study of their genetic relationships.

(61). T. Huxley. *Zoological notes and observations.* Annals and Magazine of Natural History, 1851, Vol. VIII., p. 370; 1851, Vol. VIII., p. 433.

(62). G. Gray. *Description of Aphroceros.* Proc. Zool. Soc., Vol. XXVI., p. 114.

(63). N. Lieberkühn. *Neue Beiträge zur Anatomie der Spongien.* Muller's Archiv., 1859, Seite, 353, 515.

(64). O. Schmidt. *Die Spongien des Adriatischen Meeres.* Leipzig, 1862.

The classification is the following :—I. *Calcispongiæ* (according to Grant—Lieberkühn.) II. *Ceraospongiæ* (Spongina Lieberkühn). III. *Gummineæ* (without continuous skeleton and tough like india-rubber, containing Nardo's Chondrosia). IV. *Corticatæ* (siliceous sponges, possessing as the term implies, an outer layer different from the interior of the sponge). V. *Halichondriæ* (according to Lieberkühn), and VI. *Halisarcina* (according to Lieberkühn).

In the same year appeared Bowerbanks (65) preliminary report on the Classification of the British Sponges, in which he adopts Grant's Classification. He calls the three groups : Calcarea, Silicea and Keratosa.

In 1864 appeared the first volume of Bowerbank's " Monograph of the British Sponges." (66).

The skeletons of many sponges are carefully described and many spicules are figured. He uses the classification published by him in the preliminary report mentioned above. The usefulness of this work is greatly impeded by the authors extraordinary neglect of other papers on the same subject. Several of the most important works on sponges, published shortly before, he does not appear even to have read.

Duchassing and Michelotti (67) described a number of new sponges from the Carribean Sea. Unfortunately they noticed neither the works of Bowerbank nor those of O. Schmidt, so that many of their species are identical with sponges described before.

Fritz Müller (68) discovered in 1865 an extraordinary sponge in South America, which possesses horny star shaped spicules. One of the species described by myself (69) from Australia

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(65). T. Bowerbank *On the Anatomy and Physiology of the Spongidæ.* Trans Phil. Soc , 1862. Vol. 152, p. 10, 87.

(66.) J. Bowerbank. *A Monograph of the British Spongidæ.* Ray Soc., London, 1864.

(67). Duchassing et Michelotti. *Spongiaires de la mèr Caraïbe.* Natur-kundige Verhandlungen Maatschaappij Haarlam. XXI., 2 (1864), p. 7.

(68). F. Müller. *Ueber Darwinella aurea.* Archiv. für mikroskopische Anatomie Band. I. Seite, 344.

(69). R. von Lendenfeld. *Ueber Coelenteraten des Südsee* II. Neue Aplysinidæ. Zeitschrift f. wiss. Zool. Band. XXXVIII. Seite, 234.

contains fibres with a star shaped transverse section, and helps as I pointed out in the place cited above, to explain the otherwise unprecedented occurrence of such Keratous stars.

Up to 1866, all Zoologists had, with the abovenamed exception of Leukart, considered the sponges as Protozoa.

Amongst others, Huxley, O. Schmidt, and Kölliker. At the Versammlung deutscher Naturforscher und Arzte at Hannover, in 1866, Van Beneden and Claus declared the sponges to be Cœlenterata (70).

In consequence of Bowerbank not making use of previously published essays, a great confusion in the nomenclature arose. O. Schmidt therefore in his second Supplement (71) reduced the diagnoses of Bowerbank to his own names, and it is only with this key possible to understand Bowerbank's work.

In the same year appeared the second volume of Bowerbank's Monograph (72).

A year later Hancock (73) published a paper on excavating sponges, to prove that they were not as Bowerbank had stated, ordinary Halichondriæ, which lived in deserted worm tubes, and other old excavations, but that they bored these holes themselves.

In 1867, Selenka (74) published a paper on the sponges of th Southern Seas, where for the first time a number of Australian sponges are accurately described and figured. I have been able to identify several of our sponges with Selenka's species.

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(70). Amtlicher Bericht der Versammlung deutscher Naturforscher und Aerzte in Hannover, 1866.

(71). O. Schmidt. *Zweites Supplement zu den Spongien des Adriatischen Meeres.* Leipzig, 1866.

(72). J. Bowerbank. *A Monograph of the British Spongidæ* Vol. II. Roy. Soc, London, 1866.

(73). A Hancock. *Note on the excavating sponges.* Ann. Mag., 1867, Vol. XIX., p. 229.

(74). E. Selenka. *Uber einege neue Schwämme der Südsee.* Z. f. wiss. Zool. Band XVII. Seite, 565.

In 1868, two eminent Zoologists, Haeckel (75) and Miklouho-Maclay (76) tried to prove the correctness of Leukart's (l. c.) opinion, that the sponges are Cœlenterata.

Haeckel arrives at the opinion of the Cœlenterata-nature of sponges, by his extensive knowledge of a great many species; whilst Miklouho-Maclay (l. c.) was brought to this view of the subject by the intensive study of a single form Guancha blanca.

The most important point in this question, is the fact, that the sponges are developed like all higher animals from ova and Spermatozoa, and pass through a Gastrula stage, wherefore they must be strictly separated from the Protozoa.

It is Haeckel to whom the merit of pointing out this simple but all important fact is due.

Gray (77) published in the same year a classification of the sponges, which has not been accepted by the scientific world. He also describes several new species from Australia.

Bowerbank (78) criticised Gray's system rather sharply, and pointed out many doubtful statements in it.

In the same year, 1868, appeared O. Schmidt's (79) third Supplement to his Adriatic Sponges, in which the sponges of Algeria are described.

Some changes are made in the classification and new families are added.

One of these, the Chalinea, is of interest to us, as nearly half of the Australian sponges belong to it.

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(75). E. Haeckel. *Ueber die sexuelle Fortpflanzung und das natürliche System der Schwämme.* Jen. Zeitschr. VI., 641.
(76). Miklouho-Maclay. *Beiträge zur Kenntniss der Spongien* I. Jen. Ztschr., IV., 221, and *Ueber Schwämme des nördlichen stillen Oceans und der Eismeeres.* Mem. Acad., Petersbourg, XV., 3. Seite. 1.
(77). T. Gray. *Notes on the arrangement of sponges with the description of of some new genera* Proc. Zool. Soc., 1867, p. 492.
(78) J. Bowerbank. *On Mr. Gray's arrangement of sponges.* Proc. Zool. Soc., 1868, p. 118.
(79). O. Schmidt. *III.tes Supplement. Die Spongien von Algier.*

Several smaller papers on new sponges, mostly English, were published at that time.

Bowerbank (80) and Claus (81) studied the Hexactinellid sponges, and particularly by the latter monograph of Euplectella aspergillum gives a correct and complete account of the skeleton.

Lovén (82) and others also worked on the same subject. As there are hardly any Hexactinellid (one) sponges on the shores of Australia, it is not worth while for us to enter into the history of their study more minutely.

The works of Haeckel (l.c.) created, after they had been translated into English, (83) I may say, a storm of indignation in England, and particularly in America, and a whole host of writers took up their pens to prove that Haeckel's and Miklouho-Maclay's views on the Cœlenterate-Nature of sponges were incorrect and ridiculous. Only Ray Lancaster (84) agreed with Haeckel.

Carter (85) and Kent (86) were foremost in the combat.

Also in Germany some opponents were found. Ehlers, (87) for instance, was not inclined to agree with Haeckel.

Ehlers (88) re-described the sponges which were studied by Esper.

In his most important work Grundzüge einer Spongienfauna des Atlantischen Gebietes, O. Schmidt (89) publishes the results

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(80). J. Bowerbank. *Hyalonema mirabile.* Proc. Zool. Soc, 1867, p. 18, 350.

(81). C. Claus. *Ueber Euplectella aspergillum.* Marburg und Leipzig, 1868.

(82). S. Lovén *Om en marklig i Nordijon lefrande Art of Spongia.* Oefversight of Vetensk Akad. forhondlgr XXV,. p. 105.

(83) E Haeckel. *On the systematic position of sponges.* Ann. Mag., Vol. V, 1, 107.

(84.) Ray Lancaster. *On the affinity of sponges.* Ann. Mag., Vol. VI., p. 80.

(85) H. Carter. *On the ultimate structure of marine sponges.* Ann. Mag., Vol VI., p. 329.

(86). S Kent *Haeckel on the relationship of the sponges to the corals.* Ann. Mag., Vol V., p. 204.

(87). E. Ehlers. *Ueber Aulorhipis elegans*, Z.f.w Z., Vol. XXI., p. 540.

(88). E Ehlers. *Die Esperschen Spongien.* Programme Erlangen, 1870.

(89). O. Schmidt. *Grundzüge einer Spongienfauna des Atlantischen Gebietes.* Leipzig., 1870.

of his study of the Sponges in the Museums of Copenhagen and Cambridge Mass. His classification, which he calls "Descendenz-Systematic," is different to most of the former classificatory systems. He tries to form continuous series instead of describing distinct species, and so breaks with the old dogmatic idea of species.

O. Schmidt (90) also extends his identification of the Bowerbankian Sponges, so that only few of them retain their former incognito.

He now divides the sponges into four groups :—1. Sponges with hexaradiate spicules to which belong the fossil Ventriculites. 2. Sponges with anchor-shaped tetraradiate spicules related to the fossil Vermiculates. 3. Sponges with biradiate spicules to which belong the horn-fibred sponges, and those which possess no skeleton. 4. Calcareous Sponges.

This classification has recently been adopted and worked out in detail by Zittel, (91) who supported this classification by the results of his study of fossil forms.

A whole series of small papers of this period are again devoted to the Hexactinellidæ.

An important paper was published in 1871, by Miklouho-Maclay (92), on Veluspa polymorpha, a sponge belonging to O. Schmidt's Chalinidæ. A continuous series of different forms are described, which are not divided from each other by sharp boundary-lines, and at the ends of the series we meet with totally different forms.

The single individual varies to a great extent, and not even the shape of the spicules is constant. Size and colour vary very much, and different shapes of the whole are formed by different modes of concrescence of single zooids.

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(90). O. Schmidt l c. Seite., 76.
(91). K. Zittel. *Zur Stammesgeschichte der Spongien*. München, 1878.
(92). Miklouho-Maclay. *Veluspa polymorpha.* Mem. Acad. Im , Petersb., 1870, Vol XV., p. 3.

It is remarkable that in the Australian waters, sponges corresponding to Miklouho-Maclay's descriptions are very common, and that this sponge is just as polymorphic here as Miklouho-Maclay's specimens from the White Sea. Among the thousands of Australian sponge individuals I have examined nearly the half correspond to Veluspa Miklouho-Maclay.

He also (l.c.) dwells on other sponges of varying shape.

In the same year Harting (93) described Poterion, the giant among sponges.

Carter (94) describes several new species.

In 1872, Pagenstecher (95) published a historical introduction to our knowledge of the spongida.

In the same year appeared Haeckel's Monograph of the Calcareous Sponges (96) in three volumes, with 60 plates. He hopes by the accurate study of one group of animals to render "den analytischen Beweis von der gemeinsamen Descendenz aller, einer solchen Gruppe zugehörigen Species."

This well-known work may be considered as a model of a scientific zoological book. The philosophical deductions are clever, often brilliant, the classification is simple and clear, and the plates show the artistic sense of the author.

The scientific facts contained therein are similar to those published previously by the same author.

Whilst this publication settled all doubt about the Coelenterate-nature of the sponges in Germany; English and American authors continue to publish papers to prove that the sponges are Protozoa. Carter (97) calls the cells in the walls of the ciliated chambers

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(93). P. Harting. *Memoire sur de gènre Poterion.* Naturk. Verhandel. Utrechtsch. Genoatsch 1870, p. 1.

(94). H. Carter. Ann. Mag. (Series 4), Vol. VIII, p. 1; Vol. VIII., p. 99; Vol. IX., p. 409; Vol. XII., p. 349.

(95). H. Pagenstecher. *Zur Kenntniss der Schwämme I. Geschichtliche Einleitung.* Verhandl. Verein Heidelberg VI., 1872, Seite. 1.

(96). E Haeckel. *Die Kalkschwämme* 3 Bände, Berlin, 1872.

(97). H. Carter. *Developement of the Marine Sponges.* Ann. Mag., Vol. XIV., p. 321, 389.

Spongozoa, he observed that they copulated like Difflugia, and in this way sexual multiplication was attained. The embryos formed by the conjugation of two Spongozoa are developed in the canals. He observed (l.c.) that carmine particles were absorbed by the Spongozoa and digested by them, which he takes as a proof that these cells are really animals κατ' ἐξοχήν. According to that the epithelium of the intestine of higher animals which also absorbs carmine must likewise be considered as a colony of many separate animals. He comes to the conclusion that the ciliated chambers are more like Ascidians than Polyps. At the conclusion of another paper (98) he gives his view on the subject in the following words:—"The Spongozoan must, *ipso facto*, be considered the expression of the sponge, in so far, that it represents the stomach and the generative apparatus, aided by the rest of the body, which thus becomes analogous to such accessories in the highest animals, although the plurality of Spongozoa scattered through the mass may more nearly resemble in this respect the flower buds of plant, such then appears to be the nature of a sponge."

Paleontology.

After our knowledge of the fossil sponges had been greatly increased by Goldfuss (99), de Blainville (100), made the first attempt to unite the fossil and recent sponges in one classificatory system.

Toulmain Smith (101) published in 1848, an excellent monogragh of the cretacious Ventriculites. He describes the spicules very accurately. Regarding the systematic position of those Ventriculites he made a mistake. He declares them to be Polyzoa.

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(98). H. Carter. *On the nature of the side-like body of Spongilla &c.* Ann. Mag., Vol. XIV., p. 97.

(99). G. Goldfuss. *Petrefacta Germaniæ.* Düsseldorf, 1826-1833.

(100). M. De Blainville. *Article Eponge.* Dictionnaire des Sciences Naturelles, 1819, Vol. XV.

(101). Toulmain Smith. *On the Ventriculidæ of the chalk.* Ann. Mag. Vol. XX., (1847), p. 73.

IV.—From T. E. Schultze to the present day, 1875—1884.

In no branch of Biology has such an advance been made within the last ten years as in Spongiology.

The papers to be mentioned here shall be reviewed more briefly than the preceding ones, because we shall have to repeat their contents anon : we cannot write a history of a period which is not completed.

We shall have to divide the papers of this period into five groups, and shall commence as in the foregoing chapter with the Anatomy.

Anatomy and Histology.

In a series of papers (102) Schultze describes very accurately many genera of sponges belonging to several different groups. His results are in the main features the following :—The sponges consist of three layers Ectoderm, Entoderm, and a third, which he hesitatingly calls Mesoderm.

The Ectoderm consists throughout of simple flat ciliated cells, which cover the outer surface of the sponge, and the walls of the canals through which the water flows from the outer surface to the ciliated chambers.

These ciliated chambers, together with the canals leading from thence to the Oscular tube, and also this tube, are covered with Entodermal cells, which in the chambers of the ordinary, and in the corresponding tubes of the calcareous sponges, have the shape of long, fringed and ciliated elements, whilst in the canal system they

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(102). F. E. Schulze. *Ueber den Bau und die Entwickelung der Spongien.* Zeitschrift fur wissenschaftliche Zoologie. Sycandra rayhanus Supplement, Band, XXXV., Seite, 247. Entwickelungsgeschichte von Sycandra, Band, XXVII., Seite, 486. Die Gattung Halisarca, Band, XXVIII., Seite, 1. Die Familie der Chondrosidæ, Band, XXIX., Seite, 87. Die Familie der Aplysinidæ, Band, XXX., Seite, 379. Metamorphose von Sycandra, Band, XXXI., Seite, 262. Die Gattung Spongelia, Band, XXXII., Seite, 117. Die Familie der Spongidæ, Band, XXXII., Seite, 593, Die Gattung Hircinia Band, XXXIII., Seite, 1. Die Plakiniden, Band, XXXIV., Seite, 407. Corticium candelabrum, Band, XXXV., Seite, 410.

form a low ciliated Epithelium. The intermediate layer which forms the bulk of the sponge, consists of a soft gelatinous or harder cartilaginous substance, like the gallert of the umbrellas of the Medusæ, in which cells of different shapes are embedded. These cells are partly elongate, muscular, partly star shaped tissue cells, partly horn-producing, gland cells, ova, spermatophors, and so on.

Keller (103) and Metschnikoff (104) agree in the main points with Schulze.

Schulze (105) describes a new form of propagation of sponges, by floating polycellular buds.

Sollas (106) made experiments to show the influence of caustic potash on the spicules; he published a series of anatomical and histological researches, which contain a great many interesting facts, and are worthy of comparison with Schultze's classical works.

Also, Carter (107) published some data on the structure of sponges, but unfortunately without noticing the previous publications on the subject.

Schulze (108) published in 1881, a paper on the soft parts of Euplectella, from which we learn, that the Histology of this well-known sponge, corresponds with the minute structure of sponges belonging to other groups.

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(103). O. Keller. *Untersuchung über die Anatomie und Entwickelungsgeschichte einiger Spongien des Mittelmeeres.* Basel, 1876. *Ueber den Bau von Reniera semitubulosa.* Z. f. w. Z., XXX, Seite, 563. *Studien über Organisation und Entwickelung der Chalineen.* Z. f. w. Z., XXXIII., 317. *Neue Coelenteraten aus dem Golfe von Neapel.* Arch. f. mik. Anat. XVIII., 271.

(104). E. Metschnikoff. *Beiträge zur Morphologie der Spongien.* Z. f. w. Z. Band. XXVII., Seite, 275. *Spongiologische Studien.* Seite, 349.

(105). F. E. Schulze. *Ueber die Bildung freischwebender, Brutknospen bei einer Spongie Halisarca lobularis.* Zool. Anz. II., Seite, 636.

(106). Sollas. *Sponge fauna of Norway.* Ann. Mag (Series 5), Vol. V., p. 130. Vol. V., p. 241. Vol. V., p. 396. Vol. IX., p. 141. Vol. IX., p. 426.

(107). H. Carter. *Contributions to our knowledge of the Spongida II, Ceratina* Ann Mag., Vol. VIII., p. 101. *On the development of the fibre in the Spongida.* Ann. Mag., Vol. VIII., p. 112.

(108). F. E. Schulze. *Of the soft parts of Euplectella aspergillum.* Trans. Roy. S., Edinburgh., XXIX., p. 636.

Ray Lankaster (109) dwells on Chlorophyll and Amyloid deposits in Spongilla.

I published a short note on the growth of the Hornfibres of sponges (Aplysinidæ) (110).

Poléjaeff (111) dwells in detail on the Sperma und Spermatogenesis in Sycandra raphanus.

In another paper (112) I gave the results of my researches on three species of Australian Aplysinidæ.

Besides endorsing Schulze's discoveries, I was enabled to draw attention to some new facts concerning the structure of sponges. Gland cells producing a slimy covering on the surface of the sponges when in unfavourable circumstances, similar to those discovered by Merejkovsky (112a) in Halisarca, were described. The formation and growth of ova and spermatozoa were studied, and several doubtful points elucidated by my researches.

Classification and Systematic Position.

Continuing from page 141, we record the following papers on this subject.

Gray (113) publishes a classification of the sponges amended in another paper. (114).

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(109). Ray Lankaster. *On the Chlorophyll-corpuscles and Amyloid deposits of Spongilla and Hydra.* Quart. J. Micr. Sc., Vol. XXII., p. 229.

(110). R. von Lendenfeld. *Das Hornfaserwachsthum der Aplysinidæ.* Zoologischer Anzeiger. Band V., Seite. 634.

(111). N. Poléjaeff. *Ueber das Sperma und die Spermatogenese bei Sycandra raphanus.* Sitzungsberichte der k. Akad. Wiss. Wien. Math. nat Classe I. Abth. 86, Band 3 5 Heft., Seite. 276—298.

(112). R. von Lendenfeld. *Ueber Cœlenteraten der Südsee. II. Neue Aplysinidæ.* Z.f.w.Z. Band XXXVIII., Seite. 234.

(112a). Merejkovsky. *Etudes sur les Epong dela mer blanche. Mem. de l'Acad, de Petersbg.*, 1878.

(113). J. Gray. *On the classification of Sponges.* Ann. Mag. (Series 4), Vol. XI., p. 442.

(114). J. Gray. *On the arrangement of Sponges.* Ann. Mag., Vol. XIII., p. 284.

Very different from this is Carter's (115) classificatory system. He divides the sponges, according to the structure of their skeleton, into 8 orders :—

I. *Carnosa*, without evident skeleton.

II. *Ceratina*. Possessing a skeleton composed of horny fibre, with a granular, chiefly hollow core, containing for the most part no foreign bodies.

III. *Psammonemata*. Possessing a skeleton composed of solid fibre, more or less cored with foreign bodies.

IV. *Raphidonemata*. Possessing a skeleton composed of horny fibre, with a core of proper spicules.

V. *Echinonemata*. Possessing a skeleton composed of horny fibre, cored with proper spicules internally, and echinated with proper spicules externally.

VI. *Holorhaphidata*. Possessing a skeleton, whose fibre is almost entirely composed of proper spicules, bound together by a minimum sarcode.

VII. *Hexactinellida*. Possessing a skeleton composed of hexactinellid spicules.

VIII. *Calcarea*. Possessing a skeleton composed of calcareous spicules.

Of Bowerbank's Monograph the third volume (116) appeared in 1874, in which new species are described, and some of O. Schmidt's sponges are compared with the author's descriptions.

In another series of papers (117) he describes a number of new species from all parts of the world. A great many of these are Australian.

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(115). H. Carter. *Notes introductory to the study and classification of Spongida*. Ann. Mag. (Series 4), Vol. XVI., pp. 126, 127.

(116). J. Bowerbank. *A Monograph of the British Spongidæ*. Vol. III., Ray. Soc., London, 1874.

(117). J. Bowerbank. *Contributions to the general history of the Spongidæ*. Proc. Zool. Soc., Vol. 1872, p. 115; 1872, p. 156; 1872, p. 626; 1873, p. 3; 1873, p. 319; 1874, p. 298; 1875, p. 281; 1876, p. 768.

O. Schmidt (118) published a most important paper on the sponges of the Gulf of Mexico, where the views expressed by the same author in his paper on the Atlantic Sponge-fauna are carried out. The sponges described are throughout siliceous deep sea-sponges: Lithistidæ and Hexactinellidæ. In the preface we find some notes concerning Bowerbank, who, although being personally acquainted with O. Schmidt, seems to have remained ignorant of the contents of O. Schmidt's papers on sponges.

Hyatt (119) describes many new American sponges, mostly Ceraospongiæ.

It would lead too far to review here all the papers containing descriptions of new species, suffice it to note a few of the more important publications of this kind.

The most prominent authors in this field are the following:—Marenzeller (120), Carter (121), Higgin (122), Czerniavsky

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(118). O. Schmidt. *Die Spongien des Meerbusens von Mexico.* Jena., 1878—80.

(119). A. Hyatt. *Revision of North American Porifera.* Mem. Bost. Soc., Vol. I., 1875, p. 399; Vol. II., 1877, p. 505.

(120). E. von Marenzeller. *Coelenteraten etc. der österreichischen Nordpol Expedition.* Deuschr. Akad. Wien XXXV.

(121). H. Carter. *Description and figures of deep sea sponges.* Ann. Mag., Vol. XVIII., 226, 307, 388, 458. *Arctic and Antarctic sponges.* Ann. Mag., Vol. XX., p. 38. *On Tedania* Ann. Mag., Vol. II., p. 35. *Contributions to our knowledge of the Spongida.* Ann. M., Vol. III., p. 284, 343; Vol. VIII., p. 101, 241. *History and classification of the known species of Spongilla* Ann. Mag., Vol. VII., p. 77. *Report on specimens dredged up from the Gulf of Manaar.* Ann Mag., Vol. VI., p. 129. *Supplementary report on specimens, etc., from the Gulf of Manaar.* Ann. Mag., Vol. VII., p. 361. *Contributions to our knowledge of the Spongida.* I. Carnosa. Ann. Mag., Vol. VIII., p. 241. II. *Ceratina.* Ann. Mag., Vol. VIII., p. 101. *Addendum to our knowledge of the Carnosa.* Ann. Mag. (5), Vol. VIII., p. 450. *Some sponges from the West Indies and Acapulco.* Ann. Mag. (5), Vol. IX., p. 266, 346. *New sponges, observations on old ones and a proposed new group.* Ann. Mag. (5), Vol. X., p. 106. *New genus of sponges.* Ann. Mag. (5), Vol. XI., p. 369. *Contributions to our knowledge of the Spongida—Pachytragida.* Ann, Mag. (5), Vol. XI., p, 344.

(122). T. Higgin. *Sponges dredged by the S.S. Argo in the Carribean Sea.* Ann. Mag., Vol. XIX., p. 291.

(123), Schultze (124), Sollas (125), Keller (126), Wyville Thomson (127), Marshall (128), Bowerbank (129), D'Urban (130), Dylowsky (131), Vosmaer (132), Ridley (133), Potts (134), Haswell (135), Lendenfeld (136), Chilton (137), Hilgendorf (138), Retzer (139), Vejdovsky (140).

Metschnikoff (141) dwells on the systematic position of the Spongidæ, and comes to the conclusion that their Embryology and Histology prove their relationship with the Hydrozoa, but that they are not so highly organised as these.

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(123). W. Czerniavsky. *Spongiæ littorales marium pontici et caspii.* Bull. Soc. Imp., Moscow, 1879-80.

(124). F. E. Schulze (l. c.)

(125). N. Sollas (l. c.)

(126). C. Keller (l. c.)

(127). Wyville Thomson. *The Voyage of the Challenger*, London, 1878.

(128). W. Marshall. *Ideen über die Verwandtschaftsverhältnisse der Hexactinelliden.* Z. f. w. Z., Band, XXVII., p. 113. *Untersuchungen über Dysideiden und Phoriospongien.* Z. f. w. Z. Band, XXXV., p 88. *Ueber einige neue Kieselschwämme aus dem Congo.* Jen. Zeitsch. Band XVI., p. 553.

(129). Bowerbank (l. c.), *Monagraph of the siliceo-fibred sponges.* Proc. Zool. Soc., 1875, p. 272; 1875, p. 503; 1875, p. 558; 1876, p. 535. *A Monograph of British Spongiadea*, Vol. IV. Ray. Soc., London, 1881.

(130). W. D'Urban. *The Zoology of the Barents Sea.* Ann. Mag. (5). VI., p. 253.

(131). Dylowsky. *Studien über die Spongien des russischen Reiches etc.* . Mem. Acad. Imp. Petersb., VII., Serie, XXVII., No. 6.

(132). G. Vosmaer. *The Sponges of the Leyden Museum.* I. Notes from the Leyden Museum, II. Note 13, 99. *Voorlop Berigt omtrent het onderzock Werktafel in het Zool. Stat. de Naples Report on the sponges dredged up in the Arctic Sea by the "Willem Barrents."* Niederl. Arch. f. Zool. Suppl., Band, I.

(133). O. Ridley. *Account of the Zoological Collection made during the Survey of H.M.S. Alert. Spongida.* Proc. Zool. Soc., 1881, 107. *Sponges of Franz-Josefs-Land.* Ann. Mag. (5), Vol. VII., p. 455.

(134). E. Potts. *Sponges from the neighbourhood of Boston.* Proc. Soc., Acad. Nat, Philadelphia, 1882, p. 69.

(135). W. Haswell. *On Australian freshwater sponges.* Proc. Lin. Soc., N S.W. Vol. VII., p. 208

(136). R. von Lendenfeld (l. c.)

(137). Ch. Chilton. *A New Zealand freshwater sponge.* New Zealand Journal of Science. Vol. I., p. 183.

(138). *T Hilgendorf Süsswasser-Schwämme aus Central Africa.* Sitzber. Ges. Nat. Tr., Berlin, 1883, Seite, 87

(139). W. Retzer. *Die Deutschen Süsswasser-Schwämme.* Tübingen, 1883.

(140). T. Vejdovsky. *Revisio faunae Bohæmicæ.* Prag, 1883.

(141). E. Metschnikoff. *Spongiologische Untersuchungen.* Z. f. w. Z. Band, XXXII. Seite, 374, ff.

Balfour (142) draws conclusions from F. E. Schultze's observations on the Embryology of Sycandra. He considers the Gastrula as a colony of Protozoa, like Haeckel (143) and wishes to separate the sponges from other metazoa, because the functions of Ectoderm and Entoderm in the sponges are not like those in other animals.

Lately the Analogy of the Ectoderm and Entoderm in different Cœlenterata has been found to be very vague, and I have in a series of papers contributed my share to the view that the Embryonic layers in the higher Cœlenterata are equivalent (143a), so that the fact that the Ectoderm of the sponges digests, is not sufficient to warrant that the sponges really are fundamentally different from all other Metozoa, and it is by no means certain, that it really is the Ectoderm that digests.

According to the late most important investigations on this subject, published by Marshall (144) the whole of the inner Epithelia of the sponge are entodermal, and as the digestion certainly goes on *within* the sponge, the digestive surfaces are entodermal.

In the "Stammesgeschichte der Spongien," Zittel (144a) published the classificatory system previously often alluded to, which being based on Palæontology and Zoology alike, deserves our attenticn. He divides the Spongia into eight groups as follows :—

1. Myxospongiæ. *Haeckel,* without skeleton.
2. Ceratospongiæ. *Bronn,* with horny skeleton only.
3. Monactinellidæ *Zittel,* with biradiate siliceous spicules.
4. Tetractinellidæ. *Marshall,* with anchor-shaped spicules.
5. Lithistidæ. *O. Schmidt,* with interwoven tretraradiate or irregular spicules.

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(142). F. Balfour. *Morphology and systematic position of the Spongidæ.* Quart. Jour. Micr. Sc., Vol. XIX. p. 103.

(143). E. Haeckel. *Die Gasträatheorie* Jen. Zeitsehr., Vol. VIII., p. I.

(143a). R. von Lendenfeld. *Uber das Nervensystem der Hydroidpolypen.* Z. A Band, VI. Seite, p. 69. *Eucopella Campanularia.* Z. f. w. Z. Band, XXXVIII., S. 497.

(144). W. Marshall. *Die Ontogenie von Reniera filigrana. O. Schmidt.* Z. f. w. Z. Band, XXXVII. Seite, 221.

(144a). K. Zittel. *Zur Stammesgeschichte der Spongien* München, 1878.

6. Hexactinellidæ. *O. Schmidt* with hexaradiate spicules.

7. Calcispongiæ. *de Blainville,* calcareous skeleton.

Selenka (145) described a most interesting form of a sponge, which is radially symmetrical; it has eight radii. He studied the development of this sponge, which is the first in which a structure of this kind, corresponding so closely to the Corals, has been observed. (146.)

The Histology of the sponges was particularly investigated by Schulze (l. c.), who published his results in a series of papers between 1875 and 1880. These works, models of accuracy, have proved that the sponges are not Protozoa, with such evidence, that even the staunchest holders of that theory have not tried to oppose this evidence. The conclusive results contained in these essays appear under the heading "Histology."

Keller (147) wishes the sponges to be separated from other Metazoa, but he is far from considering them as Protozoa or colonies of such any more than other animals.

O. Schmidt (148) dwells on the individuality of the sponges, on which question their systematic position of course greatly depends. The views on this subject are the following:—

Carter (149) considers the single cell (Spongozoan) as the individuality, whilst Merejkovsky (150) states that the ciliated chambers should be considered as the individuals. Haeckel (151) and with him most authors were of opinion, that the individuality in the sponges is expressed by the Osculum; any sponge consists of as

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(145). E. Selenka. *Uber einen Kieselschwamm von ashtstrahligem Bau.* Z. f. w. Z. Band, XXXIII., Seite, 467.

(146). F. E. Schultze described a similar radial structure in other Sponges at the "Versammlung deutscher Naturforscher und Aerzte" in Eisenach, 1882.

(147). C. Keller. *On the systematic position of Sponges.* Ann. Mag. (5). Vol. V., p. 268.

(148). O Schmidt. *Die Spongien des Meerbusens von Mexico.* Jena., 1880.

(149). H. Carter. *On the nature of the seed-like body of Spongilla.* Ann. Mag. Vol. XIV., p. 97.

(150). C. Merejkovsky. *Études sur les Éponges de la mèr blanche.* Mem. Acad. Imp., Petersbourgh. Tom. XVI., p. 13.

(151). E. Haeckel. *Die Kalkschwämme.* Berlin, 1872.

many persons as it has Oscula. Practically this theory leads to difficulties, because some sponges have no Oscula, and because similar sponges may have one, or a great many Oscula.

To avoid this difficulty, O. Schmidt (l.c.) expounds a theory according to which the sponges are not personified at all, but are "Zoa impersonalia," or unlimited animals.

EMBRYOLOGY.

The Histology of sponges, as also their Embryology, was not correctly described before Schulze published his observations on that subject.

Metschnikoff (152) disputes the correctness of Haeckel's observations on the Gastrula of Sycandra raphanus and states, that the skeletophorous outer side of the sponge is formed out of the round non-ciliated cells which form a plug in the Blastula.

O. Schmidt (153) confirms the observations of Metschnikoff (l.c.), and states that in other cases, besides Sycandra, no epibolic Gastrula is formed.

Also Carter (154) confirms Metschnikoff's statements.

In 1877, S. Kent (156) published an account of the development of sponges which differs very much from the descriptions given previously by F. E. Schulze and Metschnikoff. The swarming ciliated gastrula is not a single individual but a "compound ciliated gemmule." The ovum divides by continued fission into a multitude of fringe cells, the fringe of which "has apparently

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(152). E. Metschnikoff. *Spongiologische Untersuchungen.* Z. f. w. Z. Band. XXXII., Seite, 349.

(153) O. Schmidt *Zur Orientierung über die Entwickelung der Schwämme* Z.f.w Z Vol. XXV. Supplement. Seite 127. *Nochmals die Gastrula der Kalkschwämme.* Archiv. für mik. Anat. Band, XIV., Seite, 249. *Das Larvenstadium von Ascetta primordialis und A. clathrus.* Arch. f. mik. Anat. Band, XIV., Seite, 249.

(154). Carter. *Development of the Marine Sponges.* Ann. Mag. (Series 4), Vol. XIV., p. 321, 389.

(156). Sav. Kent. *Notes on the Embryology of Sponges.* Ann. Mag., Vol. II, p. 139.

been overlooked by other observers," which are exactly like the monads, the spongozoa, which compose the adult sponge. The cells lose their fringes and cilia, and coalesce into a Syncytium, and the sponge soon forms. The embryo does not pass a Blastula stage. Every one of the embryonic cells lives independently as a separate animal throrgh all these stages. The "so called ovum, with amoeboid movement, which, according to Haeckel and others, is the independent product of the *imaginary* entoderm," is an ordinary Spongozoan which has lost its fringe. In a similar way, as the "gemmules" also, the cilated chambers are formed.

Barrois (157) made some interesting observations on the embryology of different sponges. In most cases the embryo remains solid throughout, and the canal system is formed after. wards in the Mesoderm. He describes the formation of the Morula very accurately. His observations tend to prove the correctness of the previous statements of F. E. Schulze.

Schultze (158) describes the embryology of a great many different sponges. The ovum is fructified within the sponge and divides. No Morula is formed in the calcareous sponges, the stage with sixteen cells is already a Blastula. The Blastula consists of cylindrical small transparent, and rounded intransparent cells; the whole having the shape of an acorn, the intiansparent cells forming the cup.

The transparent cells—evidently the Ectodermal elements—are invaginated. The morphological Ectoderm of the so formed Gastrula is physiologically an Entoderm.

The Larva swims about and finallv affixes itself by means of pseudopodial processes given off from the Ectodermal cells.

By a complicated folding process the original sac is converted into a large mass traversed by two systems of canals, one being ectodermal and the other entodermal. (Calcispongiae.) In other sponges the process is different.

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(157). C. Barrois. *Embriology des quelques Éponges de la manche.* Annales des sciences Naturelles. Zool. VI. ser. III, Art. 9.
(158). F. E. Schultze (l.c.).

Keller (159) published a very interesting account of the early stages of Chalinula fertilis, which appears to differ slightly from the corresponding stages described by Schulze of other.

Ganin (160) also augmented our knowledge on this subject.

Marshall (161) published a detailed description of the development of species of Reniera. His observations differ from the statements of F. E. Schultze and Barrois (l.c.) The larvæ of Reniera filigrana does not pass a Gastrula stage, and does not show the apparent anomaly of having the transparent cells inside and the others outside, as Schultze observed in Sycandra.

PHYSIOLOGY.

No branch of our science has been so sorely neglected as this one, and to this it should mainly be ascribed that our knowledge of the sponges appears so theoretical. Most of the statements concerning their physiology are deducted from our experience and knowledge of the functions of cells and organs of higher animals, which are similar to those of the sponges.

Metschnikoff (162) and myself (163) have made physiological experiments on the digestion of sponges. I (l.c.) have published some facts on the formation of the slime which sponges produce, and on the sensitiveness of the ectodermal epithelium, and have tried to find out the functions of all the different forms of cells we meet with in the sponges.

Schultze (164) discovered the cells which produce the hornfibres.

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(159). C. Keller. *Studien über die Organisation und Entwickelung der Chalineen.* Z f.w.Z. Band, XXXIII. Seite, 329.

(160). Ganin. *Zur Entwickelung von Spongilla fluviatilis.* Z.A. Band I.

(161). W. Marshall. *Die Ontogenie von Reniera filigrana.* Z.f.w.Z., Band, XXXVII., Seite, 321.

(162.) E. Metschnikoff. *Spongiologische Studien.* Z.f.w.Z. Band, XXII., Seite, 371.

(163.) R. von Lendenfeld. *Cœlenteraten der Südsee Neue Aplysinidæ.* Z.f.w.Z. Band, XXXVIII., Seite. 234.

(164.) F. E. Schultze. *Ueber den Bau und die Entwickelung der Spongien. Die Familie der Spongidæ.* Z.f.w.Z. Band, XXXII., Seite, 593.

He (165), Carter (166), Metschnikoff (167), and Keller (168), and others dwell on the formation of the spicules.

Palæontology.

The older ideas about the fossil sponges were partly reformed and partly done away with by Zittel, who made a new classification, and whose essays deserve equal praise for the quantity of new forms discovered and the accuracy of their description, as also for the brilliant deductions concerning the Phylogeny or classification of sponges derived therefrom (169.)

A great many new forms were described by Duncan (170), Sinzow (171), Carter (172), Hinde (173). Wallich (174), Sollas (175), and others.

(165.) F. E. Schulze. *Ueber den Bau und die Entwickelung der Spongien, die Plakiniden.* Z.f.w.Z. Band, XXXIV., Seite 417,

(166.) H. Carter. *Development of the Marine Sponges.* Ann. Mag., Vol. XIV., 321, p. 389.

(167.) E. Metschnikoff. *Spongiologische Studien.*.Z f.w.Z. Band, XXXII., Seite, 349.

168.) C. Keller. *Studien uber Organisation und Entwickelung der Chalineen.* Z.f.w.Z. Band, XXXIII , Seite, 317.

(169). R. Zittel. *Ueber Cœloptychium, etc.* Abhandl. Bayer. Akad. Band, XII., p. 3, Seite 1. *Studien uber fossile Spongien. Ibid.* I., XIII., 1; *Ibid.* II., XIII., 1, 65; *Ibid.* III., XIII., 2, 91.

(170). M. Duncan. *On some sphæroidal Lithistid Spongida from the upper Silurian formation of New Brunswick.* Ann Mag. (5) Vol. IV., p. 84, 91. *On a lithistid Sponge and on a form of Aphrocallistes.* Journ. Lin. Soc., London Zool., Vol. XV., p. 320.

(171). T. Sinzow. *Ueber Kreideschwämme des Paratowschen Gouvernements.* Denkschr. d. neuruss Ges., 6, Band, 1.

(172). H. Carter. *On Holasterella, a Fossil sponge of the Carboniferous Era, and on the Hemiastrella, a new genus of recent sponge.* Ann. Mag. (Series 5), Vol. III., p. 141.

(173). G. Hinde. *Fossil Sponge Spicules from the Upper Chalk.* Munich, 1880.

(174). G. Wallich. *A Contribution to the Physical History of the Cretaceous Flints.*

(175). T. Sollas. *On the structure and affinities of the Genus Protospongia.* Salter. Ann. Mag. (5). Vol. V., p. 238. *On the Flint Nodules of the Trimingham Chalk.* Ann. Mag. (5). Vol. V., 384, p. 437.

This brief historic introduction has—as far as the older works are concerned—been compiled from Pagenstecher's (175) Historic review, Johnston's (176) introduction to the British Sponges, and particularly from Vosmaer's (177) excellent review of which unfortunately only the first part has at present appeared (178).

Far from being complete, this historic introduction can only serve to enable the student to find the most important works on our subject.

It may, however, be of service also as illustrating the history of science, and indicating the enormous advances made during late years in Zoological discovery.

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(175). Pagenstecher. *Zur Kenntniss Der Schwämme. I. Geschichtliche Einleitung.* Verhandlungen. Verein. Heidelberg. Vol. VI. (1872), p. 1.

(176). G. Johnston. *History of British Sponges and Lithphytes.* Edinburgh, 1842.

(177). G. Vosmaer. *Porifera.* Bronn's Klassen und Ordnungen des Thierreiches. Band II., Heft 1, 2.

(178) The whole of that review has appeared whilst this essay was in print, and I refer the reader who wishes to go more into detail, to that publication. (l.c., Heft 3.)

THE SCYPHOMEDUSÆ OF THE SOUTHERN HEMISPHERE.

By R. von Lendenfeld, Ph.D.

Part I.—Introduction.

Animals, which, as in the generative stages of the Scyphomedusæ, live in the open sea, can hardly be studied in a small area. It therefore appears advantageous to extend our investigation from the Australian shores over the whole of the Southern Hemisphere, and we have a good right to do so from Sydney, as the centre of scientific zoological research this side of the equator. Very few other fields of investigation look so promising as this.

Although hardly anything is known of the southern Medusæ in comparison to their better studied northern relatives, still nearly as many southern species have been described. In some groups there are already more southern than northern species. All families are represented here, while I have discovered a new family on our shores, which has no representative in the Northern Hemisphere.

In consequence of the larger area of ocean in this hemisphere the Medusæ are, as we might expect from the previous statements, *much more numerous* in the southern than in the northern seas, although at present there are of course not quite so many known as north of the line.

In this paper I shall give descriptions of *all* known Scyphomedusæ from this hemisphere. The description of species observed before will be brief; on those alone seen by myself I intend to dwell more in detail.

The classification of Haeckel will be adopted, and Haeckel's Diagnoses translated.

The authors will be cited, and all papers on the species referred to.

By this essay I hope to enable those who interest themselves in the subject to identify any of the Scyphomedusæ which they may find, and to describe it, in case it is new. It is only possible to augment our knowledge if we make all the use we can of the previous work done in the same field.

SCYPHOMEDUSÆ. Ray Lankaster.

The Scyphomedusæ form according to Haeckel (1) the second Legion of the Classis Medusæ. He uses Gegenbaur's name Acraspedæ for them. The difference between these Acraspedæ and the other Medusæ, the Craspedota, is however so great that I prefer to dwell on them separately.

All the large Jelly-fish or Blubbers of our shores appear to belong to this group, although there exist Medusæ belonging to the Craspedotæ which are very similar to them in appearance. The great difference lies in the sessile zooids on which these Medusæ, which are the sexual generation of the Hydrozoa, bud.

While the Craspedotæ originally budded from Hydroid Polyps, (a process which has in many cases been done away with) the Scyphomedusæ bud from a Scyphostoma which is fundamentally different from and much highly organized, than a Hydroid Polyp. I intend to dwell on this subject in another paper.

In the accompanying list, all species from the Southern Hemisphere which have been described are enumerated.

The statistical table verifies the above statements of the prevalence of the southern Scyphomedusæ over the northern in number of species. The Australian Scyphomedusæ fauna is apparently poor, but this is due only to the insufficient investigations which have hitherto been carried on on this subject. Suffice it to state, that of the five Scyphomedusæ abundant on our shores only one had been described before I studied them.

I hope, therefore, that we shall be able to add very extensively to the Australian Scyphomedusæ by our researches.

(1.) Haeckel System der Medusen, Seite 367.

SCYPHOMEDUSÆ. Ray Lankaster, 1877.

I. Ordo.—Stauromedusæ. Haeckel, 1879.

1. Family Tesseridæ. Haeckel, 1879.

1. Genus Tessera. Haeckel, 1879.
1. Species T. princeps. Haeckel, 1879.
2. Species T. typus. Haeckel, 1879.

2. Genus Tesseraria. Haeckel, 1879.
3. Species T. Scyphomeda. Haeckel, 1879.

3. Genus Tesserantha. Haeckel, 1879.
4. Species T. connectens. Haeckel, 1879.

2. Family Lucernaridæ. Johnston, 1847.

4. Genus Craterolophus. Clark, 1863.
5. Species C. Macrocystis. Von Lendenfeld, 1884 (*new*)

II. Ordo.—Peromedusæ. Haeckel, 1879.

3. Family Pericolpidæ. Haeckel, 1879.

5. Genus Pericolpa. Haeckel, 1879.
6. Species P. quadrigata. Haeckel, 1879.
7. Species P. tetralina. Haeckel, 1879.

6. Genus Pericrypta. Haeckel, 1879.
8. Species P. galea. Haeckel, 1879.
9. Species P. campana. Haeckel, 1879.

4. Family Periphyllidæ. Haeckel, 1879.

7. Genus Periphylla. Steenstrup, 1837.
10. Species P. Peronii. Haeckel, 1879.
11. Species P. mirabilis. Haeckel, 1879.

8. Genus Periphema. Haeckel, 1881.
12. Species P. regina. Haeckel, 1881.

III. Ordo.—Cubomedusæ. Haeckel, 1879.

5. Family Charybdeidæ. Gegenbaur, 1856.

9. Genus Procharybdis. Haeckel, 1879.

13. Species P. securigera. Haeckel, 1879.

14. Species P. tetraptera. Haeckel, 1879.

15. Species P. flagellata. Haeckel, 1879.

10. Genus Charybdea. Péron et Leseur, 1809.

16. Species C. alata. Reynaud, 1830.

11. Genus Tamoya. Fritz Müller, 1859.

17. Species T. haplonema. Friz Müller, 1859.

18. Species T. bursaria. Haeckel, 1879.

19. Species T. gargantua. Haeckel, 1879.

6. Family Chirodropidæ. Haeckel, 1879.

12. Genus Chiropsalmus. L. Agassiz, 1862.

20. Species C. quadrumanus. L. Agassiz, 1862.

21. Species C. zygonema. Haeckel, 1879.

13. Genus Chirodropus. Haeckel, 1879.

22. Species C. palinatus. Haeckel, 1879.

23. Species C. gorilla. Haeckel, 1879.

IV. Ordo.—Discomedusæ. Haeckel, 1866.

7. Family Ephyridæ. Haeckel, 1879.

14. Genus Ephyra. Péron et Leseur, 1809.

24. Species E. prometeor. Haeckel, 1879.

25. Species E. discometra. Haeckel, 1879.

15. Genus Palephyra Haeckel, 1879.

26. Species P. antiqua. Haeckel, 1879.

16. Genus Zonephyra. Haeckel, 1879.

27. Species Z. connectens. Haeckel, 1879.

17. Genus Nauphanta. Haeckel, 1879.

28. Species N. Challengeri. Haeckel, 1879.

18. Genus Atolla. Haeckel, 1879.
    29. Species A. Wyvilli. Haeckel, 1879.

19. Genus Collaspis. Haeckel, 1879.
    30. Species C. Achilles. Haeckel, 1879.

8. Family Linergidæ. Haeckel, 1879.

20. Genus Linantha. Haeckel, 1879.
    31. Species L. lunulata. Haeckel, 1879.

21. Genus Linerges. Haeckel, 1879.
    32. Species L. Aquila. Haeckel, 1879.

22. Genus Liniscus. Haeckel, 1879.
    33. Species L. ornithopterus. Haeckel, 1879.

23. Genus Linuche. Eschscholtz, 1829.
    34. Species L. Lamarkii. Eschscholtz, 1829.

9. Family Pelagidæ. Gegenbaur, 1856.

24. Genus Pelagia. Péron et Leseur, 1809.
    35. Species P. panopyra. Péron et Leseur, 1809.
    36. Species P. papillata. Haeckel, 1879.
    37. Species P. discoidea. Eschscholtz, 1829.

25. Genus Chrysaora. Péron et Leseur, 1809.
    38. Species C. fulgida. Haeckel, 1879.
    39. Species C. Blossevillei. Lesseur, 1829.
    40. Species C. Plocamia. Haeckel, 1879.
    41. Species C. calliparea. Haeckel, 1879.

26. Genus Dactylometra. L. Agassiz, 1862.
    42. Species D. lactea. L. Agassiz, 1862.

10. Family Cyanidæ. L. Agassiz, 1862.

27. Genus Procyanea. Haeckel, 1879.
    43. Species P. protosema. Haeckel, 1879.

28. Genus Medora. Couthouy, 1862.
    44. Species M. reticulata. Couthouy, 1862.

29. Genus Stenoptycha. L. Agassiz, 1862.
    45. Species S. rosea. L. Agassiz, 1862.
    46. Species S. Goethena. Haeckel, 1879.
30. Genus Drymonema. Haeckel, 1879.
    47. Species D. Gorgo. Fritz Müller, 1883.
31 Genus Desmonema. L. Agassiz, 1862.
    48. Species D. Annasethe. Haeckel, 1879.
    49. Species D. Gaudichaudi. L. Agassiz, 1862.
    50. Species D. pendula. Haeckel, 1879.
32. Genus Cyanea. Péron et Leseur, 1809.
    51. Species C. Annaskala. Von Lendenfeld, 1882.
33. Genus Patera. Lesson, 1843.
    52. Species P. cerebriformis. Lesson, 1843.
34. Genus Melusina. Haeckel, 1879.
    53. Species M. formosa. Haeckel, 1879.

11. Family Flosculidae. Haeckel, 1879.
    35. Genus Floscula. Haeckel, 1879.
        54. Species F. Promethea. Haeckel, 1879.
        55. Species F. Pandora. Haeckel, 1879.
    36. Genus Floresca. Haeckel, 1879.
        56. Species F. Parthenia. Haeckel, 1879.
        57. Species F. Pallada. Haeckel, 1879.

12. Family Ulmaridae. Haeckel, 1879.
    37. Genus Ulmaris. Haeckel, 1879.
        58. Species U. prototypus. Haeckel, 1879.
    38. Genus Aurelia. Péron Leseur, 1809.
        59. Species A. colpota. Brandt, 1838.
        60. Species A. clausa. Lesson, 1829.
        61. Species A. limbata. Brandt, 1835.
        62. Species A. coerulea. Von Lendenfeld, 1884 *(new)*.
    39. Genus Aurosa. Haeckel, 1879.
        63. Species A. furcata. Haeckel, 1879.
    40. Genus Auricoma. Haeckel, 1879.
        67. Species A. Aphrodite. Haeckel, 1879.

13. Family Toreumidae. Haeckel, 1879.

41. Genus Archirhiza. Haeckel, 1879.
65. Species A. aurosa. Haeckel, 1879.
66. Species A. primordialis. Haeckel, 1879.

42. Genus Toreuma. Haeckel, 1879.
67. Species T. theophila. Haeckel, 1879.
68. Species T. thamnostama. Haeckel, 1879.
69. Species T. Gegenbauri. Haeckel, 1879.

43. Genus Cassiopea. Péron et Leseur, 1809.
70. Species C. Andromeda. Eschscholtz, 1829.
71. Species C. ornata. Haeckel, 1879.
72. Species C. depressa. Haeckel, 1879.

44. Genus Cephea. Péron et Leseur, 1809.
73. Species C. fusca. Péron et Leseur, 1809.
74. Species C. conifera. Haeckel, 1879.

45. Genus Polyrhiza. L. Agassiz, 1862.
75. Species P. homopneusis. Haeckel, 1879.
76. Species P. Orythyia. Haeckel, 1879.

14. Family Pilemidae. Haeckel, 1879.

46. Genus Toxoclytus. L. Agassiz, 1862.
77. Species T. roseus. L. Agassiz, 1862.

47. Genus Lychnorhiza. Haeckel, 1879.
78. Species L. lucerna. Haeckel, 1879.

48. Genus Eupilema. Haeckel, 1879.
79. Species E. scapulare. Haeckel, 1879.
80. Species E. claustra. Haeckel, 1879.

49. Genus Pilema. Haeckel, 1879.
81. Species P. capense. Haeckel, 1879.

50. Genus Rhopilema. Haeckel, 1879.
82. Species R. rhopalophora. Haeckel, 1879.

51. Genus Brachiolophus. Haeckel, 1879.
83. Species B. collaris. Haeckel, 1879.

52. Genus Stomolophus. L. Agassiz, 1862.
84. Species S. Fritillaria. Haeckel, 1879.

15. Family Chaunostomidæ. Von Lendenfeld, 1882.
  53. Genus Pseudorhiza. Von Lendenfeld, 1882.
    85. Species P. aurosa. Von Lendenfeld, 1882.

16. Family Versuridae. Haeckel, 1879.
  54. Genus Hoplorhiza. Haeckel, 1879.
    86. Species H. simplex. Haeckel, 1879.
    87. Species H. punctata. Haeckel, 1879.
  55. Genus Cannorhiza. Haeckel, 1879.
    88. Species C. connexa. Haeckel, 1879.
  56. Genus Versura. Haeckel, 1879.
    89. Species V. palmata. Haeckel, 1879
    90. Species V. pinnata. Haeckel, 1879.
    91. Species V. versicolor. Haeckel, 1879.
  57. Genus Stylorhiza. Haeckel, 1879.
    92. Species S. punctata Von Lendenfeld, 1884 (*new*).

17. Family Crambessidae. Haeckel, 1869.
  58. Genus Cramborhiza. Haeckel, 1879.
    93. Species C. flagellata. Haeckel, 1879.
  59. Genus Crambessa. Haeckel, 1869.
    94. Species C. cruciata. Haeckel, 1879.
    95. Species C. palmipes Haeckel, 1879.
    96 Species C. mosaica. Haeckel, 1879.
  60. Genus Mastigias. L. Agassiz, 1862.
    97. Species M. papua. L. Agassiz, 1862.
    98. Species M. ocellata. Haeckel, 1879.
    99. Species M. pantherina. Haeckel, 1879.
  61. Genus Eucrambessa. Haeckel, 1879.
    100. Species E. Mülleri. Haeckel, 1879.
  62. Genus Thysanostoma. L. Agassiz, 1862.
    101. Species T. thysanura. Haeckel, 1879.
    102. Species T. melitea. Haeckel, 1879.
  63. Genus Leptobrachia. Brandt, 1838.
    103. Species L. leptopus. Brandt, 1838.
  64. Genus Leonura. Haeckel, 1879.
    104. Species L. terminalis. Haeckel, 1879,

Orders and Families.	Total Number of Known Species.	Species in the Southern Hemisphere.	Australian Species.
SCYPHOMEDUSÆ	210	104	26
I. Ordo Stauromedusæ	18	5	2
1. Tesseridæ	8	4	1
2. Lucernaridæ	12	1	1
II. Ordo Peromedusæ	12	7	3
3. Pericolpidæ	4	4	3
4. Periphyllidæ	8	3	0
III. Ordo Cubomedusæ	22	11	1
5. Charybdeidæ	17	7	1
6. Chirodropidæ	5	4	0
IV. Ordo Discomedusæ	158	81	20
7. Ephyridæ	12	7	1
8. Linergidæ	11	4	0
9. Pelagidæ	20	8	0
10. Cyanidæ	21	11	2
11. Flosculidæ	4	4	0
12. Ulmaridæ	21	6	2
13. Toreumidæ	18	12	6
14. Pilemidæ	18	8	0
15. Chaunostomidæ	1	1	1
16. Versuridæ	14	7	4
17. Crambessidæ	18	13	4

SCYPHOMEDUSÆ. Ray Lankaster, 1877.

The Scyphomedusæ are Medusæ with Gastral filaments or Phacells, with entodermal Gonads, without Velum, with marginal laps of the Umbrella, without a double centralized nerve-ring. Developed originally from a Scyphostoma by Strobilation. Ontogenesis, mostly change of generations often connected with a metamorphosis. The sexual generation is produced by terminal budding of (1) the non-sexual Scyphostoma generation.

I. Ordo Stauromedusæ. Haeckel, 1879.

Scyphomedusæ without organs of sense, 4 pair of adradial or 4 simple interradial Gonads in the sub-umbral wall. Stomach with four large perradial pouches 2).

1. Family. *Tesseridæ.* Haeckel, 1879.

Stauromedusæ with simple undivided margin of the umbrella, without hollow margin laps. Eight simple per-and inter-radial tentacles. Ring-shaped muscle on margin of Umbrella continuous. In middle of Exumbrella a protuberance or stalk.

1. Gen. *Tessera.* Haeckel, 1879.

Tesseridæ without stalk, with eight simple tentacles without nettle knot.

1. sp. *Tessera princeps.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 374.

Tafel, XXI. Figuren, 1-6.

Umbrella bell shaped, higher than broad, with conical protuberance on Exumbrella containing a gastral canal. Four simple gastral filaments. Mouth tube quadrangular prismatic nearly as long as the height of the Umbrella. Mouth square. Four simple hoof shaped Gonads. The four perradial tentacles double as long as the four interradial ones.

Size : Breadth of Umbrella, 4 mm., height 5 mm.

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(1). Haeckel, Medusen. Seite, 360.
(2). Haeckel, Medusen. Seite, 364.

Locality: Antarctic Ocean, S.E. of Kerguelen. Lat. S. 64° 37′. Long., E. of Greenwich, 85° 49′. Station 154 of the "Challenger." Wyville Thomson.

2. Gen. *Tesserantha.* Haeckel, 1879.

Tesseridæ without Umbrella stalk, with Exumbrellar process; with 16 simple, not hollow tentacles, without terminal nettle knot.

2. sp. *Tesserantha connectens.* Haeckel, 1879.

Haeckel, Tiefsee Medusen der "Challenger" Expedition. Seite 42. Tafel. XV.

Umbrella helmet shaped, 1½ as high as broad, above with conic process with canal. Four double rows of gastral filaments. Mouth tube quadrangular, prismatic, half as long as the height of the Umbrella. Mouth with four folded laps. Four simple hoof shaped Gonads. The arch surrounds the knots. The eight tentacles of the same length as long as the height of the Umbrella.

Size: Width of Umbrella, 6 mm., height of Umbrella, 9 mm.

Locality: South-eastern part of the Pacific Ocean, near Juan Fernandez.

Lat. S. 33° 31′. Long., W. Greenwich, 74° 43′. Station, 299 of the "Challenger," in a depth of 2,160 fathoms. Wyville Thomson.

2. Family. *Lucernaridæ.* Johnston, 1847.

Margin of Umbrella simple, undivided, without hollow arms or margin-laps, with simple tentacles. On the Exumbrella a prolongation, with which the Medusa affixes itself to foreign bodies.

3. Gen. *Craterolophus.* Clark, 1863.

Lucernaridæ, with four Mesogon pouches in the wall of the Subumbrella, without marginal anchors or papillæ.

3. Sp. *Craterolophus macrocystis.* R. von Lendenfeld, 1884. Nova species.

The genus Craterolophus has only been found on the coast of Heligoland, where the hitherto single species Craterolophus Tethys, Clark, is very abundant; but nowhere else. Our species is accordingly the second. Unfortunately it is very rare, so that my description must be imperfect as I only got two specimens, both of which were cut into sections forthwith.

Umbrella deep bell shaped, expanded about half as broad as high (in Cr. Tethys broader than high). Stalk about $\frac{2}{3}$ of the height of the umbrella, (in Cr. Tethys only $\frac{1}{4}$—$\frac{1}{3}$.) Eight arms short at equal distances. Every arm with a cluster of about 30 tentacles. The Gonads are like those of Cr. Tethys, feathery.

Colour: Dark olive green, fades in spirits.

Size: Height of umbrella, 12 mm.; breadth, 6 mm.; stalk, 8 mm. high; and extended 3 mm. thick.

Locality: East coast of New Zealand, Port Chalmers, Hutton, Lyttleton, von Lendenfeld.

On Macrocystis.

II. Ordo Peromedusæ. Haeckel, 1877.

Scyphomedusæ, with four interradial organs of sense, which contain an organ of hearing and several eyes, 4 or 12 tentacles, 8 or 16 marginal laps. Stomach surrounded by a large subumbral ring-shaped sinus, with four interradial strictures. Four pairs of frill-shaped Gonads.

3. Family. *Pericolpidæ.* Haeckel, 1877.

Margin of Umbrella with four perradial tentacles and 8 adradial marginal laps. Festoon-canal with 16 pouches.

4. Gen. *Pericolpa.* Haeckel, 1879.

Without perradial pouches, with continuous funnel-cavities, four interradial Tæniols, in the basal stomach are solid bars without gastral filaments.

4. Sp. *Pericolpa quadrigata.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 413.

Tafel, XXIII.

Umbrella high; conic, twice as high as broad; a deep furrow between central part and marginal part of Umbrella. The 4 perradial Pedalia double as broad as the interradial ones, as long as the margin laps, these eight in number; 4 tentacles double as long as height of Umbrella. Mouth tube quadrangular prismatic, nearly double as long as the central stomach.

Size: 10 mm. wide and 20 mm. high.

Locality: Antarctic Ocean, south-east of Kerguelen. Lat. S. 64° 37′. Long. E. of Greenwich, 85° 49′. Station, Nr. 154, of the "Challenger," Wyville Thomson.

5. Gen. *Pericrypta.* Haeckel, 1879.

Four perradial pouches with four continuous cavities. 4 interradial Taeniols of the basal stomach; they are high caves covered along their whole length with two rows of gastral filaments.

5. sp. *Pericrypta galea.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 414.

Umbrella high, helmet shaped, 1½ as high as broad, divided in two equally high parts by a circular groove. The four perradial Pedalia of the margin of the Umbrella only slightly broader than the four interradial ones, slightly longer than the eight marginal laps. Four tentacles as long as height of Umbrella. Mouth tube cubic, with wide pouches with eight long adradial barbs.

Size: Breadth, 30 mm., height, 40 mm.

Locality: South Pacific Ocean, East Coast of Australia. Schnehagen.

6. sp. *Pericrypta campana.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 414.

Umbrella bell shaped, a little higher than broad. Shallow circular groove. Inner part double as high as marginal ring. The four perradial Pedalia double as broad as the four interradial, double as long as the eight stump margin laps. Four tentacles double as long as the height of the Umbrella. Mouth tube quadrangular prismatic, half as long as the central stomach, without barbs.

Size: Breadth of Umbrella, 24 mm., height, 30 mm.

Locality: South Pacific Ocean, near New Zealand. Weber.

4. Family. *Periphyllidæ.* Haeckel, 1877.

Peromedusæ with 12 tentacles and four marginal organs of sense. With 16 margin laps. Exumbrella with 16 Pedalia, and circular muscle; on either side of the Pedalia a pouch. Festoon canal consists of 32 lap pouches.

6. Gen. *Periphylla.* Steenstrup, 1837.

With four perradial pouches in the mouth tube, and 4 basal funnel cavities. The 4 interradial Taeniols are hollow caves, along the whole length of which there are two rows of Gastral filaments.

7. sp. *Periphylla Peronii.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 420.

Charybdea periphylla. Péron et Leseur. Tableau, etc., p. 332.

Charybdea periphilla de Blainville, 1834. Actinologie, p. 275. Atlas pl. 31, fig. 1.

Charybdea periphylla. Milne Edwards. 1839. Cuvier, Règne Animal, Illustré., pl. 55, fig. 2.

Charybdea periphylla. L. Agassiz, 1862. Monograph of the Acalephæ. Contributions etc. Vol. IV., p. 173.

Umbrella flat conic, broader than high. Margin laps triangular pointed, their distal wings narrow. The tentacle laps projecting a little more than the laps of the marginal organs of sense. Tentacles long and thick, double as long as the height of the Umbrella, at the base half as broad as the margin laps. Mouth tube cubic. No barbs.

Colour: Subumbral surface of the Umbrella brown, tentacles yellowish.

Size: Breadth of Umbrella, 60 mm., height, 50 mm.

Locality: Equatorial part of Atlantic Ocean. Péron. Coast of South Africa. W. Bleek.

8. sp. *Periphylla mirabilis.* Haeckel, 1879.

Haeckel System der Medusen. Seite, 422. Die Tiefsee Medusen der "Challenger" Expedition. Seite, 54. Tafel, XVIII, XXIII.

Umbrella conic, $\frac{1}{4}$ higher than broad. Pedal zone higher than the lap zone. Both together $\frac{2}{3}$ as high as the cone. Margin laps oval, distal wings triangular. Tentacle laps slightly projecting, less than the eight laps of the marginal sense organs. Tentacles double as long as height of Umbrella, at the base $\frac{1}{3}$ as broad as the margin laps. Mouth tube cubic, $\frac{1}{3}$ as high as the Umbrella, 8 adradial long barbs.

Colour: In spirits, light violet, subumbral surface dark violet. Gonads orange.

Size: Breadth of Umbrella, 120 mm., height, 160 mm.

Locality: East Coast of New Zealand. Lat., S. 40° 28′. Long., E. of Greenwich, 177° 43′, depth, 1,100 fathoms. Station, Nr. 168, "Challenger." Wyville Thomson.

7. Gen. *Periphema.* Haeckel, 1879.

With 4 perradial pouches in the mouth-tube, and 4 perradial extensions of the basal stomach. Between these the four subumbral funnel-cavities form hollow cones which bear two rows of gastral filaments, except on the top. The two rows terminate separately below the point of the cone.

9. Sp. *Periphema regina.* Haeckel, 1881.

Haeckel Tiefsee medusen der "Challenger" Expedition. Seite, 72. Tafel, XXIV., XXV.

Periphylla regina. Haeckel, 1879. System der Medusen. Seite, 421.

Umbrella bell-shaped, as high as broad; pedal zone lower than lap zone; margin laps oval, distal wings semi-circular; 8 tentacular laps more projecting than those of the marginal organs of sense. Tentacles very thick, about as long as the height of the Umbrella, at the base $\frac{1}{3}$ as broad as the margin laps. Mouth-tube cubic large and thick-walled half as high and broad as the Umbrella-mouth, without barbs.

Size: Breadth 180-200 mm.; height, 180-200 mm.

Locality: Antarctic Ocean, S.E. of Kerguelen, Lat. S. 62° 26′. Long. E. of Greenwich, 95° 44′. In a depth of 1975 fathoms. Station Nr. 156 of the "Challenger." Wyville Thomson.

Notices of new Fishes.

By William Macleay, F.L.S., &c.

Platycephalus longispinis. n. sp.

D. 1/7/14. A. 14. L. lat. 75.

Somewhat like *P. Bassensis.* Length of head $3\frac{1}{3}$ in the total length, width of head one-fourth of the same. The space between the eyes is flat and less than the diameter of the eye, with a distinct ridge on each side commencing at the anterior edge of the orbit, and terminating at the extremity of the occiput, the latter part of the ridges interrupted, and resembling long, low, recumbent spines, without being spinous. Another very low similarly interrupted ridge is traceable behind the eye, commencing with one or two short spines, and extending to the commencement of the lateral line. A trace of another ridge in the median line of the head is to be seen near the snout, and again behind the eyes in about the line of the præorbital spines, it shows in one very low, long, recumbent spine. The præocular terminates at its outer anterior angle in a strong, acute, short spine, from thence proceed two ridges, with a smooth groove between to the præopercular spines, the first sixth of the lower of these ridges is strongly serrated The lower præopercular spine is very long, strong, acute, and grooved on its thicker portion, the upper is less than a third of the length of the other, and points upwards and away from it. One spine on the operculum. The lower jaw is longer than the upper.

Lateral line smooth. Coloration yellowish-grey, spotted with yellow on the upper surface, white on the under surface, the two dorsals and the pectoral fins spotted with brown ; the ventrals and anal white. The caudal fin is imperfect in my only specimen, but it seems to have been clouded with black. Length, 10 inches.

Taken in a trawl net outside Port Jackson in 50 fathoms.

PETROSCIRTES WILSONI. n. sp.

D. 26. A. 22. V. 2.

Height of body one-fifth of the total length. Profile perpendicular, with a high compressed crest as in *P. cristiceps*. Several of the rays, from the 17th backwards, of the dorsal fin terminate in long filaments. Colour (in spirits) dark grey, a row of moderate sized spots along the median line of the side towards the tail, and a row of smaller spots beneath. The dorsal fin is indistinctly speckled, the anal is blackish margined. The pectorals are colourless. In the fresh specimen the colours were probably more brilliant, and possibly reddish in some places.

This fish was found lately at the north shore of Port Jackson by Mr. J. D. Wilson, in an empty shell.

ATHERINOSOMA JAMESONII.

D. 5 8. A. 12. L. lat. 28. L. tr. 5-6.

Height of body over 4 times in the total length; length of head about the same. Eye large, head between the eyes broad and flat. Mouth small, slightly oblique, the edge of each jaw armed with a row of strong recurved teeth, similar teeth on the vomer. Scales large, cycloid, no lateral line. The 1st dorsal fin is situated in front of the middle of the back, and has the 1st spine terminating in a long filament, the others are filamentose, but shorter; the 2nd dorsal commences opposite the middle of the anal, and has the first rays elevated; the anal also has the first few rays elevated; the caudal fin is moderately forked; the ventrals reach to the anus; the pectorals reach to the 7th body scale. Colour greenish yellow, with minute microscopic dots all over but thickest towards the back, a narrow black line on the side along the middle of the 3rd row of scales; the first rays of the 2nd dorsal and anal fins black; the 1st dorsal fin finely speckled, the ventrals colourless. Length, $1\frac{1}{4}$ to $1\frac{1}{2}$ inch.

Bremer River, a tributary of the Brisbane. Fresh water.

This very curious little fish which I name after its discoverer, Mr. Jamieson of Ipswich, is most certainly akin to the *Atherinosoma* *vorax*, described by Count Castelnau, from Cape Schank, and I provisionally place it in that genus. Assuredly it cannot be placed in the Family *Atherinidæ*, notwithstanding its many points of resemblance, but I am not quite satisfied as to its real affinities, and therefore refrain from placing it, as was suggested by the late Count Castelnau, in a new Family to be named *Neoatherinidæ*.

UROLOPHUS BUCCULENTUS. n. sp.

This species differs from *U. testaceus* in being broader on the disk, and in having the snout terminating in a more distinct triangular point, in having the tail shorter, with the dorsal fin much larger, and the caudal broader and more rounded. But the chief difference is in the mouth, which in this species is more than three times larger proportionately to the size of the fish than in *U. testaceus*. The nasal valve is almost truncate, and not fringed, and there are twelve short papillæ at the bottom of the mouth.

Trawled outside Port Jackson, in 40 to 60 fathoms.

On the Improvements effected by the Australian Climate, Soil, and Culture on the Merino Sheep.

By P. N. Trebeck, Esq.

The subject of Merino sheep and Wool, is probably so uninteresting to most of our members, that in drawing your attention this evening to the various developments and changes which have been effected by our Australian squatters, I shall confine myself chiefly to a comparison of the European Merino types of wcol, with the various samples on the table before you, grown under Australian culture. We must not forget, that our squatters, in thus increasing the length, lustre, and other good qualities, have done so entirely with a desire to meet the requirements and tastes of the manufacturers and wearers, and thus secure the highest returns for their capital and labor. Our climate and soil have assisted them very materially in producing a longer and stouter fibre. In a few years, should the taste for wearing fabrics made from the old style of clothing wool, return, they will find that it will not be so easy a matter to work back to the short dense very fine clothing wool of former years.

In examining the samples before you, you will observe that our own colony formerly produced the very highest qualities of clothing wool, suitable for making the finest felts (for piano hammers, &c.), scarlet hunting cloths, superfine broad cloths, and other fabrics of the most delicate texture, fit for royal robes. You will also see the combing and lustrous samples, which have almost supplanted the former, and are better adapted for the highest qualities of alpacas, lustres, and the numerous descriptions of corded and fancy tweeds, so popular now with peer and peasant.

The Merino sheep, which produces these high-class wools was described as long ago as the first century, by Lucius Columella of Cadiz, one of the best authors on practical agriculture in that century. The original flocks appear to have been confined for many years to Spain, whence they have been gradually distributed to most parts of Europe, North and South America and our own colonies. Here we have found the Merino a hardy animal, thriving alike on the high and luxuriant pasture lands on the western waters of New England and Monaro, 2,000 to 3,000 feet above the sea, or, on the arid plains of the western interior, where the food consists only of scanty herbage and shrubs.

I will first draw your attention to the Merino wools grown in Europe, as representative of the average wools of the imported Merino sheep, and then compare them with those grown in our colonies from those sheep, giving at the same time a short statement of the climate and soil in which our wools have been grown.

No. 1.—The highest class of German clothing wool in the grease, sent by the Emperor of Germany to our Agricultual Society.

No. 2.—The same wool scoured, estimated to be worth 6s. per lb. The loss in scouring about 78 to 80 per cent.

No. 3.—Fair class Silesian wool roughly washed, worth about 20d. per lb.

No. 4.—The same wool scoured by the manufacturer, ready for working; value 4s. 3d. per lb.

In the four small bottles you will observe samples of German and Silesian wool, which are a little longer than the first two. They are of fine quality, and represent the ordinary commercial Silesian wool as sold in London, and used in Europe for their finest fabrics. The Silesian Merino is the ancestor of many of our best flocks, and you will notice presently by the Mudgee samples in the larger bottles, how closely our best earlier wools resembled those from their Silesian progenitors. In the large bottle No. 1, is a sample of the late Hon. E. K. Cox's wool, in 1870. It is beautifully fine, and contains every good quality of its Silesian ancestry. Its elasticity and felting qualities can scarcely be surpassed. It was grown at Rawdon near Rylstone, 2,000 feet above the sea. Formation, basalt, porphyry, and carboniferous rocks, country moderately timbered, fair pasture. Mr. Cox won the Grand Prix in Paris in 1878, beating all nations. The box No. 2, contains a similar wool (bottle broken) of the highest Silesian type, equal to any ever produced in the colonies. It was grown by the late Mr. C. C. Cox, in 1870, at Brombee near Mudgee. Elevation about 1,700 feet above the sea. Formation, devonian slate and limestone, country moderately timbered.

The large bottle No. 3. This is also a good type of the earlier wools for which New South Wales became so famous. It was grown in 1870 by Mr. J. B. Bettington, at Brindley Park, near Merriwa, about 1,200 feet above the sea. Formation, rich soil, from basaltic and carboniferous rocks, open country, lightly timbered, well grassed.

Bottle No. 4. As I shall be presently showing you modern Victorian wool of good length, I have brought you a sample of Mr. J. L. Currie's wool of 1870, a good type of the Australian Merino wool of those days, grown on Basaltic Plains, about 1,200 feet above the sea, open plains, with scarcely any timber, well-grassed. You will observe that even so far back, the Victorian wool had assumed a *distinct* combing type, *peculiarly its own*, and that colony, without doubt, now produces the very highest class of this long lustrous wool.

I will now draw your attention to our Merino Wools of the present day, to show how the wool from the same purely-bred Merino has, under the influence of climate, soil, and culture, attained a much greater length and improved considerably in lustre and colour, while it has retained most of its excellent qualities, extreme fineness of fibre alone excepted.

In box No. 5, is a sample of Mr. H. C. White's wool from his flock, at Havilah, near Mudgee, long considered one of the premier ones of our colony. Formerly it much resembled the fine Mudgee samples in the larger bottles, but has now become longer in staple and somewhat stouter in fibre, while it has retained its denseness, the quality above all others the most difficult to perpetuate here, and so necessary to introduce periodically into our arid western interior. Havilah is about 1500 feet above the sea. Formation, Devonian slate and limestone; country fairly grassed and moderately timbered. Just awarded a Gold Medal at the Calcutta Exhibition.

In box No. 6, is a sample of the well-known Collaroy Wool, not quite so fine in fibre as the Havilah, but the sheep grow heavy fleeces and give excellent results in money value per head. Collaroy is on eastern water on the south of the Liverpool Range, 1200 feet above the sea. Formation, chiefly basaltic, carboniferous rocks, with some rich pasture; lightly timbered.

In box No. 7, is Mr. F. R. White's wool, bred originally from the Havilah and Broombee flocks,—an excellent description of sound, soft wool, giving good results per sheep. Grown at Harben Vale, near Murrurundi, on eastern waters, about 1300 feet above the sea. Formation, basaltic and carboniferous rocks. Hilly country, good pasture, moderately timbered.

In box No. 8, is a very nice sample of true Merino Wool, grown by Mr. F. B. Suttor, at Bathurst, from Tasmanian stock. All the good qualities have been perpetuated most faithfully. Height, 2000 feet above the sea. Formation, granite and basalt. Grown in open paddocks and sheltered at night. Just awarded a Gold Medal at Calcutta.

We will now examine two samples from Riverina. The first grown by Messrs. H. and C. Douglass, of North Yanco, No. 9, on the edge of the timbered country, near Narrandera, on the Murrumbidgee. A very nice soft and silky exhibit. Grown about 600 feet above the sea. Formation, post-tertiary and alluvial deposits, just on the verge of the salt-bush plains. Awarded a Bronze Medal at Calcutta.

The other, No. 10, is wool grown by Mr. Falkiner, of Boonooke, near Deniliquin. These contrast strongly with the first samples of German, Silesian, and earlier Mudgee Wools. The length of the ram's wool is 5 to 6 inches. This is a good sample of what can be done by judicious culture and selection. Boonooke is only 300 feet above the sea. Formation, post-tertiary and alluvial deposits. Good salt-bush country, lightly timbered.

It was supposed that the Darling River country would not grow high class wool, but if you examine the almost perfect specimens of ewes' combing wool, grown by the Hon. T. Cumming, at his Arumpo Station, on the Lower Darling, you will be convinced that very excellent wool can be grown even there, under intelligent culture. It was for these ewes that Mr. Cumming recently purchased the Victorian ram, for which he gave 3150 guineas. You will find wool from this ram in the same box. It is $5\frac{1}{2}$ inches long, and shows in a remarkable degree what profitable results may be attained by skilful management. Arumpo is about 250 feet above the sea. Formation, post-tertiary deposits. Fairly grassed and lightly timbered.

I have brought a fleece of the modern Victorian combing wool to contrast with that from its German and Silesian ancestors. It was grown by Mr. Charles Ayrey, of Warranooke, who now possesses one of the finest flocks in Victoria. In the olden days this flock was bred freely from Silesian blood, but lately has only had the addition occasionally of a very choice Tasmanian or Victorian ram. Colour, length, strength, lustre, and softness are present in a high degree, and can scarcely be excelled. Mr. Ayrey's rams have sold up to 1000 guineas. Warranooke is about 500 feet above the sea. Formation, Silurian, basalt, and post-tertiary. Good pasture, moderately timbered.

You will find on the table two representative types of Tasmanian Wool—Messrs. Gibson and Sons' and Mr. Kermodes. Both are very pure specimens of Merino combing wool. There is also a fine sample of wool scoured by Mrs. Darchy, of Oxley, Lower Lachlan, which deservedly obtained a Gold Medal at Calcutta.

There are also samples from various parts of the colony, and a curiosity in the way of black and white transversely striped pure Merino Wool, from Mr. Edol's Burrawang Station, and by way of a shocking example, some wool from the coast districts of northern Queensland. The spear grass which you see has quite banished sheep from the coast districts of that colony.

I should add that our squatters, while they have been attending to the quality of the wool, have not neglected the carcase. The Merino sheep of most of our leading flocks is becoming a larger and a better developed animal, with a strong constitution and singularly free from disease.

I hope I have in some degree succeeded in showing how well our Australian colonies are adapted for the growth of the highest classes of the Merino sheep and wool. The whole of the country on our western watersheds is an *essentially pastoral one,* and eminently suitable for the progressive development and improvement of the Merino sheep, and we only require the fostering help of an intelligent Government to keep in the front rank of the wool-producing countries of the world.

NOTES AND EXHIBITS.

Mr. Norton exhibited a specimen of Tasmanite from the River Tamar in Tasmania, and explained that it was a species of shale formed in thin layers, and that numerous small flattened discs of some substance like amber, resembling spores of a lycopod, were scattered throughout the whole substance of the stone, in consequence of which it would burn with a bright flame without its substance being apparently reduced thereby. It was of no value as a fuel.

The President exhibited several fine specimens of the "*Paper Nautilus*," which had been brought from Lord Howe Island by Mr. H. T. Wilkinson, J.P. It is said that they are of rare occurrence there.

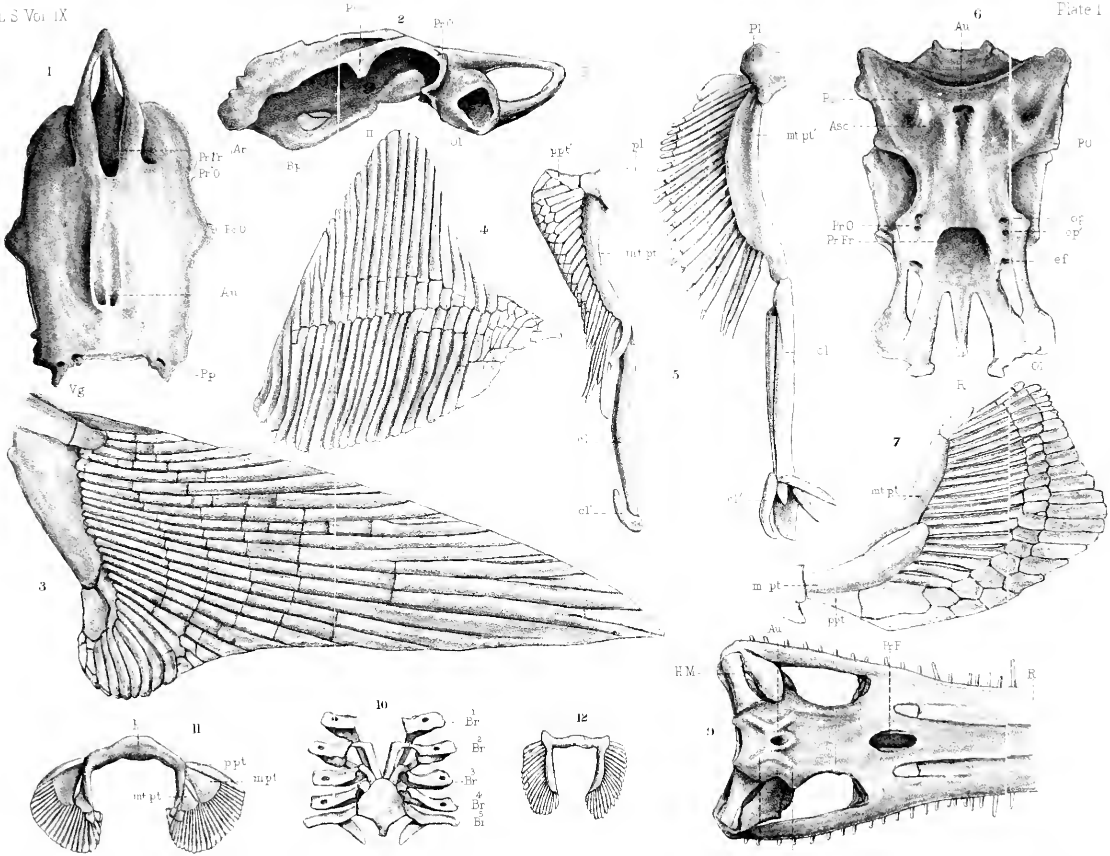
Mr. Whitelegge exhibited a number of transparent sections of fossil wood from the Oldham Coalfield, Lancashire, also some longitudinal sections of fossil wood from the Darling Downs, and transverse and longitudinal sections of *Lepidodendron*, *Stigmaria*, and *Calamites*.

Mr. Deane exhibited a phial of water from a spring in Mrs. Darvall's land, near Ryde, with specimens of the minerals deposited by it (alum and sulphate of iron), and fragments of wood infiltrated and quasi-petrified by these substances.

Mr. Whittell exhibited a specimen in flower of *Swainsonia Greyana* and read the following note :—This handsome flowering plant is indigenous to the interior of this colony; and from the delicacy of its colour and general design one would scarcely expect it to come from the most arid portion of our land. The plant from which these flowers, &c., were taken was grown by myself at Petersham from seeds which I brought from the banks of the Darling River in the neighbourhood of the town of Wilcannia. In this its natural habitat, I have never observed the plant exceed about five feet in height. It dies away annually, rather early in summer, and not even a vestige of it is seen again till early Spring. The effect of change of climate on this plant is certainly startling, as it appears to disregard entirely its natural habit and dimensions. The plant from which the exhibits were taken now measures over nine feet in height, the piece before you measures about nine feet only; it has been vigorous in its growth without any sign of natural decay for one year and six months, and as you will observe is still in a healthy state. The old shoots are still flowering and have been flowering without cessation for at least one year. Another peculiarity is that on exceeding their natural height some of the stems have a tendency to twine around any support that presents itself in a manner peculiar to climbing or running plants proper. I may add that this plant is popularly supposed to produce a sort of insanity, ending in some cases in death in stock that feed upon it. I am of opinion that this is incorrect; I have never seen any stock actually feeding upon it, but I have seen horses eat freely, without any ill effect, of another species of the same genus (?) which grows plentifully on the black soil flats which are at times inundated by the waters of the Darling. The Hon. William Macleay, who has had large experience in a district where this plant grows, informed me a few days ago that he also was of opinion that it is not poisonous to stock. The quantity of seed yielded by the plant in the neighbourhood of Sydney appears to me to be much smaller than in its native clime. Mr. Whittell also exhibited specimens of *Lagria rufescens*, and stated he was informed by a resident that there are thousands of these Beetles to be seen in the Ryde district this year. They are to be seen in swarms on the fruit trees, and are very destructive to the fruit, materially damaging its market value by eating shallow canals all over the surface, but seeming to prefer those parts where slight decomposition has set in.

The President announced that the Council of the Society had been presented by a member of the Society with £100, accompanied with a request that it should be offered as a prize for an essay on "The Life History of the Bacillus of Typhoid Fever." The Council has assented to the proposal, and advertisements to that effect will be immediately inserted in the most prominent scientific publications throughout the world. The essays will be received by the Society not later than 31st December, 1884. The intention and wishes of the donor of the prize will be best given in his own words. "The questions chiefly to be solved in the investigation of the Life History of the *Bacillus* of typhoid fever, are—1. What are the specific characters of the organism, as distinguished from other *Bacteria?* 2. What are the changes, if any, which the organism undergoes in the human body? 3. What are its modes of development and reproduction in the human body? 4. What changes or metamorphoses, if any, does the organism undergo after ejection from the human body, or in any other condition of its existence? 5. What fluids or other substances seem best adapted for the growth and multiplication of the organism? 6. Can the organism live or be cultivated in pure or distilled water? 7. What are its limits of endurance of heat, cold, dryness, or humidity? As far as these points are concerned, the author should confine himself entirely to facts which come under his own observation, and those should be given in detail, with a full explanation of the method of investigation. But in dealing with the results obtained by these investigations, and the consideration of the means whereby a knowledge of the life history of this most dangerous organism may help towards its eradication, the theories and observations of others may appropriately be referred to, but in every such case the authority must be correctly cited. The chief points to be ascertained in this branch of the subject are—1. How, and under what conditions, does the organism get access to the human body? 2. How can its growth be impeded, or its vitality destroyed in the human body without serious injury to the individual affected? 3. How can it be eradicated or rendered innocuous in wells, water-holes, drains, &c."

The President remarked that the present seemed to be a very opportune time to bring this matter forward, as the subject was now engaging the serious attention of medical men, owing to the prevalence of typhoid fever. He had been given to understand that Australia offered exceptional opportunities for the investigation of the *Bacteria*, as the climate was favourable for their growth during the greater part of the year. He expected, however, that essays would be received also from other parts of the world, especially from Europe; and he felt sure that the information which would be obtained would be of great value in regard to the treatment of typhoid fever and other diseases caused by the different forms of *Bacteria*. It is owing to the unostentatious liberality of the donor of the prize that this Society is afforded the happy prospect of doing such great good; for it is in deference to the wishes of the member who has made this munificent gift that his name should not be published in connection with it, but that the prize should be offered by the Society.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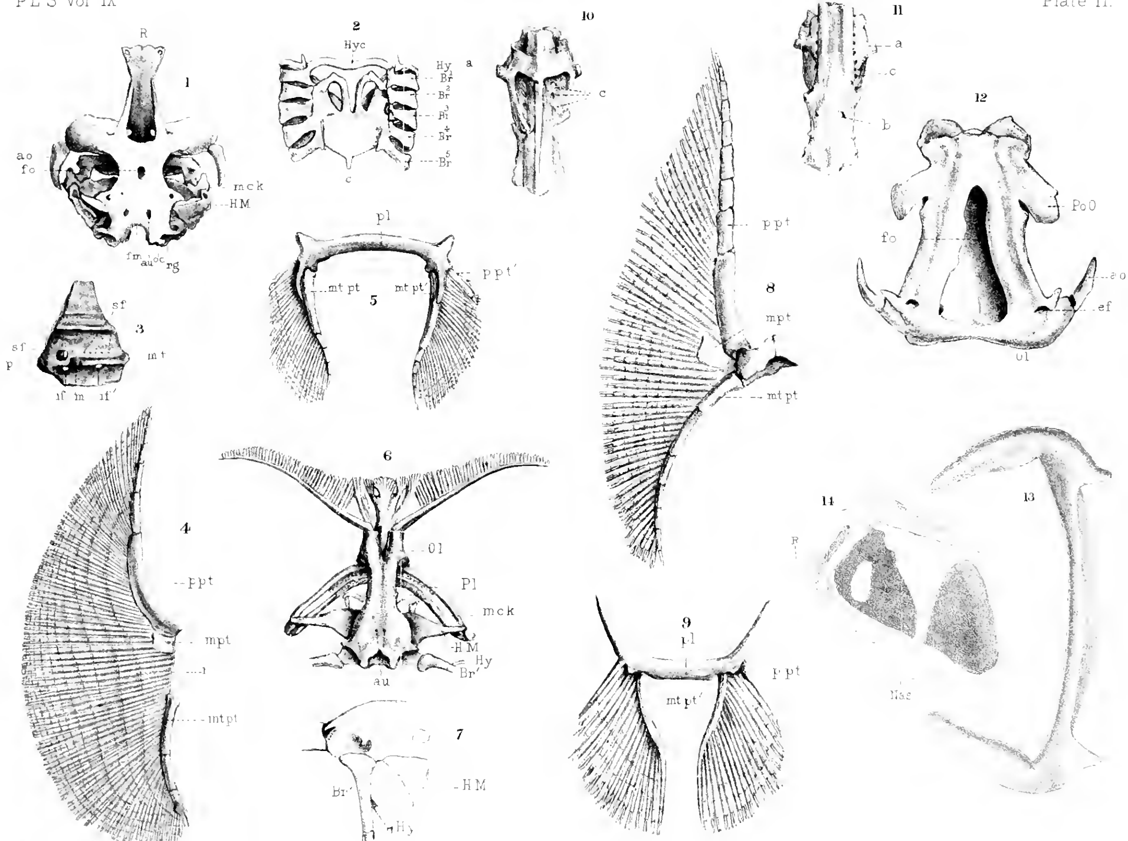
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WEDNESDAY, 25TH MARCH, 1884.

The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., in the chair.

MEMBER ELECTED.

James F. Fitzhardinge, Esq.

DONATIONS.

A pamphlet, "Notes on Wool." By P. N. Trebeck, Esq. From the author.

"Catalogue of the Australian Museum Library," 1883. From the Trustees.

"On *Ogyris Genoveva*, Hewitson, and its life history." By W. H. Miskin, Esq., Brisbane. From the author.

"Feuille des Jeunes Naturalistes." No. 160. Février, 1884. From the Editor.

"Mémoires et Publications de la Société des Sciences des Arts et des Lettres du Hainaut." IV. Serie. Tome 16, for 1880. From the Society.

"Sands' Sydney Directory for 1884." From Dr. Thomas Dixson.

"Science." Vol. III., Nos. 50, 52 and 53. January 18th to February 8th, 1884. From the Editor.

"Proceedings of the Academy of Natural Science, Philadelphia." Part II., for 1883. From the Society.

"Bulletin of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass." Vol XI., Nos. 5, 6, 7 and 8. From the Curator.

"Saturated Steam, the motive power in Volcanoes and Earthquakes." By R. A. Peacock, C.E., &c. 1882. From the author.

"Voyage to New Guinea and the Moluccas, during the years 1774 to 1776." By Captain Thomas Forrest. One Vol., 4to, illustrated. 1780. From Captain Hector, through Henry Austin, Esq.

"Transactions of the Philosophical Society of New South Wales." One Vol., 1862 to 1865. "Transactions of the Royal Society of New South Wales." For the years 1868, 1872, 1873, 1876, 1877, 1878, 1879, 1880, 1881 and 1882. "Sedimentary formations of New South Wales," by the Rev. W. B. Clarke. 1878. "New South Wales in 1881," by Thomas Richards. 1882. Presented with several additional miscellaneous publications by the Royal Society of New South Wales.

"Minerals of New South Wales," Second edition, by Prof. Archd. Liversidge, F.R.S. Official "Report on Museums of Technology, Science, and Art." 1883. Four Pamphlets on Mineralogy. By Prof. Liversidge. From the author.

"Anthropologische Ergebnisse einer Reise in der Südsee und dem malayischen Archipel in den Jahren 1879—1882." By Dr. Otto Finsch, 1884. From the author.

"Mittheilungen aus der Zoologischen Station, zu Neapel." Band IV, Heft. 4, 1883. From the Director.

'Transactions of the Cambridge Philosophical Society," Vol. XIII., Parts 1, 2, and 3, 1881-83. Also "Proceedings," Vol. VI., Nos. 1 to 6, 1881-83. From the Society.

Plants which have become Naturalized in N. S. Wales.

By W. Woolls, Ph.D., F.L.S.

As, on several occasions, I have given partial lists of the plants which have become naturalized in N. S. Wales, I propose now to enumerate all such species as have been observed, and to arrange them systematically according to the plan pursued by Baron Mueller in his Census of the Australian Plants. There is a great difficulty in determining, in some instances, whether certain species are indigenous or introduced; and as years roll on and native plants disappear in the progress of cultivation, the difficulty will be increased. In the preface to the Census, the Baron observes:— "The lines of demarcation between truly indigenous and more recently immigrated plants can no longer in all cases be drawn with precision; but whereas *Alchemilla vulgaris* and *Veronica serpillifolia* were found along with several European-Carices in untrodden parts of the Australian Alps during the authors earliest explorations, *A. arvensis* and *V. peregrina* were at first only noticed near settlements. The occurrence of *Arabis glabra, Geum urbanum, Agrimonia Eupatoria, Eupatorium cannabinum, Carpesium cernuum* and some others may therefore readily be disputed as indigenous, and some questions concerning the nativity of various of our plants will probably remain for ever involved in doubts." Whilst it must be admitted, then, that there is some degree of uncertainty in dealing with species supposed to be of exotic origin, especially such plants as those to which the Baron refers, there are many which are known to have been introduced at particular times, and under particular circumstances, some having been introduced for industrial purposes, and others having sprung up amidst crops raised from foreign seed; whilst the great majority of those to which the name of weeds is given, have been conveyed to us over the ocean by birds, by currents of air, or by the wool, manes, tails, &c., of imported quadrupeds. As the great majority of these plants, now common to Australia and other regions, were not known to the first colonists, and do not appear in the lists of plants published by the early Botanists, it is only reasonable to suppose that such species were not found in N. S. Wales at the beginning of the Century. Brown's *Prodomus*, which gives an account of the Plants collected by him between the years 1802 and 1805, is a most useful guide, so far as it goes, in determining what species are really indigenous; but even in that most valuable work we are somewhat staggered in finding *Solanum nigrum*, *Verbena officinalis*, *Prunella vulgaris*, and *Cynodon dactylon* recorded amongst Australian plants. Judging *a priori*, it might be thought that the first three of these came from Europe and the last from India, but such does not appear to have been the case. Some years ago, when *Cyperus rotundus* (then called *C. hydra*) made its appearance in the Government Gardens in Parramatta, Caley the Botanist regarded it as a foreign importation, and so it was looked upon until the publication of the Seventh Vol. of our Flora, when Mr Bentham proved from specimens forwarded to him from Australia, that it was a plant of very wide distribution, and identical with Brown's *C. littoralis*. Some years after Caley had left the colony, he wrote to Mr. G. Suttor, F.L.S., from the Island of St. Vincent, where he held the office of Director of the Botanical Garden, referring to the *Cyperus* which he had noticed in Parramatta and identifying it with the weed which was doing so much mischief to gardens and plantations in the West Indies. Now, this circumstance shows us how difficult it is to determine, in some instances, whether certain plants are indigenous or not. The same remark is applicable to *Cynodon dactylon*, the "couch grass" of the colonists, for, whilst Brown collected it at Port Jackson in the beginning of the present century, it is known to be identical with the Doorba (sometimes written Doorwa) or Hurryalee grass of India and to spring up generally in ground that has been cultivated. On the flats near some of our rivers, there is a grass called "Water Couch"

(*Paspalum distichum*), which the old hands say was unknown in the early days of the colony, and yet this grass is the same as Brown's *P. littorale*, which may still be found growing on the shores of Port Jackson, as well as in the Tropical Regions of the New and Old World. *Sorghum Halapense* (*Andropogon Halapensis*) is another grass which presents some difficulty, for whilst Baron Mueller places it amongst the indigenous species of Western Australia, N. S. Wales and Queensland, the settlers on the banks of the Hawkesbury look upon it as a recent importation, and seed of it has been circulated under the name of *Panicum spectabile!* There is good reason, therefore, for saying that "the lines of demarcation between truly indigenous and more recently immigrated plants can no longer in all cases be drawn with precision." It seems almost impossible to decide, indeed, in the case of certain Caryophyllaceous and Cruciferous plants; for, whilst they are now widely disseminated throughout the colonies, there is no record of them as indigenous in the early days of the colony. Sir J. D. Hooker, writing in 1859, places *Polycarpon tetraphyllum* and *Sagina apetala* amongst introduced plants, but Baron Mueller, in his recent Census (1883), regards them as common to several parts of Australia. Again Hooker has *Portulaca oleracea* in his list of importations, but the Baron, having ascertained that the plant occurs in five Australian colonies, as well as in the arid regions of the north, is forced to the conviction that it is really indigenous.

It is worthy of remark, that whilst many English plants have become naturalized in Australia, no Australian plant has become naturalized in England. Hooker observes :—"For my own part, I am disposed to consider that the three elements of (1) abundant exportation of seed from Europe into Australia for agricultural and horticultural purposes, and scanty export of Australian seed produce to England; (2) better adaptation of Australia than England to support numerous forms of vegetable life; and (3), abundance of unoccupied ground in Australia as compared with England, are, combined, all but sufficient to account for the predominance of so many European naturalized plants in Australia, and for the converse state of things in England." The climate and soil differ so much from each other in England and Australia, that one would scarcely expect many species to be common to both, or that the plants of the one should spring up accidentally amongst those of the other; and yet it appears, that, whilst Australian plants are cultivated with difficulty in England, English plants find their way hither and flourish; thus showing, that, owing to the absence of long frosty winters and to the rare occurrence of cold drizzling rains, Australia is better adapted to support numerous forms of vegetable life than England.

In reviewing the list of naturalized plants, it will be found that not more than one-sixth of the whole are monocotyledonous, whilst of the dicotyledonous plants no less than 35 belong to the order of the Compositæ. With regard to the scantiness of the former, it may be observed, that as we descend in the vegetable kingdom, the species are more Cosmopolitan in their character, or have a wider distribution than plants of a higher organisation. Hence grasses, rushes, and sedges, have many species in common in sub-tropical and temperate countries. Balfour says that "Humboldt and Bonfland, in their travels in equinoctial America, did not see an exogenous plant which was found equally in the New and the Old World; the only plants which they discovered common to both being some grasses and sedges." As we proceed from the tropics, the greater number of cosmopolitan species are likewise endogens, whilst the introduced species of exogens vary in proportion to the extent of cultivation, the character of the soil, and the nature of their seeds. The Composite order of plants being the most extensive of all orders, and the species being found, though in different proportions, in all parts of the world, it might naturally be expected that many of them would find their way to this colony amidst the various seeds imported for the purposes of cultivation. Such has been the case in some instances, but the most troublesome weeds of the order appear to have been introduced accidentally. The seeds of many Composites are well adapted for a wide distribution, for whilst the pappus of some species serves as an apparatus for conveying them through the air, the hooked or rough fruits of others cause them to be taken from place to place by animals. Amongst the Composites, which of late years have become a pest to graziers, the two species of *Hypochæris* are the most remarkable. These plants establish themselves in the bush, as well as in cultivated ground, and render the pasture unpalatable for stock, though I have been informed, that in Victoria they are eaten by sheep. Now the pappus of these species is well adapted for scattering the seeds in all directions, as it is feathery and becomes the sport of every wind. The same remark is applicable to plants of the thistle kind, and this accounts for the great increase of such plants in all parts of the colony where they are permitted to go to seed. *Xanthium spinosum* affords an instance of distribution in another way. This plant (the Bathurst Burr of the colonists) has not any pappus, but the fruit or burrs are covered with hooked prickles which adhere to the manes and tails of horses, and the wool of sheep, and thus the seeds are conveyed from country to country. It is said that it was brought in the first instance to this colony in the manes of some South American horses, but it may also have found its way from the Cape of Good Hope in the wool of some imported sheep, for Dr. Shaw (Journal Lin. Soc., Vol. 14, 1874) traces its introduction into South Africa, and its enormously rapid distribution there, to that source. These instances, amongst many which might be given, are sufficient to account for the number of introduced Composites and their increase in the colony.

The consideration of this subject, in connection with the progress of cultivation, is interesting as showing the changes which are coming over the vegetation of N. S. Wales. It would appear from the Vegetable Fossils found in our auriferous drifts that the Flora of this colony and Victoria was very different in ages past from what it is now, and that, in the pliocene period, forests of trees which now exist only in fossilised fruits and wood, extended to what forms at the present period the valley of the Upper Macquarie. What relation the Flora of the past bears to the Flora of the present, remains yet to be investigated ; but it seems to be pretty well established that the genus "*Spondylostrobus* differs from all other cupressineous genera, living as well as bygone." (F. *von Mueller* in Geological Survey of Victoria). The late eminent Geologist, the Rev. W. B. Clarke, alludes to the Flora of the past in his work on "The Sedimentary Formations of N S. Wales," p. 89, and Mr. Wilkinson the indefatigable Government Geologist and President of the Linnean Society of N. S. Wales, follows up the subject in his late Annual Address, informing us, that the fossil leaves of the Miocene or Eocene period belong to 27 species and 21 genera, of which only six of the genera are contained in the living Flora of Australia. Reasoning from these facts, Mr. R. Etheridge, Junr., of the British Museum, concludes, "That the Tertiary Flora of Australia is far more nearly allied to the Tertiary Floras of other Continents than to the living Flora of Australia." Great changes, then, have taken place in the Flora of N. S. Wales in long ages past, and it is equally certain that great changes (though probably from very different causes) are taking place now. On this side of the Dividing Range, the destruction of Eucalypts, the cultivation of the ground with foreign plants, and the naturalisation of 170 species from different parts of the world, have made great inroads on the indigenous Flora, and it is not too visionary to predict, that, in the course of another Century, many of the native plants will exist only in enclosed or remote places; whilst a mixed Flora, adapted to the altered circumstances of the colony, will usurp the place of the past vegetation. Where Sydney and Parramatta now stand, R. Brown collected many of his specimens, and as it was customary in the early days of the colony, to clear and burn off without reference to the value of the timber, the Eucalypts of which he speaks as so difficult to classify, have long since passed away from the immediate neighbourhood of these towns. In more recent times, the indiscriminate ring-barking of such trees has extended through the length and breadth of the colony, and, whilst the folly of this policy cannot be too strongly condemned as having some effect on the rainfall and health of the country, it is certain that it is making a great revolution in the Flora. The Rev. J. E. Tenison-Woods, in his very interesting account of Java, tells us that the natives never destroy a teak-tree without planting another in its place, and he expresses a wish that the colonists in Australia would be as careful in respect to one of our ironbarks (*E. crebra*), which he regards as of equal value. It is rather strange that not long since, I remonstrated with a gentleman for allowing his overseer to ring-bark some of these very trees, for although *E. crebra* is not the most valuable of the iron-barks, yet it is one of our most durable timbers. But the changes to which I have alluded are not confined to this side of the Dividing Range. Many of the weeds enumerated in the subjoined list are now found at every sheep and cattle station in the interior, whilst it is to be feared that some of the best salt-bushes, as well as the graceful myall, are doomed to extermination. When sheep feed continually in the same paddocks, they eat down the salt-bushes and prevent the growth of young plants, so that some stations, which formerly had abundance of these plants, are now completely denuded of them. The Myall also suffers from the cattle, for as the old trees die off, the young ones are eaten or trodden down. In many parts, useful grasses and another plants are springing up in the place of those which are disappearing, but I mention the fact, merely in illustration of the changes which are taking place in our Flora. There was a time, when some of the orders now so largely represented on this continent did not exist here, and when the Flora of Australia was assimilated to that of Europe. And a day will come most assuredly, when in the necessary process of cultivation and the introduction of foreign species, many plants of what are now deemed Australian types will make way for a new order of things.

LIST OF PLANTS NATURALIZED IN N. S. W.

DICOTYLEDONEÆ.

RANUNCULACEÆ.

RANUNCULUS.

1. *R. muricatus.* (L.)

PAPAVERACÆ.

ARGEMONE.

2. *A. Mexicana.* (L.)

FUMARIA.

3. *F. officinalis.* (L.)

CRUCIFERÆ.

LEPIDIUM.

4. *L. sativum.* (L.)
5. *L. ruderale.* (L.)

RAPHANUS.

6. *R. raphanistrum.* (L.)

SINAPIS.

7. *S arvensis.* (L.)

BRASSICA.

8. *B. campestris.* (L.)

SISYMBRIUM.

9. *S. officinale.* (Scop.)

SENEBIERA.

10. *S. didyma.* (Pers.)

CAPSELLA.

11. *C. bursa-pastoris.* (Mœnch.)

CAMELINA.

12. *C. dentata.* (Pers.)

LINEÆ.

LINUM.

13. *L. Gallicum.* (L.)

GERANIACEÆ.

PELARGONIUM.

14. *P. graveolens.* (Ait.)

ERODIUM.

15. *E. moschatum.* (Willd.)

OXALIS.

16. *O. cernua.* (Thunb.)

MALVACEÆ.

MALVA.

17. *M. rotundifolia.* (L.)
18. *M. parviflora.* (L.)
19. *M. sylvestris.* (L.)

CRISTARIA.

20. *C. coccinea.* (Pursh.)

SIDA.

21. *S. rhombifolia.* (L.)

EUPHORBIACEÆ.

EUPHORBIA.

22. *E. peplus.* (Willd.)
23. *E. helioscopia.* (Willd.)

RICINUS.

24. *R. communis.* (Willd.)

URTICACEÆ.

URTICA.

25. *U. dioica.* (L.)
26. *U. urens.* (L.)

CANNABINACEÆ.

CANNABIS.

27. *C. sativa.* (Willd.

CARYOPHYLLEÆ.

GYPSOPHILA.

28. *G. tubulosa.* (Boiss.)

SILENE.

29. *S. Gallica.* (L.)

CERASTIUM.

30. *C. vulgatum.* (L.)

STELLARIA.

31. *S. media.* (L.)

SPERGULA.

32. *S. arvensis.* (L.)

DIANTHUS.

33. *D. prolifer.* (L.)

POLYCARPON.

34. *P. tetraphyllum.* (L.) (?)

PORTULACA.

35. *P. oleracea.* (L.) (?)

AMARANTACEÆ.

AMARANTUS.

36. *A. paniculatus.* (L.)
37. *A. blitum.* (L.)
38. *A. viridis.* (L.)

RUMEX.

39. *R. crispus.* (L.)
40. *R. conglomeratus.* (L.)
41. *R. acetosella.* (L.)

SALSOLACEÆ.

CHENOPODIUM,

42. *C. murale.* (L.)
43. *C. ambrosioides.* (L.)

ATRIPLEX.

44. *A. patula.* (L.)

FICOIDEÆ.

OPUNTIA.

45. *O. Tuna.* (Mill)
46. *O. ficus indica.* (Haw.)
47. *O. vulgaris.* (Mill.)

POLYGONACEÆ.

POLYGONUM.

48. *P. aviculare.* (L.)
49. *P. orientale.* (L.)

PHYTOLACCEÆ.

PHYTOLACCA.

50. *P. octandra.* (L.)

LEGUMINOSÆ.

ARGYROLOBIUM.

51. *A. Andrewsianum.* (Steud.)

MEDICAGO.

52. *M. sativa.* (L.)
53. *M. lupulina.* (L.)
54. *M. maculata.* (L.)
55. *M. denticulata.* (L.)

TRIFOLIUM.

56. *T. pratense.* (L.)
57. *T. repens.* (L.)

VICIA.

58. *V. sativa.* (L.)
59. *V. hirsuta.* (L.)

LOTUS.

60. *L. tetragonobolus.* (L.)

ULEX.

61. *U. Europæus.* (Willd.)

CAJANUS.

62. *C. bicolor.* (D.C.)

MELILOTUS.

63. *M. parviflora.* (Desf.)

ROBINIA.

64. *R. pseudacacia.* (Willd.)

ROSACEÆ.

ROSA.

65. *R. rubiginosa.* (L.)

ONAGREÆ.

ŒNOTHERA.

66. *O. biennis.* (L.)
67. *O. tetraptera.* (Willd.)

EPILOBIUM.

68. *E. roseum.* (Sm.)

UMBELLIFERÆ.

AMMI.

69. *A majus.* (L.)

SIUM.

70. *S. latifolium.* (L.)
71. *S. angustifolium.* (L.)

PASTINACIA.

72. *P. sativa.* (L.)

ANETHUM.

73. *A. fœniculum.* (Willd.)

BUPLEURUM.

74. *B. rotundifolium.* (Willd.)

DIPSACACEÆ.

SCABIOSA.

75. *S. atropurpurea.* (Willd.)

PASSIFLOREÆ.

PASSIFLORA.

76. *P. cærulea.* (Willd.)

COMPOSITÆ.

CENTAUREA.

77. *C. Melitensis.* (L.)
78. *C. calcitrapa.* (L.)

CARTHAMNUS.

79. *C. tinctorius.* (L.)

ONOPORDON.

80. *O. acanthium.* (L.)

CIRSIUM.

81. *C. lanceolatum.* (Scop.)

CARDUUS.

82. *C. Marianus.* (L.)

EUPATORIUM.

83. *E. cannabinum.* (L.)

ERIGERON.

84. *E. Canadensis.* (L.)
85. *E. linifolius.* (L.)

ASTER.

86. *A. dumosus.* (Willd.)

XANTHIUM.

87. *X. spinosum.* (L.)

TOLPIS.

88. *T. barbata.* (Willd.)

SIEGESBECKIA.

89. *S. orientalis.* (L.)

GALINSOGEA.

90. *G. parviflora.* (Cav.)

BIDENS.

91. *B. pilosa.* (L.)

TAGETES.

92. *T glandulifera.* (Schranck.)

ANTHEMIS.

93. *A. cotula.* (L.)

CHRYSANTHEMUM.

94. *C. segetum.* (L.)
95. *C. Parthenium.* (Pers.)

SOLIVA.

96. *S. anthemifolia.* (R. Br.)

GNAPHALIUM.

97. *G. luteo-album.* (L.)
98. *G. purpureum.* (Thunb.)

SENECIO.

99. *S. scandens.* (D.C.)
100. *vulgaris.* (L.)

CRYPTOSTEMMA.

101. *C. calendulaceum.* (R. Br.)

HYPOCHÆRIS.

102. *H. glabra.* (L.)
103. *H. radiata.* (L.)

PICRIS.

104. *P. hieraciodes.* (L.)

CREPIS.

105. *C. Japonica.* (Benth.)

WEDELIA.

106. *W. hispida.* (Kunth.)

SONCHUS.

107. *S. oleraceus.* (L.)

CICHORIUS.

108. *C. intybus.* (L.)

LEONTODON.

109. *L. hirtus.* (L.)

TRAGOPOGON.

110. *T. porrifolius.* (L.)

TARAXACUM.

111. *T. dens-leonis.* (Desf.)

RUBIACEÆ.

GALIUM.

112. *G. aparine.* (L.)

SHERARDIA.

113. *S. arvensis.* (Willd.)

CAMPANULACEÆ.

LOBELIA.

114. *L. erinus.* (L.)

PLANTAGINEÆ.

PLANTAGO

115. *P. lanceolata.* (Willd.)
116. *P. major.* (Willd.)

PRIMULACEÆ.

ANAGALLIS.

117. *A. arvensis.* (L.)

JASMINEÆ.

OLÆA.

118. *O. Europæa.* (Willd.)

ASCLEPIADACEÆ.

GOMPHOCARPUS.

119. *G. fruticosus.* (R. Br.)

APOCYNEÆ.

VINCA.

120. *V. rosea.* (L.)

CONVOLVULACEÆ.

IPOMÆA.

121. *I. purpurea.* (Rot.)

CUSCUTA.

122. *C. epithymum.* (Willd.)

SOLANACEÆ

SOLANUM.

123. *S. pseudocapsicum.* (L.)
124. *S. auriculatum.* (Ait.)
125. *S. Sodomæum.* (L.)

VERBASCUM.

126. *V. blattaria.* (L.)

CELSIA.

127. *C. Cretica.* (L.)

NICANDRA.

128. *N. physaloides.* (Gærtn.)

LYCIUM.

129. *L. Chinense.* (Mill.)

DATURA.

130. *D. Tatula.* (L.)

NICOTIANA.

131. *N. glauca.* (Grah.)

SCROPHULARINEÆ.

LINARIA.

132. *L. elatine.* (L.)

ASPERIFOLIÆ

ECHIUM.

133. *E. violaceum.* (L.)

LABIATÆ.

MARRUBIUM.

134. *M. vulgare.* (L.)

STACHYS.

135. *S. arvensis.* (L.)

LEONITES.

136. *L. leonurus.* (R.Br.)

SALVIA.

137. *S. verbenacea.* (L.)

MOLUCELLA.

138. *M. lævis.* (L.)

VERBENACEÆ.

LANTANA.

139. *L. camara.* (L.)

VERBENA.

140. *V. Bonariensis.* (L.)
141. *V. venosa.* (G.& H.)

MONOCOTYLEDONEÆ.

IRIDEÆ.

SISYRINCHIUM.

142. *S. Bermudianum.* (L.)

143. *S. micranthum.* (Cav.)

TRICHONEMA.

144. *T. bulbicodium.* (H.K.)

SPARAXIS.

145. *S. tricolor.* (H.K.)

GLADIOLUS.

146. *G. cuspidatus.* (H.K.)

LILIACEÆ.

ZEPHYRANTHES.

147. *Z. Atamasco.* (Herb.)

ALLIUM.

148. *A. fragrans.* (Vent.)

COMMELINEÆ.

COMMELINA.

149. *C. Africana.* (Willd.

GRAMINACEÆ.

STENOTAPHRUM.

150. *S. americanum.* (Schrank.)

APLUDA.

151. *A. mutica.* (L.)

Phalaris.

152. *P. canariensis.* (L.)

Anthoxanthium.

153. *A. odoratum.* (L.)

Holcus.

154. *H. lanatus.* (L.)

Avena.

155. *A. fatua.* (L.)

Dactylis.

156. *D. glomerata.* (L.)

Poa.

157. *P. annua.* (L.)
158. *P. glauca.* (Sm.)
159. *P. pratensis.* (L.)

Briza.

160. *B. maxima.* (L.)
161. *B. minor.* (L.)

Bromus.

162. *B. sterilis.* (L).
163. *B. mollis.* (L.)

Ceratochloa.

164. *C. unilioides.* (L.)

Lolium.

165. *L. temulentum.* (L.)
166. *L. perenne.* (L.)

Hordeum.

167. *H. nodosum.* (L.)
168. *H. murinum.* (L.)

Note.—*Psoralea pinnata* and *Reseda luteola* are by some regarded as naturalized plants, and Sir J. D. Hooker, places the Peach-tree (*Amygdalus persica*) in the same category. The following species, which also appear in his list, I have omitted, as I have never found them growing in a wild state:—

Papaver album.
Papaver dubium.
Eschscholtzia californica.
Lathyrus odoratus.
Lathyrus latifolius.
Lupinus polyphyllus.
Delphinium consolidum.

THE AUSTRALIAN HYDROMEDUSÆ.

By R. von Lendenfeld, Ph.D.

Part I.—The Classification of the Hydromedusæ.

The Hydromedusæ are here taken in the sense, which Claus (1) attaches to his order Hydroidea. They are characterized by Claus (l.c.) in the following manner:—

"Kleine Polypen und ramificierte, festsitzende Polypenstöcke mit medusoiden Geschlechtsgemmen oder mit kleinen Medusen als zugehörige Geschlechtsgeneration, sowie kleine mit Randsaum versehene (craspedote) Medusen, ohne polypoide Ammengeneration."

It must be noted, that all Hydroid Zoophytes, "whether they" have Medusoide Geschlechtsgemmen "or" produce generative elements without the aid of medusoid buds, are placed in the order Hydroidea by Claus. The same course will be adopted in this paper.

Accordingly the Hydromedusæ comprise the Hydroid Zoophytes (Hincks), and the craspedote Medusen (Haeckel), together with the Hydrocorallinæ (Moseley.)

Although, perhaps only few groups of animals have been the subject of so many papers, as the Hydromedusæ, still our knowledge, particularly of the Australian representatives of this group, is very limited.

Most of the Hydromedusæ undergo a change of generation, which is very different in the different Families. The adult animal with sexual products is in many cases a Medusa, and of course it is this stage of the whole cycle of changing generations, which must be considered most in describing, naming and classifying our animals.

(1.) *C. Claus* Grundzüge der Zoologie vierte Auflage. Seite, 248.

The relation between the adult Medusa and the Hydroid Zoophyte, on which it grows is similar to the relation between an adult Proglottis of a Taenia and the non-sexual head of the tape-worm.

It is an accepted custom in every branch of Zoology to classify a series of changing generations, according to that stage in which mature ova and Spermatozoa are found, and it is as expedient to do this here as in any other group of animals.

However clear and self-evident this may appear, it has nevertheless not been done in the case of our Hydromedusæ.

Here the non-sexual stages, the colonies of nutritive Zooids, on which the sexual stages bud, are described and classified, whilst the adult Medusa is unknown or ignored. This practice has been followed by most of the authors on Hydroid Zoophytes, although both Haeckel and Claus have shown the fallacy of such a practice. And so the value of papers on this subject, which are written without the consideration of the adult Medusa, is very small. Besides this, in most cases, not even the nutritive Zooids but only their skeletons have been accurately described.

Of course this is much easier and more convenient, than to describe the soft Medusæ, which are difficult to obtain and preserve, and which have no skeleton at all—but it is not scientific.

What would an Entomologist say if the dried skins of the larvæ of Cecidomya were used to classify these flies, and they were accordingly placed under the annelid worms, instead of placing them according to the structure of the adult Insect in the group of the nemocerous flies. It would appear monstrous, but it is only the same thing that has been done in the case of many Hydroid Zoophites.

Besides describing the new forms I have found, the main object of this paper is, to give a list of all the known Australian species, with references.

Before entering on the subject it may be worth while to recall to the recollection of the reader a few of the most interesting points concerning the morphology and physiology of our animals.

The recent researches of Kleinenberg (1), F. E. Schulze (2), Hertwig (3), Weismann (4), Hamann (5), Jickeli (6), myself (7), and others on the structure of the Hydromedusæ, have thrown quite a new light on these animals. With the aid of these authors results and with the help of Haeckel's (8), Monagraph, I hope to be able to extend our knowledge on this subject a little.

The great scientific interest which attaches to the study of the Hydromedusæ and the nearly related Siphonophora, lies in the Polymorphism of the individuals which belong to one colony. All possible stages in the differentiation of the persons are met with, and it is a thing of particular interest to follow the development of this Polymorphism through its different stages.

This Polymorphism is attained in the following manner :—The Hydroids multiply by budding, and all persons or individuals, with the exception of the free Medusa-stages, which bud from the original Polype, remain in continuity, their stomachs are united by a tube. Now a division of labour takes place among the different persons and consequently they change their shape and structure by natural selection, differing finally very much from each other.

(1.) *N. Kleinenberg.* Hydra, 1872.

(2.) *F. E. Schulze.* Cordylophora lacustris, 1871. Syncoryne Sarsii, 1873.

(3.) *O. und R. Hertwig.* Das Nervensystem und die Sinnesorgane der Medusen, 1878. Der Organismus der Medusen, 1878.

(4.) *Weismann.* Die Entstehung der Geschlechtszellen bei den Hydroiden, 1883.

(5.) *O. Hamann.* Der Organismus der Hydroidpolypen Jenaische Zeitschrift. Band, XV. Seite. 545.

(6.) *C. Jickeli.* Der Bau der Hydroidpolypen. I., II., Morphologisches Jahrbuch. Band, VIII Seite, 373, 580.

(7.) *R. von Lendenfeld.* Ueber das Nervensystem der Hydroidpolypen. Zoologischer Anzeiger Nr. 131. Ueber eine eigenthümliche Art der Sprossenbildung bei den Campanulariden. Zoologischer Anzeiger Nr. 130. Ueber Wehrthiere und Nesselzellen Zeitschrift für wiss. Zool. Band, XXXVIII. Seite, 355. (Translated into English Annales and Magazine of Natural History. 5 Series. Nr. 71.) Eucopella Campanularia Zeitschrift für Wissenschaft. Zool. Band, XXXVIII. Seite, 497.

(8.) *E. Haeckel.* Das System der Medusen. Jena, 1879-1880. Die Medusen der Challenger Expedition. Jena, 1881 (Translated into English. Report of the Zoology of the voyage of the "Challenger.")

In the simplest case of Protohydra we have a Polype, which multiplies by fission and is propagated by generative elements, produced in the wall of the body. Hydra multiplies by budding and also produces ova and Spermatozoa in the wall of the gastral cavity.

Both these Hydroids always remain single and never form colonies: the budding persons are always completely isolated from the parent. The same thing happens in the case of Myriothela.

In the stock-forming Hydroida, most of the buds do not attain personal liberty but remain in connection with the primary Polype, their common parent, by tubes through which the nutritive chymus flows freely. In the simplest case all the Polypes belonging to one colony are alike: Clava is to be compared to a colony of Hydra's. Whilst in Clava and Tabiclava the generative elements are produced by all the Zooids, in other Hydroids the production of generative elements devolves on certain Zoids only, which change their shapes and became Blastostyles; whilst the other Zooids remain pretty much unchanged in appearance, losing only the reproductive faculty. Division of labour causes some persons belonging to the stock—a simple political unity—to become alimentary, and others to attain reproductive functions.

To this group belong the Cordylophorinæ, Bimerinæ, Campanlarinæ, Sertularinæ, and perhaps also the fossil Graptolithes. Also, the Plumularidæ are placed in it.

The Plumularidæ are characterized by the tranformation of some of the Zooids into Machopolypes. These are persons whose main duty is to defend the stock against outer enemies, and to attack, slay, and bring home, food for the nutritive Zooids. They are the soldiers and fishers of the colony; often as many as 80% of the Zooids of a colony are thus transformed into soldiers, a state of affairs not even reached by the Continental powers. These Machopolyps, or rather the cups in which they live, were formally called Nematothecæ or Sarcothecæ.

According to Metschnikoff (1) some of these, which possess no thread-cells have also the function of devouring the trophosomes of the colony when they get sick. With great acuteness Metschnikoff (l.c.) follows up the similarity between this process and the action of amoeboid wandering cells or white blood corpuscles and festering cells, which perform the same duties in higher animals. By the action of these analogous organs similar work is performed.

These Machapolypes appear in three different forms which are sometimes met with in the same colony. They may possess thread-cells or adhesive cells, similar to those found in the Ctenophoræ, or both. I have described the Morphology and Physiology of these Machopolypes elsewhere. (2.)

An intermediate stage between the members of this latter group and the Clavidæ, is met with in Eudendrium, where there are Blastostyles and Polypes, but where both may contain ripe ova, and where the Polypes which mature the generative elements afterwards, in many cases lose their tentacles, and so become Blastostyles as it were under the eyes of the observer.

I propose to place all Hydroids mentioned above with the exception of those which produce free Medusæ, or which are descended from Hydromedusæ which once produced free Zooids, in the first Suborder the Hydropolypinæ. The great difficulty in executing this task and classifying the Hydromedusæ according to whether their Gonophores are medusoid or not, lies in the great similarity between Polypostyles, that is Gonophores derived from a generative Polype direct, and Medusoid Gonophores, that is rudimentary Medusæ.

I have attempted a classification, comprising all the Hydromedusæ in the Zoologischer Anzeiger, (3) but I fear, as I pointed

(1.) *E. Metschnikoff.* Ueber die intracelluläre Verdauung bei wirbellosen Thieren. Arbeiten aus dem Zool. Inst. der Universität Wien Band V. (Translated into English, Quarterly Journal of Mik. Science, Nr. 93.)

(2.) *R. von Lendenfeld.* Ueber Wehrthiere und Nesselzellen. Zeitschrift für wiss. Zool Band, XXXVIII Seite, 355 (Translated into English Annales and Magazine of Natural History, 5th Series. Nr. 71.)

(3.) *R. von Lendenfeld.* Das System der Hydromedusen. Zoologischer Anzeiger 1884.

out in that paper, that many of the statements contained in this first attempt of the kind, are erroneous. Since then a work (1) on the generative elements of the Hydromedusæ, has appeared which is equally excellent for the correctness of the observations contained therein as for the ingenious conclusions drawn therefrom. Although I did not receive this work until after this paper had been read before the Linnean Society of N. S. Wales, I shall still endeavour to make as much use of it as as possible.

The observations contained in this book are given in a table (l.c. p. 214, f.f.), and show, that many of the genera which I had placed in my former (l.c.) paper, among the Hydropolypinæ, show in the Gonophores no traces of a medusoid structure. There are a few however, in the Gonophores of which such traces have been discovered by Weismann ; genera which I had placed under the Hydropolypinæ. These are Sertularia and Plumularia.

Weismann (l.c.), states that two genera, namely Autennularia and Campanularia are peculiar, for the extraordinary difference between the male and female Gonophores. In both these genera the male Gonophores show no trace of the Medusoid structue, whilst such a structure—several layers of cells outside the genertive elements—is met with in the female.

Now of course it is quite out of the question to suppose, that the ancestors of these two genera possessed female Medusæ, whilst the male Gonophores were always sessil Polypostyles. We must therefore, conclude that both male and female Gonophores descended from free Medusæ or from sessile Polypostyles, Weismann considers it probable—any such conclusion of course can only be the more or less probable and never certain—that both descended from free Medusæ. Now the male, not Medusoid Gonaphores, of these, are quite similar to those of other Hydroids, and so Weismann concludes further, that also these (Aglaophenia Sertularella. Opercularella) have descended from free Mudusæ.

(1.) *A. Weismann.* Die Entstehung der Sexnolzellen bei den Hydromedusen. Jena, 1883.

In this manner he brings all but five of those genera which were investigated by him into the group with Medusoid Gonophores, my Hydromedusinæ. But even these five, with the exception of Hydra (l.c. pag. 245 ff.), he finally considers to be Hydromedusae with medusoid buds. These conclusions are mainly based on the observations made by Weismann on the wandering of the generative cells, one of the most important discoveries concerning our animals, which were ever made, statements which also I had occasion to confirm in my paper on Eucopella.

The medusæ certainly are more recent than the Hydroid colonies, and there can be no doubt, that the Hydroid colonies must have been propagated sexually before Medusæ were formed. It would appear very strange if no such ancestral forms should have come down to us as it is clear that *now* the free Medusæ are in many cases worse than useless and have therefore again become rudimentary. The cases of Gonophores which show traces of a Medusoid structure doubtlessly belong partly to the Hydromedusinæ as they have really descended from Hydromedusæ with free Zooids. On the other hand it is certainly possible that some of these are not rudimentary Medusæ but real Polypostyles. It is only a case of greater or smaller probability, and probability always is a subjective feeling. Weismann thinks it probable that these Gonophores are rudimentary Medusæ, and his opinion is of great weight if we consider the excellency of his work on the subject, and I dare say he is quite right.

I for my own part have not been convinced by his publication. and consider it as probable that Gonophores, which are not rudimentary Medusæ, do exist. Whether all the forms, which according to my idea, have other Gonophores, and therefore are placed among the Hydropolypinæ really belong there, is another question. In doubtful cases I decided according to the position of the Gonophore for the reasons given in my former paper (Zoologischer Anzeiger) on this subject.

The Hydroid colonies are often overgrown by tufts of Diatoms and other Protista, and a Medusa produced near the base of the colony would in consequence not be able to swim away whilst the small embryo escaping the Gonongium could easily penetrate the marine undergrowth, which, of course, in this case, is of advantage to the colony, hiding and sheltering the Gonophore.

I have, therefore, in doubtful cases, placed those Hydromedusinæ, which have Gonophores at the base of the colony under the Hydropolypinæ, those on the other hand, which bear exposed Gonophores under the Hydromedusinæ.

The first suborder of the Hydromedusæ, the Hydropolypinæ, comprises accordingly Hydra, the Clavidæ, Eudendridæ, Cordylophorinæ, Bimerinæ, Campanularinæ, Sertularinæ, the Plumularidæ, and Dicorynidæ. I have also placed the Graptolithidæ under this heading.

We meet with quite a different kind of Polymorphisne in another series of Hydromedusæ. Here Medusæ are formed, that is Hydroid persons, which lead a free life and are provided with an apparatus for free locomotion. This apparatus is in most cases a bell-shaped Umbrella, an extremely clumsy and unsuitable propelling organ. Only very few Medusæ are destitute of an Umbrella and crawl on their marginal tentacles like Clavatella (Eleutheria.)

These Medusæ, which had originally the function of distributing the species like the winged Imagines of Insects, with which they are to be compared, are small when born and often grow to a large size afterwards. In such cases the nourishment assimilated by the Medusa greatly exceeds that, which the Polyp colony needs. Such Hydromedusæ however (Zygodoctyla) are rare. In most cases they remain small, losing more and more the function of taking up nourishment which in such cases devolves on the Polyp colonies.

Finally Medusæ are produced which only live a short time (Globiceps), and which already bear ripe sexual products at the time of their liberation. The stomach of such Medusæ may even be obliterated (Eucopella) and an organism is produced, which like the Ephemera is in fact only an apparatus for carrying the sexual product to a greater distance like the Hectokotylus.

These rudimentary Medusæ, produced, of course, in the ordinary course of natural selection, show that it is in many cases advantageous for the species *not* to have free swimming stages. In consequence of this the Medusæ may even become more rudimentary, and finally remain attached to the Hydroid colony, where they mature the sexual products within them (Tabularia.) When they have once become so far rudimentary, their parts, particularly the locomotive organ, the Umbrella will be obliterated, unless it is utilised for some other purpose (Weismann, Dohrn), and we shall finally have a Medusoid Gonophor before us. According to Weismann *all* Gonophores are rudimentary Medusæ as stated above. I, however, do not wholly agree with Weismann on this point, although I gladly admit that this is quite possible.

I place all Hydroid colonies which produce Medusæ, and also those which possess Gonophores of a doubtless medusoid origin in this group, which I designate as the second Suborder of the Hydromedusæ, the Hydromedusinæ. I accordingly place the Anthomedusidæ (Anthomedusæ Haeckel), the Tubularidæ (comprising Coryne, Myriothela, Stylactis, Tubularia, Pennaria and related genera), the Leptomedusidæ (Leptomedusæ Haeckel), and those Campanularidæ which possess decidedly medusoid Gonophores as Gonothyrea and Halecium in this suborder.

In the first of these families, the Medusæ bud on *all* the Zoids and become free, in the second they also bud on all Polypes of the stock, but are more or less rudimentary. In the third and fourth family the Medusæ bud on differentiated Polypes, Blastostyls becoming free in the one and rudimentary in the other.

Some Hydroid colonies producing Medusæ, which belong to Haeckel's Margelidæ, are so different from the others that I place them in accordance with *Claus* in a separate family the Hydractinidæ, which evidently connects the calcareous Hydrocorollinæ with the chitinous Hydromedusinæ.

The Hydrocorallinæ themselves, which I reckon as the third suborder, also produce Medusæ, or at least some of them do, but the calcareous skeleton seems to me to be so important a characteristic, because it points to fundamental chemical differences in the Protoplasme, that I separate them in accordance with *Claus* from the other Hydromedusæ.

The process described above, by which the Medusæ became more and more rudimentary, was apparently advantageous only for one series of Hydromedusæ, whilst in another series we find the Hydroid colony becoming more and more rudimentary inasmuch as the nourishment is more and more assimilated by the Medusa stage and less by the Polypes.

This process which is indicated in Zygodactyla may go so far that the Polype stages are finally done away with altogether, and a Medusa is produced direct from the ovum without the intermediate stage of a Polype. In this manner the change of generation is done away with altogether and we have Medusæ before us, which, although probably descended from Hydroid ancestors, show no trace of such a descendance, and now only the comparative anatomy of these forms proves that they belong to our Hydromedusæ. Such Medusæ are very numerous. *Claus* combines all these forms in his suborder Trachomedusæ, which corresponds with our fourth suborder Trachomedusinæ.

The Trachomedusinæ comprise Haeckel's Trachomedusæ and Narkomedusæ, which correspond to our families Trachomedusidæ and Narkomedusidæ.

It appears to me that the total neglect of those Hydromedusæ, which do not produce free Medusæ, in Haeckel's System der Medusen is not true to nature. If Haeckel considers the Lucernaridæ as part of the Acraspædæ which they doubtlessly are, one would also expect that he would include the Hydroid Polypes in his Craspedotæ. And I think I shall follow out Haeckel's ideas better by placing them there than by separating them from those Hydromedusæ which produce free zoids.

The difference between Craspedotæ and Acraspedæ is so great that it seems advantageous to separate these two groups entirely. In this point I agree with *Claus*. The great similarity between the two is only analogy and not homology. At all events the Hydroid Zoophytes are much more nearly related to the Craspedote Medusæ than the latter to the Acraspedæ.

The Polypomedusæ form in my classification the second classis of the subtype Cnidaria (1), *(Claus)* of the Cœlenterata, and comprise all polypiform and Medusiform animals. I have selected this name for the Hydromedusæ of *Claus* (2), and given the reasons for doing so in my preliminary report (3). Since then I have received *Claus's* Lehrbuch of Zoology (4), and I find that *Claus* also has adopted in the latter publication this term, which I had found independently to be the most expressive.

The Polypomedusæ as a classis are devided into the three ordines Hydromedusæ (Hydroidea *Claus*, Hydromedusæ *Weismann*), Syphonophora and Scyphomedusal *(Ray Lankaster*, Acraspaedæ Gegenbaur, Haeckel.)

Our Ordo Hydromedusæ is, as mentioned above, to be divided into four suborders. The relative value of these classificatory terms is elucidated in the following table :—

TYPE COELENTERATA.

1. Subtype Spongiæ.
2. Subtype Cuidaria.

SUBTYPE CUIDARIA.

1. Classis Anthozoa.
2. Classis Polypomedusæ.
3. Classis Ctenophoræ.

CLASSIS POLYPOMEDUSÆ.

Aphacellæ	{ 1. Ordo Hydromedusæ.
	{ 2. Ordo Syphonophora.
Phacellotæ	3. Ordo Scyphomedusæ.

(1.) *Marshall* has objected in a recent publication (Die Ontogenie von Reniera filigrana, Zeitschrift für wiss. Zool. Band XXXVII.) to this term on the ground that it "den Begriff nicht deckt" (l.c. Seite 243 Anmerkung), I don't see what advantage would be gained in altering *Claus's* generally adopted term in this case.

(2.) *C. Claus*. Grundzüge der Zoologie, 4te Auflage, Seite 243.

(3.) *R. v. Lendenfeld*. Das System der Hydromedusen. Zoologischer Anzeiger, Band VI., 1884.

(4.) *C. Claus*. Lehrbuch der Zoologie 1883, Seite 306.

ORDO HYDROMEDUSÆ.

1. Subordo Hydropolypinæ.
2. „ Hydromedusinæ.
3. „ Hydrocorallinæ.
4. „ Trachomedusinæ.

If we now classify the Hydromedusæ according to the principles set forth above we shall arrive at the following classificatory system :—

Schemas are attached to the diagnoses. The italics represent stages which do not take up nourishment, the stages given in ordinary print represent such which do. The schema's also show the way in which the budding process alternates with the sexual propagation. As the change of generation is caused by this alternation on the one hand and influenced mainly by the phase in which nourishment is taken up, these schema's will elucidate the differences which are met with among the Hydromedusæ in this respect.

The most important genera are mentioned. Genera which are imperfectly known have been omitted.

ORDO, HYDROMEDUSÆ. Carus, 1863.

HYDROPHORAE. Huxley, 1856.
HYDROIDEA. Agassiz, 1862.
HYDROIDÆ. Claus, 1876.

THE POLYPCOLONIES.

HYDROID ZOOPHITES. Hinks, 1868. (Old term.)

THE MEDUSÆ.

CRASPEDOTÆ. Gegenbaur, 1856.
CYCLONEURÆ. Eimer, 1878.
APHACELLÆ. Haeckel, 1878.
CRASPEDOTÆ. Haeckel, 1879. (1.)

POLYPES WITHOUT GASTRAL FILAMENTS OFTEN IN COLONIES, SOMETIMES WITH GREATLY TRANSFORMED GENERATIVE OR DEFENSIVE PERSONS, AND CYCLONEUROUS MEDUSÆ, WITHOUT GASTRAL FILAMENTS.

I.—SUBORDO HYDROPOLYPINÆ. Von Lendenfeld, 1884.

HYDROMEDUSÆ GENERALLY FORMING COLONIES OF ALIMENTARY AND GENERATIVE PERSONS. THE TWOFUNCTIONS MAY DEVOLVE ON ALL PERSONS ALIKE, OR BE EXECUTED BY DIFFERENT ZOOIDS. RARELY SOLITARY. NOT PRODUCING MEDUSÆ. THE BLASTOSTYLS OF THE HYDROPOLYPINÆ ARE TRANSFORMED POLYPES AND NOT RUDIMENTARY MEDUSÆ.

(1.) Other synonyms in the works referred to.

I. FAMILY HYDRIDÆ. Huxley, 1856.

Multiplying by budding or fission, and by sexual cells produced in every Polype (1) Solitary.

SCHEMA.

Polype *Ovum*

Polype

Ovum.

Protohydra. Greff.
Hydra. Linne.
Etc.

2. FAMILY CLAVIDÆ. Von Lendenfeld, 1884. non Allman !

Forming colonies, all persons alike and all maturing (2) sexual cells on hollow tentacular processes.

SCHEMA :

Ovum

Polype

Hydrorhiza

First Polype

Ovum.

(1.) In this and in other similar cases it is very likely, and has indeed been observed, that although the Polypes which produce ova are similar to others which may not appear adult ; budding and sexual propagation are not carried on by the same individual at the same period. It appears likely, that here, as in the Infusoria, periods of sexually multiplying and budding generations alternate, and so a division of labour in time exists, which may lead to a division of labour in space, if the budding persons remain attached to one another.

(2.) "Maturing" in this and the following definitions, because the generative elements in many cases are *produced* elsewhere, and wander into the place, where they finally reach maturity at a comparatively late period.

1. SUB-FAMILY CLAVINÆ,

With scattered filiforme tentacles.

Clava. Gmelin.
Tubiclava. Allman.
Rhyzogeton. Agassiz.

2. SUB-FAMILY CORYNINÆ.

With scattered capitate tentacles.

Coryne. Gärtner.
Actinogonium. Allman.
Wrightia. Allman.
Stylactis. Allman.

3. FAMILY MYRIOTHELIDÆ. Allman, 1872.

Solitary with scattered capitate tentacles. Some of the tentacles are transformed and bear the sexual products.

SCHEMA.

Polype
|
Ovum
|
Polype.

Myriothela. Sars.

4. FAMILY EUDENDRIDÆ. Allman, 1872.

Forming colonies, all Polypes may mature sexual product whereby they are often changed into Polypostyles without mouth or tentacles.

SCHEMA.

Ovum *Ovum*
| |
Polype *Polypostyl*
\ /
Hydrorhiza
|
First Polype
|
Ovum.

Endendrium. Allman.

5. FAMILY BLASTOPOLYPIDÆ. Von Lendenfeld, 1884.

Forming colonies with differentiated Alimentary and Generative Zooids. The latter are Polypostyles and mature the sexual products. The Alimentary Zooids do not take part in the sexual reproduction.

SCHEMA.

Ovum

Polype *Polypostyl*

Hydrohiza

First Polype

Ovum.

I. SUB-FAMILY. CORDYLOPHORINÆ.

Alimentary Zooids of the Colony, with scattered filiform, tentacles not protected by a chitinous cup.

Cordylophora. Allman.

Merona. Norman.

II. SUB-FAMILY. BIMERINÆ.

Alimentary Zooids with one verticil of filiform tentacles, not protected by a chitinous cup.

Heterocordyle. Allman.

Pachycordyle. Weismann.

Garveia. St. Wright.

Bimeria. St. Wright.

Coinistes. St. Wright.

Etc.

III. SUB-FAMILY. CAMPANULARINÆ.

Alimentary Zooids, with one verticil of filiform tentacles in chitinous cups which are connected with the Hydrorhiza by more or less developed stalks, and never adnate to the stem.

Campanularia. Lamarck.

Opercularella. Hincks.

Calycella. Hincks.

Etc.

IV. SUB-FAMILY. SERTULARINÆ.

SERTULARIDÆ. Hincks.

Alimentary Zooids, invested by chitinous cups, which are more or less adnate to the stem, and never possess separate Hydrocauli.

Lineolaria. Hincks.
Sertularia. Linné.
Diphasia. Agassiz.
Sertularella. Gray.
Pasythea. Lamouroux.
Idia. Laumouroux.
Thuiaria Fleming.
Hydrallmania. Hincks.
Triplograptus. Richter.
Corynoides. Nicholson.
Dendrograptus. Hall.
Callograptus. Hall.
Dictyonema. Hall.
Ptilograptus. Hall.
Thomnograptus. Hall.
Buthograptus. Hall.
Inocaulis. Hall.

6. FAMILY. GRAPTHOLITHIDÆ.

Possessing a chitinous Endo- and Exo-skeleton. The former rod-shaped. Colonies free swimming, probably extinct. From the Cambrian to the lowei Devonian.

I. GROUP. GRAPTOLIDEA. Lapworth.

Hydrosom developed from a Sicula, every canal containing Coenosarc, bears only one row of cells. Axis (Virgula) on the dorsal side in a furrow of the inner lamina.

A. MONOPRIONIDÆ.

Hydrothecæ in one row opposite the axis.

1. SUB-FAMILY. MONOGROPTINÆ.

MONOGROPTIDÆ. Lapworth.

Developed one-sided; pointed ends of the Sicula pointing upwards, united with the dorsal margin of the proximal end of a single or composite Hydrosome.

Monograptus. Geinitz.
Rostrites. Barrande.
Cryptograptus. Caruthers.
Azygograptus. Nicholson.
Dimorphograptus. Lapworth.

2. SUB-FAMILY. LEPTOGRAPTINÆ.

LEPTOGRAPTIDÆ. Lapworth.

Hydrosom bilateral, with irregular branches. Cells apart, just touching. Sicula persistent in the axilar. The broad part forming the proximal end of the Hydrosome.

Leptograptus. Lapworth.
Amphigraptus. Lapworth.
Pleurograptus. Nicholson.
Nemograptus. Emmons.
Coenograptus. Hall.

3. SUB-FAMILY. DICHOGRAPTINÆ.

DICHOGRAPTIDÆ. Lapworth.

Bilateral. Branches of regular cells, very dense, rectangular Sicula persistent. Its point at the proximal end of the Hydrosome.

Didymograptus. McCoy.
Trichograptus. Nicholson.
Tetrograptus. Salter.
Goniograptus. McCoy.
Schizograptus. Nicholson.
Temnograptus. Nicholson.
Ctenograptus. Nicholson.
Dichograptus. Salter.
Lagonograptus. Hall.
Clonograptus. Hall.
Clematograptus. Hopkins.
Cladograpsus. McCoy

4. SUB-FAMILY. DICRANOGRAPTINÆ.

DICRANOGRAPTIDÆ. Lapworth.

Hydrosom consists of two originally dorsally united axes. Cells overlapping. Exterior part indented. Broad end of the Sicula on the proximal end of the Hydrosoma.

Dicellograptus. Hopkins.
Dicranograptus. Hall.

B. DIPRIONIDÆ.

Cells in two rows, axis central.

5. SUB-FAMILY. DIPLOGRAPTINÆ.

DIPLOGRAPTIDÆ. Lapworth.

Hydrosom consists of two branches dorsally joined. Sicula imbedded. The broad part forming the proximal end of the Hydrosom.

Climacograptus. Hall.
Diplograptus. McCoy.
Glyptograptus. Lapworth.
Petalograptus. Suess.
Cephalograptus. Hopkins.

6. SUB-FAMILY. PHYLLOGRAPTINÆ.

PHYLLOGRAPTIDÆ. Lapworth.

Hydrosom consists of four biserial axes, which coalesce with their dorsal sides. Sicula imbedded. The broader ends close to the proximal terminations of the Hydrosoms.

Phyllograptus. Hall.

II. GROUP. RETIOLOIDÆ. Lapworth.

No Sicula. The Coeaosark of the common canal developes a double row of cells. Epidermis supported by chitnious fibers.

7. SUB-FAMILY. GLASSOGRAPTINÆ.

GLASSOGRAPTIDÆ. Lapworth.

Both axes united in the middle of the body.

Retiograptus. Hall.
Sasiograptus. Lapworth.

8. SUB-FAMILY. GLADIOGRAPTIÆ.

GLADIOGRAPTIDÆ. Lapworth.

Both axes separate. Perfect exoskeleton of chitinous fibres.

Clathrograptus. Lapworth.
Trigonograptus. Nicholson.
Retiolithes. Barrande.

7. FAMILY PLUMULARIDÆ. Hincks, 1868.

Forming a colony. Alimentary and Generative Zooids, and Machopolyps. Alimentary Zooids with one verticil of filiform Tentacles.

Ovum
|
Blastostyl Polyp *Machopholyp*
|
Hydroriza.
|
First Polyp
|
Ovum.

Ophiodes. Hincks.
Plumularia. McCrady.
Antennularia. Lamarck.
Aglaophemia. McCrady.
Halicornaria. Busk.
Halicornopsis. Bale.
Sciarella. Allman.
Acanthella. Allman.
Schizatricha. Allman.
Polyplumaria. Sars.
Heteroplana. Allman.
Acanthochladium. Allman.
Lithocarpus. Kirchenpauer.
Kirchenpaueria. Jickeli.
Streptocaulus. Allman.
Diplochilus. Allman.
Cladocarpus. Allman.
Azigoplana. Allman.
Etc.

8. FAMILY DICORYNIDÆ. Allman.

Generative Zooids free swimming Polypes with two tentacles and without a mouth, carrying two ova each.

These Zooids bud only on Polypostyles, and never on the Alimentary Zooids which have one verticil of filiforme tentacles.

SCHEMA.

Ovum
|
Free Polypoid
|
Polyp *Polypostyl*
\ /
Hydrorhiza
|
First Polyp
|
Ovum.

Dicoryne. Allman.

II. SUBORDER HYDROMEDUSINÆ. Von Lendenfeld, 1884.

COLONIES OF POLYMORPHIC ZOOIDS. THE ALIMENTARY ZOOIDS RETAIN THE SHAPE OF POLYPES, WHILST THOSE IN WHICH THE SEXUAL PRODUCTS REACH MATURITY ARE MEDUSÆ, WHICH MAY BECOME FREE OR REMAIN ATTACHED TO THE COLONY AND BECOME RUDIMENTARY.

9. FAMILY ANTHOMEDUSIDÆ. Von Lendenfeld, 1884.

Anthomedusæ. Haeckel, without the Cytaeidæ of Haeckel.

Medusæ become free, without Otoliths, with Ocelli at the base of the tentacles. Gonads in the outer or oral wall of the gastral cavity. Mostly four Radial Canals. The Polype colonies on which these Medusæ bud, contain alimentary Zooids, which are not invested by chitinous cups. The Medusæ bud mostly on the ordinary alimentary Polypes, exceptionally they are also born on peduncles and bud direct from the Hydrorhiza. A division of labour between alimentary Polypes and Polypes, which produce Medusæ, Polypostyles does not occur.

SCHEMA.

Ovum
|
Medusa
|
Polyp
|
Hydrorhiza
|
First Polyp
|
Ovum.

or :

Ovum
|
Medusa *Ovum*
\ /
Medusa
|
Polyp
|
Hydrorhiza
|
First Polyp
|
Ovum.

or :

Ovum
|
Polyp Medusa
\ /
Hydroriza
|
First Polyp
|
Ovum.

I. SUB-FAMILY. CODONINÆ.

CODONIDÆ. Haeckel.

Mouth simple, with flaps or barbels. Gonade simple tube shaped, not divided radially, with four simple Radial Canals and unbranched tentacles. Alimentary Zooids, with tentacles, which are scattered, or in two verticils.

Codonium. Haeckel.
Sarsia. Lesson.
Syndictyon. A. Agassiz.
Ectopleura. L. Agassiz.
Dipurena. MacCrady.
Bathycodon. Haeckel.
Dicodonium. Haeckel.
Dinema Van. Beneden.
Steenstrupia. Forbes.
Euphysa. Forbes.
Hybocodon. L. Agassiz.
Amphicodon. Haeckel.
Amalthaea. O. Schmidt.
Globiceps. Ayres.
Gymnocoryne. Hincks?
Vorticlava. Alder.
Acharadria Strethill. Wright.
Dendroclava. Weismann.

II. SUB-FAMILY. TIARINÆ.

TIARIDÆ. Haeckel.

Anthomedusidæ with four broad Moutharms, with four or four pair of gonads, four simple Radial Canals and unbranched tentacles. The alimentary Zooids of the Polypecolonies with scattered capitate tentacles.

Protiara. Haeckel.
Moderia. Forbes.
Corynites. McCrady.
Amphinema. Haeckel.
Codonorchis. Haeckel.

Stomodoca. L. Agassiz.
Panthaea. Lesson.
Conis. Brandt.
Tiara. Lesson.
Turris. Lesson.
Catablema. - Haeckel.
Turritopsis. McCrady.
Callitiara. Haeckel
Corydendrium Van. Beneden ?

III. SUB-FAMILY. MARGELINÆ.

Margelidæ. Haeckel, with the exceptian of Haeckel's Genera Cytaeis, Cubogaster, Dysmorphosa, Cytæandra.)

Anthomedusæ, with simple or branched moutharms. Gonade divided into four or eight marginal flaps. The Medusæ bud on Colonies of Polypes, which contain alimentary Zooids, with a verticil of filiform tentacles.

Lizusa. Haeckel.
Lizzia. Forbes.
Lizzella. Haeckel.
Thamnitis Haeckel.
Thamnostylus. Haeckel.
Thamnostoma. Haeckel.
Limnorea. Peron.
Margelis. Steenstrup.
Hippocrene. Mertens.
Nemopsis. L. Agassiz ?
Margelium. Haeckel.
Rathkea. Brandt.

IV. SUB-FAMILY. CLADONEMINÆ.

CLADONEMIDÆ. Gegenbaur.

Anthomedusæ, with branched tentacles, with 4—8 simple or branched Radial Canals, and four or four pair of gastral Gonads. The Medusæ bud on Polypecolonies which contain alimentary Zooids, with scattered capitate tentacles.

Pteronema. Haeckel.
Zanclea. Gegenbaur.

Gemmaria. McCrady.
Eleutheria. Quatrefages.
Ctenaria. Haeckel.
Cladonema. Diyardin.
Dendronema. Haeckel.
Heterostephanus. Allman ?

10. FAMILY TUBULARIDÆ. Von Lendenfeld, 1884.

The Medusæ in this family become more or less rudimentary, and remain attached to the Polypes.

All Zooids are alike and all bear Medusæ.

SCHEMA.

Ovum
|
Medusoid bud
|
Polyp
|
Hydrorhiza
|
First Polyp
|
Ovum

I. SUB-FAMILY. PENNARINÆ.

The Polypes possess a distal set of capitate and a proximal set of filiform tentacles.

Pennaria. Goldfuss.
Halocordyle. Allman.
Monocaulus Sars ?

II. SUB-FAMILY. TUBULARINÆ.

The Polypes possess two verticils of filiform tentacles.

Tubularia. Allman.

III. SUB-FAMILY. ATRACTYLINÆ.

The Polypes possess a single verticil of filiform tentacles. The medusoid buds are produced on the Hydrocaulus.

Atractylis. Hincks.

11. FAMILY LEPTOMEDUSIDÆ. Von Lendenfeld, 1884.

LEPTOMEDUSÆ. Haeckel.

Medusea with Ocelli or Ectodermal Otolithes and Gonads, developed in the walls of the Radial Canals.

Medusæ always budding on transformed Polypes, Polypostyls and never on the alimentary Zooids.

Alimentary Zooids and Polypostyles invested by a chitinous Perisarc.

SCHEMA:

Ovum
|
Medusa
|
Polyp Polypostyl
\ /
Hydrohiza
|
First Polyp
|
Ovum.

I. SUB-FAMILY THAUMANTINA.

THAUMUANTIDÆ. Gegenbaur.

Leptomedusæ without marginal vesicles, simple Radial Canals.

Tetranema. Haeckel.
Dissonema. Haeckel.
Octonema. Haeckel.
Thaumtias. Eschscholtz.
Staurostoma. Haeckel.
Laodice. Lesson.
Melicertella. Haeckel.
Melicertissa. Haeckel.
Melicertum. A. Agassiz.
Melicertidium. Haeckel.
Orchistoma. Haeckel.

II. SUB-FAMILY. CANNOTINÆ.

ANNOTIDÆ. Haeckel.

Leptomedusæ, without marginal vesicles, with branched Radial Canals.

Staurodiscus. Haeckel.
Ganinema. A. Agassiz.
Ptychogena. A. Agassiz.
Staurophora. Brandt.
Polyorchis. A. Agassiz.
Cannota. Haeckel.
Discannota. Haeckel.
Berenice. Péron et Leseur.
Dipleurosoma. A. Boeck.
Dicronocanna. Haeckel.
Toxorchis. Haeckel.
Veletta. Haeckel.
Willia. Forbes.
Proboscidactyla. Brandt.
Cladocanna. Haeckel.

III. SUB-FAMILY. EUCOPINÆ.

EUCOPIDÆ. Gegenbaur.

Leptomedusæ, with marginal vesicles and four simple unbranched radial canals.

Eucopium. Haeckel.
Saphenella. Haeckel.
Eucope. Gegenbaur.
Obelia. Péron et Leseur.
Tiaropsis. L. Agassiz.
Euchilota. McCrady.
Phialium. Haeckel.
Phialis. Haeckel.
Mitrocomium. Haeckel.
Epenthesis. McCrady.
Mitrocomella. Haeckel.
Phialidium. Lemkart.

Mitrocoma. Haeckel.
Eutimimu. Haeckel.
Eutima. McCrady.
Saphenia. Eschscholtz.
Eutimeta. Haeckel.
Eutimalphes. Haeckel.
Octorchidium. Haeckel.
Octorchis. Haeckel.
Octorchandra. Haeckel.
Irenium. Haeckel.
Irene. Eschscholtz.
Tima. Eschscholtz.

IV. SUB-FAMILY. EUCOPELLINÆ. Von Lendenfeld.

Medusa without stomach, highly developed organs of sense, no tentacles, eight marginal vesicles. Four radial canals, which send branches into the Gonads.

Alimentary Zooid, with 32 tentacles and a Perisarc. Blastostyl consisting of four radial tubes, between which the Medusæ bud.

Ova formed as in the Companularinæ in the Hydrorhiza.

SCHEMA :

Ovum
|
Medusa
|
Poly *Blastostyl*
\ /
Hydrorhiza
|
First Polyp
|
Ovum.

Eucopella. Von Lendenfeld.

V. SUB-FAMILY AEQUORINÆ.

Aequoridæ. Eschscholtz.

With marginal vesicles and numerous (at least 8), often branched Radial Canals.

Octacanna. Haeckel.
Zygocanna. Haeckel.
Zygocannota. Haeckel.
Zygocannula. Haeckel.
Halopsis. A. Agassiz.
Aequorea. Péron et Leseur.
Rhegmatodes A. Agassiz.
Stomobrachium. Brandt.
Staurobrachium. Haeckel.
Mesonema. Eschscholtz.
Polycanna. Haeckel.

12. FAMILY CAMPANULINIDÆ. Von Lendenfeld, 1884.

Colonies of Polypes which are differentiated into alimentary Zooids with one verticil of filiform tentacles and generative Polypes, Polypostyles without mouth or tentacles. Both kinds of Zooids are invested by chitinous capsules. The Polypostyles only produce by budding sexual Zooids, which are rudimentary Medusæ and never become free.

SCHEMA :

Ovum
|
medusoid bud
|
Polype *Polypostyl*
\ /
Hydrorhiza
|
First Polyp.
|
Ovum.

Gonothyrea. Allman.
Halecium. Oken.

(According to Weismann all the genera placed under the heading Campanularidæ, should be placed here.)

13. FAMILY HYDRACTINIDÆ. Von Lendenfeld, 1884.

Hydractinidæ. Claus (?).

Polypecolonies with free or rudimentary Medusæ. The free Medusæ belong to Haeckels Sub-family Cytæidæ, and possess Ocelli at the base of the tentacles, and no Otolithes. The tentacles are scattered and equally distributed. With simple Moutharms.

The Polype colonies consist of a dense mass of entwined Hydrorhizæ from which the Hydrocauli, simple or slightly branched grow forth. The alimentary Zooids possess one verticil of filiform tentacles. The Medusæ bud from the Hydrorhiza, or on mouthless Polyps, Polypostyles, rarely on the alimentary Polypes. Besides the alimentary and Generative Zooids we meet with defensive Spiral Zooids. (P. Wright.)

I. SUB-FAMILY CYTÆINÆ.

Cytæidæ. Haeckel.

Producing free Medusæ, which bud from the Hydrorhiza.

SCHEMA:

Ovum
|
Medusa   Polype   *Spiralzoid*
\ | /
entwined Hydrorhiza, basal plate
|
First Polype
|
Ovum.

Cytæis. Eschscholtz.
Cubogaster. Haeckel.
Dysmorphosa. Philippi.
Cyteandra. Haeckel.
Corynopsis. Allman.

II. SUB-FAMILY HYDRACTININÆ.

Medusæ bud on Polypostyls, remain sessile and become rudimentary (or immersed in the basal plate ?)

SCHEMA :

Ovum

medusoid bud

Spiralzooid Polype *Polypostyl*

entwined Hydrorhiza, basal plate

First Polype

Ovum

Hydractinia. Van Bemeden.
Coppinia. Hincks ?

III. SUBORDER HYDROCORALLINÆ.
Moseley.

ALIMENTARY ZOOIDS WITH FEW VERTICILLATE, CAPITATE TENTACLES. HYDRORHIZA FORMING A DENSE CALCAREOUS SKELETON WHICH ALSO INVESTS THE POLYPES. GROUPS OF MACHAPOLYPES, IN THE FORM OF TENTACULAR ZOOIDS, SURROUND THE ALIMENTARY POLYPES.

Ultimately generative Zooids are probably Medusæ.

SCHEMA (?) :

Ovum

Medusa

Machopolyp Polype

Hydrorihiza

First Polype

Ovum.

14. FAMILY. STROMATOPORIDÆ. Murie and Nicholson.

Possessing undulating laminæ in the skeleton.

Stromatopora. Goldfuss.
Stylodictyon. Murie and Nicholson.
Clathrodictyon. Murie and Nicholson.
Pachystroma. Murie and Nicholson.
Dictyostroma. Murie and Nicholson.
Ellipsactinia. Steinmann.
Cannopora. Murie and Nicholson.
Stromatocerium. Murie and Nicholson.
Labechia. Lansdale.
Etc.

15. FAMILY. MILLIPORIDÆ. Moseley.

Alimentary Zooids, with from 4 to 6 tentacles. Polypary with many conic protuberances divided by Tabulæ. Coeneuchym with reticulating canals.

Millepora. Linne.
Pliabothrus. Pourtales.
Axopora. Edwards.
Porosphæra, Steinmann.
Cylindrohyphasma. Steinmann.
Etc.

16. FAMILY. STYLASTERIDÆ. Gray.

Alimentary Zooids with from 4 to 12 tentacles. Massive Hydrosom containing tubes which possess pseudosepta formed by the regular position of the tentacular Zooids.

Cryptohelia. E. H.
Stylaster. Gray.
Allopora. Ehrenberg.
Polypora.
Eudobelia. E. H.
Distichopora. Verill.
Lepidopora. Pourtales.
Errina. Gray.
Pentalophora. Kent.
Etc.

IV. SUBORDER TRACHOMEDUSINÆ.

Von Lendenfeld, 1884.

TRACHOMEDUSÆ *CLAUS.*

HYDROMEDUSÆ WHICH ARE MEDUSÆ, AND ARE PROPAGATED SEXUALLY WITHOUT A CHANGE OF GENERATION AND WITHOUT FORMING POLYPOID ZOOIDS. MEDUSÆ WITH ENTODERMAL ACUSTIC CLUBS.

SCHEMA:

Ovum
|
Medusa
|
Ovum

or:

Ovum
|
Medusa *Ovum*
\ /
Medusa
|
Ovum.

17. FAMILY TRACHOMEDUSIDÆ. Von Lendenfeld, 1884.

Trachomedusae. Haeckel.

The Gonads are developed in the walls of the Radial Canals.

1. SUB-FAMILY PETASNLÆ.

Petasidæ. Haeckel.

With 4 Radial Canals, with long tube shaped stomach. Acustic clubs free or in vesicles on the margin of the Umbrella.

Petasus. Haeckel.
Dipetasus. Haeckel.
Petasata. Haeckel.
Petachnum. Haeckel.
Aglauropsis. F. Müller.
Gossea. L. Agassiz.
Olindias. F. Müller.

II. SUB-FAMILY. TRACHINEMINÆ.

TRACHINEMIDÆ. Gegenbaur.

With 8 Radial Canals, with long tube-shaped stomach.

Trachynema. Gegenbaur.
Marmanema. Haeckel.
Rhopalonemā. Gegenbaur.
Pectillis. Haeckel.
Pectis. Haeckel.
Pectanthis. Haeckel.

III. SUB-FAMILY. AGLAURINÆ.

AGLAURIDÆ. L. Agassiz.

With 8 Radial Canals and with a pedicle to the stomach.

Aglantha. Haeckel.
Aglaura. Péron et Lesseur.
Stauraglaura. Haeckel.
Persa. McCrady.

IV. SUB-FAMILY. GERYONINÆ.

GERYONIDÆ. Haeckel.

Four or 6 radial tubes, leaf-shaped gonads. Long stomach pedicle, 8 or 12 marginal peroniæ, and as many acustic vesicles.

Liriantha. Haeckel.
Liriope. Lesson.
Glossoconus Haeckel.
Glossocodon. Haeckel.
Geryones. Haeckel.
Geryonia. Péron et Leseur.
Carmaris. Haeckel.
Carmarina. Haeckel.

18. FAMILY. NARKOMEDUSIDÆ. Von Lendenfeld, 1884.

NARKOMEDUSÆ, Haeckel.

Trachomedusæ, with gastral gonads.

I. SUB-FAMILY. CUNANTHINÆ.

CUNANTHIDÆ. Haeckel.

With broad pouch-shaped Radial Canals, with otoporpa.

Cunantha. Haeckel.
Cunarcha. Haeckel.
Cunoctantha. Haeckel.
Cunoctona. Haeckel.
Cunina. Eschscholtz.
Cunissa. Haeckel.

II. SUB-FAMILY. PEGANTHINÆ,

PEGANTHIDÆ. Haeckel.

Without Radial Canals and without gastral pouches in the sub-umbrella. With otoporpa.

Polycolpa. Haeckel.
Polyxenia, Eschscholtz.
Pegasia. Péron et Leseur.
Pegantha. Haeckel.

III. SUB-FAMILY. AGEININÆ.

AEGINIDÆ. Gegenbaur.

Circular canal in communication with the gastral cavity by double peranial tubes. With gastral pouches without otoporpa.

Aegina. Eschscholtz.
Aeginella. Haeckel.
Aegineta. Gegenbaur.
Aeginopsis. Brandt.
Aeginura. Haeckel.
Aeginodiscus. Haeckel.
Aeginodorus. Haeckel.
Aeginorhodus. Haeckel.

IV. SUB-FAMILY. SOLAMARINÆ.

SALMARIDÆ. Haeckel.

Without circular canal and without otoporpa, with or without Radial Canals.

Solmissus. Haeckel.

Solmundus. Haeckel.
Solmundella. Haeckel.
Solmoneta. Haeckel.
Solmaris. Haeckel.

In this list, of course, by no means *all* known genera are mentioned, but I have endeavoured not to omit any of the more recently established ones.

The older genera, for instance, of Lomouroux and Lamarck, and those recent ones, which appear too doubtful, have not been included.

This classification will, like all its predecessors, doubtlessly be full of errors, but I think the leading idea of it is the correct one, although the application of it in detail has in many cases very likely been a wrong one. And so I beg the reader to judge mildly of this attempt at a reasonable classification of the Hydromedusæ.

THE SCYPHOMEDUSÆ OF THE SOUTHERN HEMISPHERE.

By R. von Lendenfeld, Ph.D.

Part II.

III. Ordo.—Cubomedusæ.

Haeckel, System der Medusen. Seite, 423, 1879.
Charydeidæ. Gegenbaur, 1856.
Marsupialidæ. Agassiz, 1862.
Conomedusæ. Haeckel, 1878.
Lobophora. Claus, 1878.

Acraspede with 4 perradial marginal bodies, which contain an acoustic club, with Entodermal Otolithe sack, and one or more eyes; 4 interradial tentacles or tentacle clusters. Gastral cavity with four wide perradial square pouches. Gonads four pair leaf-shaped bulges, which are fixed by their margin to the four interradial septa. They are developed from the Sub-umbral Entoderm of the pouches of the stomach. And they project free into their cavity.

Family. *Charybdeidæ.* Gegenbaur, 1856.

Cubomedusæ with 4 simple interradial tentacles, and 4 perradial marginal bodies, without any marginal flaps in the velarium, but with 8 marginal pouches, without arms in the 4 radial pouches.

Genus. *Procharybdis.* Haeckel, 1879.

Charydeidæ with 4 simple interradial tentacles with Pedalia, simple velarium without velar-canals and without Frenula.

Species. *Procharybdis tetraptera.*

Haeckel, System der Medusen. Seite, 437.
Tafel, XXV. Figuren, 3, 4.

Umbrella nearly oval, 1½ times as high as broad, vertex flat; the 4 side surfaces strongly curved. Gastral cavity flat with 4 large oval mouth flaps. In the interradial elongated corners of the base of the Gastral cavity there are 4 pairs of wing-shaped Phacellæ, every one hand-shaped and split in 20—30 filaments. Margin of the Umbrella with 8 flat adradial gallert-flaps. Velarium simple, narrow, continuous. The distance of the niches of the sense organs from the margin of the Umbrella is about the same as that of the Pedalbase. Four Pedalia very large, about as long as the height of the Umbrella; leaf-shaped, with 2 large wings. The Abaxial wing reaches nearly to the middle of the interradial margin of the Umbrella. The Axial wing is very narrow above, and very broad and deeply cut out below. Four tentacles are higher than the height of the Umbrella.

Size: Breadth of Umbrella, 20 mm. Height of Umbrella, 30 mm.

Locality: Indian Ocean; Sunda, Archipel. Rabbe.

Species. *Procharybdis flagellata.*

Haeckel, System der Medusen. Seite, 438.

(?) Marsupialis flagellata, Lesson, 1843, Acalèphes, p. 278. Umbrella conic, stubbed above. The height twice the width; 4 side surfaces strongly curved. The 4 interradial sides rounded and a little projecting. Gastral cavity? Margin of Umbrella continuous with 8 laps. Velarium simple, narrow, continuous. The distance of the niches of the sense organs to the margin of the Umbrella is about half the distance of the pedal base. 4 Pedalia lancet shaped and half as long as the height of the Umbrella, with very narrow wings. Tentacles several times as long as the height of the Umbrella.

Size: Breadth of Umbrella, 20 mm. Height of Umbrella, 40 mm.; Ontogenesis unknown.

Locality: North Coast of Australia: Torres Straits Weber (New Guinea. Lesson ?)

Species. *Procharybdis cuboides.*

Haeckel, System der Medusen. Seite, 439.

Umbrella nearly cubic, stubbed above, the same height as breadth. Gastral cavity square, quite flat with 4 short mouth flaps. 4 Phacelles bipartate, with very short and numerous Gastral filaments. Twice as broad as their interval. Margin of Umbrella hardly flapped. The distance of the niches of the sense organs to the margin of the Umbrella about half the distance of the pedal base. Velarium pretty broad, quite simple, plaited. Pedalia nearly lancet-shaped, broadest in the middle, with two narrow wings, half the height of the Umbrella. Tentacles about as long, swollen to a roundish knob at the end.

Size: Breadth of Umbrella, 35 mm. Height of Umbrella, 35 mm. Ontogenesis unknown.

Locality: Tropic Zone of the Pacific Ocean; Sandwich Islands. Ballier.

Species. *Procharybdis securigera.*

Haeckel, System der Medusen. Seite, 640.

Umbrella nearly cubic, stubbed above, as high as broad. Gastral cavity quadrate, flat, with 7 triangular mouth flaps, 4 pair wing-shaped Phacellæ, every one split in 10—20 filaments. Margin of Umbrella slightly 8 flapped. The distance of the niches of the sense organs from the margin of the Umbrella is the same as their distance from the pedal base. 4 Pedalia axe-shaped, half as long as the height of the umbrella. 4 Tentacles which are longer than the height of the Umbrella swollen at the base to a roundish knob.

Size: Breadth of Umbrella, 40 mm. Height of Umbrella, 40 mm.

Locality: Pacific Coast of Central America. Fuchs.

Genus. *Charybdea.* Péron et Leseur.

Charybdeide with 4 simple interradial tentacles, with Pedalia, suspended velarium (velar-canals with 4 perradial Frenula). Gastral cavity flat and low, without broad mesenteria. 4 horizontal groups of filaments, single or double, fascicular or pencil-shaped, only on the interradial corners of the fundus.

Species. *Charybdea alata.* Reynaud.

Haeckel, System der Medusen. Seite, 441.

Charybdea alata. Reynaud, 1830. Lesson's Centurie Zoologique, p. 95. Pl. 33. Fig. 1.

Marsupialis alata. Lesson, 1843. *Acalèphes,* p. 278.

Tamoya alata. L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 174.

Umbrella conic, about as high as broad. Gastral cavity very small, scarcely half as broad as the Umbrella-radius. Gastral cavity simple. Four Phacellæ simple pencil-shaped, scarcely half as broad as their interstices. The distance of the niches of the sense organs from the margin of the Umbrella is $\frac{1}{3}$ as great as their distance from the pedal base. Velarium narrow in every quadrant with 6 simple velar canals. Pedalia lancet-shaped, nearly as long as the Umbrella is high, with rather broad wings.

Colour: Gastral cavity blue, according to Reynaud.

Size: Breadth of Umbrella, 30 mm.; height of Umbrella, 33 mm; Ontogenesis unknown.

Locality: South Atlantic Ocean, Reynaud, South Africa. W. Bleek.

Genus. *Tamoya.* Fritz Müller, 1859.

Charybdeide, with 4 simple interradial tentacles, pedalia, suspended velarium, (with velar-canals and 4 perradial Frenula.) Gastral cavity large and deep, connected with the Sub-umbrella, by 4 broad perradial mesenteria. Four filament groups of vertical rows of threads, or brush-shaped bands which represent the interradial middle-lines of the sides of the Gastral cavity.

Species. *Tamoya haplonema.* Fritz Müller, 1859.

Haeckel, System der Medusen, Seite, 443, 1879.

Tamoya haplonema, Fritz Müller, 1859; Abhandl. Naturf. Ges. Halle. Bat. V., p. 1., Taf. I.. II.

Tamoya haplonema, L. Agassiz, 1862; Monogr. Acal. Contrib. IV., p. 174.

Umbrella nearly quadrangular-prismatic, stubbed at the top, more than $\frac{1}{3}$ as high as it is broad. Gastral cavity nearly globular, occupying the upper half of the Sub-umbrella-cavity. Twice as high as the infundibuliform mouth-tube, which is split below into 4 short triangular mouth-flaps; 4 Phacellæ simple interradial rows of thread, which pass through the upper $\frac{2}{3}$ of the Gastral side of the cavity. Velarium broad, with numerous dendritic ramified canals. Pedalia in the form of clubs, twice as long as broad, about $\frac{1}{3}$ as long as the height of the Umbrella, spreading towards the base, two winged with broad meridial-wings.

Size: Breadth of Umbrella, 120 mm. Height, 150 mm; Ontogenesis unknown.

Locality: Coast of Brazil, Desterro, Santo Catharina. Fritz-Müller.

Species: *Tamoya bursariæ.* Haeckel.

Haeckel, System der Medusen. Seite, 444, 1879.

Bursarius cythereæ, Lesson, 1829; Voyage de la Coquille, Zoophytes, p. 108, pl. XIV., fig. 1.

Bursarius cythereæ, L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 174.

Umbrella semi-spherical, the upper third curved, the other thirds cubic, $1\frac{1}{2}$ as high as broad. The semi-spherical cupola and the 9 quadratic side-surfaces are papillous, sprinkled with large nettle-knobs. The 4 corner pillars, half as broad as the side-surfaces, are divided into two parts by a deep furrow, and longitudinally finely ribbed. Margin of Umbrella only slightly thickened, divided into many triangular prismatic ridges by deep cuttings. From which 6—8 are on each of the 4 side-surfaces.

Pedalia oval, three-cornerd, $1\frac{1}{2}$ as long as the sub-umbrella cavity, the dorsal margin wing-shaped, rising from the margin of the Umbrella.

Size: Breadth of Umbrella, 70 mm.; height of Umbrella, 100 mm.; Ontogenesis unknown.

Locality: New Guinea, Rawack, Waigion. Lesson.

Species. *Tamoya gargantua.* Haeckel.

Haeckel, System der Medusen. Seite, 444.

Beroe gargantua, Lesson, 1829; Voyage de la Coquille, Zoophytes, p. 261, pl. XV., fig. 1.

Epomis gargantua, Lesson, 1843, Acalèphes, p. 262.

Umbrella quadrangular-pyramidal, twice as high as broad. Diameter of the opening of the Umbrella 3 times as large as that of the stubbed summit. Exumbrella with 16 deep longitudinal furrows, by which 16 convex divisions of nearly the same breadth are formed. Gastral cavity nearly globular, occupying the upper third of the Sub-umbrella cavity, 4 Phacellæ, simple interradial rows of threads along the sides of the Gastral cavity. Velarium broad, with numerous, dense slightly branched canals. Pedalia nearly sickle-shaped, with broad convex abaxial wings, narrow concave abaxial-wings, $\frac{1}{4}$ as long as the Sub-umbrella cavity.

Size: Breadth of Umbrella 80-100 mm.; height, 200 mm. Ontogenesis unknown.

Locality: Tropical part of the Pacific Ocean, Tahiti, Lesson, Samoa, Weber.

Family. *Chirodropidæ.* Haeckel, 1879.

Cubomedusæ, with 4 interradial tentacle-bundles and 4 perradial marginal bodies; with 16 marginal pouches in the marginal flaps of the velarium and 8 umbral arms in the 4 radial-pouches.

Genus. *Chiropsalmus.* L. Agassiz, 1862.

Chirodropidæ, with 8 simple finger-shaped pouch-arms on the Umbrella-wall of the 4 radial-pouches, with 4 hand-shaped Pedalia, which possess numerous tentacles, and with 8 leaf-shaped Gonads.

Species. *Chriropsalmus zygonema.* Haeckel.

Haeckel, System der Medusen. Seite, 641.

Umbrella quadrangular pyramidal, stubbed above, $1\frac{1}{2}$ times as high as broad, with the suspended velarium. Mouth-tube small, with 4 flaps, half as long as the roundish Gastral-pouch, the side-walls have 4 interradial arched Phacellæ. The two pouch-arms oval and very small; 4 Pedalia leaf-shaped, two-edged, not symmetrical, about $\frac{1}{3}$ as long as the height of the Umbrella, every one with 2 short gallert-processes. Altogether 8 tentacles.

Size: Breadth of the Umbrella, 40 mm.; height of Umbrella, 60 mm.

Locality: South Atlantic Ocean. Smith.

Species. *Chiropsalmus quadrumanus.* L. Agassiz.

Haeckel, System der Medusen. Seite, 447.

Chiropsalmus quadrumanus, L. Agassiz, 1862; Monogr. Acal. Contrib. IV., p. 174.

Tamoya quadrumana, Fritz Müller, 1859; Abhandl. Naturf. Ges. Halle. p. 1., Tef. I.

Umbrella bell-shaped, nearly semi-spherical, together with the suspended velarium scarcely as high as broad. Mouth-tube large, quadrangular pyramidal, split into 4 strong triangular mouth-flaps, higher than the nearly globular gastral pouch, which contains 4 interradial crooked arched rows of Gastral filaments. Two pouch-arms on the umbral-wall of each radial-pouch, near their entrance, very large, fingershaped, simple and more than half as long as the pouch itself. Four Pedalia hand-shaped, not symmetrical, nearly as long as the height of the Umbrella, every one with 10 narrow gallert-processes. Altogether 40 long tentacles.

Size: Breadth of the Umbrella, 120 mm.; Height of the Umbrella, 130 mm. Ontogenesis unknown.

Locality: Coast of Brazil, Desterro Island, S. Catharina. Fritz Müller.

Genus. *Chirodropus.* Haeckel.

Chirodropidæ, with 8 quadripartite, half feathered pouch-arms on the umbral-wall of the 4 radial-pouches, with 4 hand-shaped Pedalia, which possess numerous tentacles, and with 8 grape-like Gonads.

Species. *Chirodropus palmatus.* Haeckel.

Haeckel, System der Medusen. Seite. 448.

Umbrella quadrilateral-prismatic, vaulted above like a bell, with the suspended velarium $1\frac{1}{2}$ times as high as broad. Margins strongly projecting, sides flat Mouth-tube with 4 flaps, scarcely half the height of the oval Gastral pouch. Both pouch arms on the umbral-wall of each radial-pouch are aduate in their two upper thirds, and are only free in the lower part and split into a great many filaments. Four Pedalia hand-shaped, not symmetrical, very large, nearly as long as the height of the Umbrella, each with 21 long and broad band-shaped gallert-processes. Altogether 84 long tentacles.

Size: Breadth of Umbrella, 70 mm.; height of Umbrella 100 mm. Ontogenesis unknown.

Locality: South Atlantic Ocean, not far from the Island St. Helen. Levasseur.

Species. *Chirodropus gorilla.* Haeckel.

Haeckel, System der Medusen, 448.

Umbrella bell-shaped, nearly semi-sphærical Together with the suspended velarium $1\frac{1}{2}$ times as high as broad, margin slightly projecting, side curved. Mouth-tube quadrilateral-pyramidal nearly as high as the globular gastral-pouch. Both pouch-arms on the umbral-wall of the radial-pouches are adnate in their upper third, in the lower part they hang freely in the pouch, and are split into numerous filaments. Four Pedalia hand-shaped, not symmetrical scarcely as high as the height of the Umbrella, each with 9 long narrow gallert-processes.

Altogether 36 tentacles.

Size: Breadth of Umbrella, 120 mm.; height, 150 mm. Ontogenesis unknown.

Locality: Coast of New Guinea, Chinchozo Loango. Falkenstein.

ON SOME FOSSIL PLANTS FROM DUBBO, NEW SOUTH WALES.

PLATE IX.

BY THE REV. J. MILNE CURRAN, F.G.S.

While attempting to determine the geological position of the so-called Hawkesbury Sandstone at Dubbo, I have been gradually led to study the fossil plants which are so abundantly represented in the district. A few years ago I submitted my collection of fossils to the Rev. J. E. Tenison-Woods, who identified the species already known at that time. Shortly afterwards he gave a diagnosis and figures of all the new species in a paper entitled, "The Fossil Flora of the Coal Deposits of Australia," published in Vol. VIII. of our Proceedings. The following is a list of the fossil plants described therein :

FILICES.

Sphenopteris crebra, Ten.-Woods. Ballimore.
Sphenopteris glossophylla, Ten.-Woods. Ballimore.
Neuropteris australis, Ten.-Woods. Ballimore.
Thinnfeldia odontopteroides, Morris. Dubbo.
Thinnfeldia media, Ten.-Woods. Dubbo.
Alethopteris Currani, Ten.-Woods. Ballimore.
Alethopteris concinna, Ten.-Woods. Ballimore.
Merianopteris major, Feistm. Ballimore.

CONIFERÆ.

Walchia milneana, Ten.-Woods. Ballimore.

Since the publication of the paper referred to, I have collected fossils from many parts of the district. Cf these some are well-known species, but others cannot be referred to any hitherto described Australian forms.

ODONTOPTERIS MACROPHYLLA, sp. nov. Plate IX., fig. 3.

Frond pinnate and bipinnate. Pinnules more or less opposite, obliquely ovate to ovate-acuminate, free, obliquely inserted by the whole base. No costa. Veins fine, all arising from the rachis, dichotomous, diverging as they ascend, and numbering 30 to 33 at the margin. Length of longest pinnule, 10; width of base, 9. Length of specimen, 67 : all millimetres.

Loc. Dubbo.

This beautiful and undoubted species of *Odontopteris* (Brongniart) is very different from M'Coy's *O. microphylla,* from which it is easily distinguished by its greater size and general habit. The Dubbo species was found in a shaft sunk on the Railway line at 275 miles 25 chains. It is common in a dark carbonaceous shale, associated with *Thinnfeldia odontopteroides, Hymenophyllites dubia,* and *Alethopteris australis.*

I am of opinion that many of the very fine impressions on the Dubbo Sandstones, considered to be some species of *Thinnfeldia,* can be referred to this genus. On Plate IX., fig. 4A, I have reproduced a pinnule of *Thinnfeldia odontopteroides* from Dr. Feistmantel's "Palaeozoische und mesozoische Flora des östlichen Australiens," for comparison with a pinnule of *Odontopteris.* In mere impressions or casts, showing no trace of the venation, the one cannot be distinguished from the other. The differences, however, are very great. In *Thinnfeldia* the veins arise, partly from one, which is almost median, and partly from the rachis; while in *Odontopteris* all the veins come direct from the rachis.

ALETHOPTERIS AUSTRALIS. Morris (as Pecopteris).

Refs —Strzelecki, Ph. Desc. of New South Wales, pl. VIII., figs. 1, 2, 2a. M'Coy, Palæ. Vict., pl. XIV., fig. 3, p. 17.

Feistmantel quotes this fern from the Clarence River—the only locality hitherto known for it in N.S.W. There can be no doubt as to its identity: as in the case of *Thinnfeldia* and *Hymenophyllites.* I have been able to mount some pinnules on microscopic slides, so that the venation can be followed as easily as in a recent fern.

Loc. Same as proceeding.

THINNFELDIA ODONTOPTEROIDES. Feistm. Pl. IX., fig. 4.

Refs.—Proc. Linn. Soc., N.S.W., Vol. VIII., p. 162.

This fossil plant has been described and figured in almost every variety by Dr. O. Feistmantel in the work already referred to. As Feistmantel's papers are not easily procurable, and as *Thinnfeldia* is (in Australia) a recognised characteristic mesozoic fossil, I herewith present a figure of a specimen, from Garensey's Quarry, Dubbo, where it is very common. It is confined to a particular bed—a sparsely micaceous, finely bedded, friable sandstone. It occurs, either in the shape of sharply defined casts, which show *Thinnfeldia* to have been a plant with stout coriaceous pinnules, or as a red impression (peroxide of iron), which is reduced to dust by exposure.

In a shaft sunk on the Railway, about three miles from the Quarry, *Thinnfeldia* fossils are found in a remarkable state of preservation, in a black carbonaceous shale. The shale may be truly described as consisting almost entirely of plant remains. As the shale is taken out fresh it is not easy to see the fossils, but as the stone weathers they peel off in flakes. It is only necessary to steep them in water, and pinnule separates from pinnule and rachis from rachis so perfectly, that they may be mounted on microscopic slides as translucent objects. Many of them can readily be used as negatives to obtain nature-printed heliotypes. Pl. IX., fig. 4, is an enlarged copy of one.

Some of the pinnules are studded with minute dots, which may be stomata. Although I have examined more than 50 specimens by transmitted light, I have never met with anything which could be considered as pointing to the mode of fructification, of which nothing is known That this should be so, is remarkable, notwithstanding all that has been written, and the great number of plants that have been examined during the last forty years. It lends some weight to the opinions of Ettingshausen and Andrea, who placed Thinnfeldia with the Conifers. It is not easy to see the reason for this, for it appears amongst ourselves to be a settled question, that *Thinnfeldia* was a fern. I have to add the following localities as new :—Beni, Talbragar R., Macquarie R., between Wellington and Dubbo, 16 miles from the latter place. In both instances the specimens were not perfect enough for specific determination.

HYMENOPHYLLITES DUBIA. Nov. sp. Pl. IX., figs. 1 and 2.

This cannot, with the material in hand, be distinguished from *Sphenopteris digitata* of Phillips. (See Geology of Yorkshire. 2nd Edit. Part I. Plate VIII., figs. 5 and 6.) Nothing was known of the venation of the Yorkshire species. In the Dubbo species, however, a nervure can be made out, which is divided and continued into each lobe. It certainly belongs to the Sphenopteridæ and for the reason stated, I consider it a species of *Hynenophyllites.* As more perfect specimens will doubtless come to hand, I content myself for the present with figuring the species. Phillips' species is derived from the sandstones and shales of Gristhorpe and Scalby (Jurassic.)

Loc. From a well, West Dubbo.

CYCADACEÆ.

PODOZAMITES. Sp.

Prof. M'Coy described (Pal. Vict., p. 33, pl. 8, figs. 1, 2, and 5) a species of *Podozamites* which was associated with *Alethopteris Australis,* and with which the Dubbo specimen will, I think, be found identical. I collected only one example, and that a fragment, but parallel nerves rapidly constricted at the base were easily noticeable, and at once separate it from *Zamites*—the one other form which it approaches. *Loc.* Railway shaft, associated with *Thinnfeldia odontopteroides, Alethopteris Australis, Odontopteris macrophylla* and *Podozamites ?*

CONIFERÆ.

WALCHIA PINIFORMIS (?). Sterengberg.

Refs. Fl. d. Vorw. i. p. 22. Goeppert, Foss. Flor. de Perm., pl. 49, fig. 13.

Twigs of this are found in water-worn pebbles of an indurated fireclay in the Talbragar R. It differs from *Walchia Milneana,* Ten.-Woods, in having its leaves linear to lanceolate and curved inwards at the apex. A few of the specimens show that the stems were flexible, reminding one of some of the Lycopodiaceæ. One species can hardly be distinguished from one figured by Mr. Twelvetrees, from the Upper Permian of Eastern Russia. (Qt. J. Geol. Soc., Lond., Vol. 38, p. 498, pl. 21, fig. 4.)

In conclusion I may remark that there are some forms which we should expect, which are not as yet recorded from Dubbo, notably *Tæniopteris*.

With the foregoing list, imperfect as it is, it would be an easy matter to make some attempt to correlate the Dubbo and Ballimore beds with other well-known formations; this I propose to attempt in another paper.

EXPLANATION OF PLATE IX.

1.—Hymenophyllites dubia.
2.—A few lobes of same as seen by transmitted light.
3.—Odontopteris macrophylla and Thinnfeldia.
4.—Thinnfeldia odontopteroides, from Dubbo.
4A.—Pinnule from Feistmantel.

NOTES AND EXHIBITS.

Mr. Ramsay exhibited a fine collection of Marine animals in illustration of the new and excellent methods of mounting and preserving specimens in use by Senor Lo Bianco, at Dr. Dohrn's Zoological Station, Naples. Among the exhibits were *Trachypterus tænia*, *Torpedo ocellata*, *Pennaria Carolinii*, *Eudendrium ramosum*, *Zoobotryon pellucidum*, *Pennatula phosphora*, *Autidon rosacea*, *Chromodoris elegans*, *Pleurophyllidea lineata*, *Pyrosoma elegans*, *Cestus Veneris*, *Rhizostoma pulmo*, and many other beautiful preparations.

The President exhibited a portion of the lower jaw of a *Diprotodon* which had been found near Armidale by Mr. W. M. Harris. It was interesting to note the occurrence of the remains of this gigantic extinct marsupial on the summit of the Great Dividing Range as well as on the low-lying plains of the Darling District.

WEDNESDAY, 30TH APRIL, 1884.

The Vice-President, Dr. James C. Cox, F.L.S., in the chair.

MEMBER ELECTED.

Layman M. Harrison, Esq., of Sydney.

DONATIONS.

"Mittheilungen aus der Zoologischen Station zu Neapel." Band V., Heft 1. From the Director.

"On the Origin of the Flora and Fauna of New Zealand." By Prof. F. W. Hutton, F.G.S., &c. From the Author.

"Journal of the Royal Microscopical Society of London." February, 1884. Also, "List of Fellows, &c., 1883. From the Society.

"Transactions of the Entomological Society of London." 1883, Part V. From the Society.

"Nests and Eggs of Australian Birds." By Archibald J. Campbell, Melbourne. 8vo, 1883. From the Author.

"Bulletin of the Museum of Comparative Zoology at Harvard College." Vol. XI., No. 9, 1883. From the Curator.

"Report of Progress of the Geological and Natural History Survey of Canada, for 1880-81, 1882." 1 Vol., 4to. With accompanying Maps, 1883. "Catalogue of Canadian Plants." 1883. From the Director of the Survey.

"Science." Vol. III., Nos. 53 to 57, 17th February to 7th March, 1884. From the Editor.

"Tijdschrift voor Entomologie." Vol. 26, Parts 3 and 4, 1882-83. From the Entomological Society of the Netherlands.

"Supplement to descriptive Catalogue of the Fishes of Australia." By the Hon. William Macleay, F.L.S. From the Author.

"Victorian Naturalist." Vol. I., No. 3., March, 1884. From the Field Naturalists' Club of Victoria.

A very large and valuable collection of the publications of Belgian Scientific Societies. From M. Th. Lefèvre, Secretary of the Royal Malacological Society of Belgium.

"Feuille des Jeunes Naturalistes." No. 161, March, 1884. From the Editor.

"Mémoires de la Société de Physique et d'Histoire Naturelle de Genève." Tomes XXIII. to XXVII. and XXVIII., Part I. 1873 to 1882, 4to. From the Society.

"Linnæi Genera Plantarum." 1 Vol., 8vo., 1764. From Thomas Whitelegge, Esq.

"Entomologisk Tidschrift pa foranstaltande af Entomologiska föreningen i Stockholm." Arg. 4, Heft. 1, 2, 3 and 4, 8vo, 1883. From the Society.

PAPERS READ.

ON THE PRESERVATION OF TENDER MARINE ANIMALS.

By R. Von Lendenfeld, Ph.D.

I shall endeavour here to give a few hints on this subject which may be of service to those of our members, who have no access to the Zoological Journals in which such methods of preserving are described. I do this in consequence of a wish expressed at the March meeting at the Linnean Society of N.S.W.

Medusæ, Actiniæ, Alcyonidæ, and particularly also Syphonophora and Cnetophora are so tender, and contain in parts of their bodies such a great percentage of water (in Aurelia as much as 97% !) that it is difficult to preserve them without their shrinking.

Like other specimens, these also should be kept in strong *non-methylated* spirits of wine (70-80%), or in a mixture of alcohol and glycerine. But if they were placed in such a liquid immediately on being caught, they would shrink to a shapeless mass and be useless. It is therefore necessary to harden them before placing them there. This hardening can be effected by the aid of compounds of heavy metals which act chemically on the Protoplasm in the cells, and harden it, thereby hardening the whole specimen. The metal itself, or its Oxide, is frequently precipitated in the Protoplasm, causing the whole to turn a dark colour.

Osmic Acid, Chromic Acid, Chloride of Gold, Chloride of Palladium, Chloride of Quicksilver, Nitrate of Silver, and Chloride of Iron, are used for the above-mentioned purposes.

The solutions in use are very weak, from 0·2 to 1% in strength, and the animal is immersed in them directly after having been removed from the seawater. The different solutions are allowed to act for some time, from one second to an hour or more as the case may be. Then the specimen is well washed in fresh water and placed in *weak* spirits (30 or 40%.) It is left there a short time, then placed in stronger spirits, and finally put into the strong spirits, (70-80%.)

Different solutions are used to gain different ends. Osmic Acid preserves the Epithelia wonderfully, whilst Chloride of Gold and Picric Acid have a greater effect on that sort of Protoplasm which is met in Ganglia cells and Nerves, wherefore these are often used for the purpose of studying the latter. Chloride of Mercury (corrosive sublimate) is very much used and greatly recommended by many. Chromic Acid or Bichromate of Potassium, make the Protoplasm yellow, and coagulate it in such a manner as to make it perfectly intransparent. Very transparent animals can, therefore, be made better visible by Chromic Acid. It must be used in very weak solution, and particularly carefully washed out before the specimens are placed in spirits. It preserves Epithelia exceedingly well, and is very useful to put fish in before preserving them in spirits.

Silver is reduced principally in the intercellular substance, and therefore used to demonstrate the cell margins. Chloride of Palladium is used for the same purposes as Gold.

Besides preserving the animals in a natural state, it is also necessary to preserve them in an expanded state, and as all animals naturally roll themselves up and retract their soft appendages when placed in a poisonous solution, it is attended with great difficulty to kill them so rapidly that they have not time to retract.

Sometimes it is possible to kill Hydroids and the Zooids of Corals with Osmic Acid so rapidly that they do not contract. Much more difficult this is with the Actiniæ (Sea anemones). The best way to preserve these latter in an expanded state, is to warm them to a temperature of about 43° C. Hereby they do not contract, and are lamed partially by the high temperature.

They can then be chloroformed, the only poison which has any effect on them (1), and treated with Osmic Acid, or any of the other re-agents.

The Osmic Acid is a high Oxide 0_3 0_5 of the Metal Osmium belonging to the Platina group with a specific weight of 22. It is exceedingly rare, and derived only from the remains of material out of which Platina has been obtained.

F. E. Schulze was the first to introduce this substance into the Zoological Laboratories. And more discoveries are due to the application of this re-agent, than to any other.

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(1) The brothers Hertwig have shown that Curare and Cyanite of Potassium, and also Morphine do not affect them. A bit of Cyanite of Potassium half as big as a sea anemone placed in its stomach, does not kill it.

THE SCYPHOMEDUSÆ OF THE SOUTHERN HEMISPHERE.

By R. von Lendenfeld, Ph.D.

Part III.—Conclusion.

IV. Ordo.—Discomedusæ.

Discomedusæ. Haeckel, 1866.

Phanerocarpæ. *Eschscholtz*, 1829.

Discophoræ. Claus, 1879. (non Eschscholtz, 1829. non Agassiz, 1862.)

Semaeostomeæ et *Rhizostomeæ.* L. Agassiz, 1862.

Acraspedæ with 8-16 or more marginal bodies (always 4 perradial and 4 interradial, besides these sometimes several accessory); in each marginal body an acoustic vesicle with Entodermal Otolith-pouch, and often at the same time an eye. Marginal flaps, always 8 pairs primary (Ephyra-flaps), and besides often numerous accessory, (Velar-flaps). Tentacles sometimes present, sometimes wanting. Gastral cavity surrounded by a circle of radial processes (8-16-32 or more), sometimes broad radial-pouches, sometimes narrow radial canals. Gonads 4, interradial folded bulges in the Sub-umbrella of the sides of the Gastral cavity, from the Entoderm of which they are developed (they disintegrate seldom into 8 adradrial bulges). They are sometimes pouch-shaped, sometimes protruding inwards into the central Gastral cavity, sometimes protruding outwards in hernia-shape into the Umbrella cavity.

Umbrella flattened, orbicular. The ancestral form of all Discomedusæ is the Octomeral Ephyra.

Family. *Ephyridæ.*

With broad radial-pouches, without terminal branch-canals. Discomedusæ with simple, four cornered Manubrium, without mouth-arms, with simple central mouth. Mostly 16 broad radial-pouches (8 ocular and 8 tentacular) rarely 16-32. With these alternating as many short, solid tentacles. Mostly 16 (rarely 32-64) marginal flaps with or without simple flap-pouches, always without branched flap-canals. 4 interradial or 8 adradial Gonads in the Subumbrella wall of the Gastral cavity.

Genus. *Ephrya.*

Ephyridæ with 8 marginal bodies, and 8 tentacles, with 16 marginal flaps without flap-pouches, and 4 interradial horse-shoe shaped Gonads.

Species. *Ephyra prometeor.*

Haeckel, System der Medusen. Seite, 482.

Umbrella flat bell-shaped, $1\frac{1}{2}$ times as broad as high. Marginal flaps oval, about as long as broad, and $\frac{1}{3}$ as long as the radius of the Umbrella. Tentacles pointed, twice as long as the marginal flaps. 4 simple interradial Gastral filaments. 4 Gonads horse-shoe shaped without flaps and smooth.

Size: Breadth of Umbrella, 8 mm. Height of Umbrella, 6 m.m. Ontogenesis unknown.

Locality: Coast of Australia. Weber.

Species. *Ephyra discometra.*

Haeckel, System der Medusen. Seite, 641.

Umbrella flat, orbicular. Marginal flaps pentagonal, pointed, its tentacular side twice as high as its ocular side. Tentacles cylindrical, club like at the end, the same length as the radius of the Umbrella. In each of the 4 phacellæ there are three Gastral filaments. 4 Gonads horse-shoe shaped, two-flapped.

Genus. *Palephyra.*

Ephyride with 8 marginal bodies and 8 tentacles, 16 marginal flaps and 16 flap-pouches (fork-shaped branches of the 8 ocular radial-pouches) and with 7 interradial horse-shoe shaped Gonads.

Species. *Palephyra antiqua.*

Haeckel, System der Medusen. Seite, 484.

Umbrella nearly semi-spherical, with thick convex central disk, flat spread margin of disk, twice as high as broad. Marginal flaps narrow, oval, pointed, about half as long as the radius of Umbrella. Tentacles as long as the radius of the Umbrella. 4 Gonads horse-shoe shaped with thin median arches and thickened lateral part. On each Gonad 6-8 thin Gastral filaments. Manubrium nearly cubic, hardly half as long as the radius of the Umbrella, without mouth flaps.

Size: Breadth of Umbrella, 20 mm. Height of Umbrella, 8 mm.

Locality: Indian Ocean, to the East of Madagascar.

Genus. *Zonephyra.*

Ephyridæ with eight marginal bodies and 8 tentacles, 16 marginal flaps, and 32 flap-pouches (16 ocular and 16 tentacular) and 4 interradial horse-shoe shaped Gonads.

Species. *Zonephyra connectens.*

Haeckel, System der Medusen. Seite, 641.

Umbrella flat orbicular with deep circular furrow. Manubrium as long as the diameter of the Umbrella, split into 4 oval triangular curved mouth-flaps in the distal third. 16 marginal flaps, nearly pointed, $\frac{1}{4}$ as long as the radius of the Umbrella. 8 tentacles about as long as the radius of the Umbrella. 4 Gonads horse-shoe shaped, two flapped.

Size: Breadth of Umbrella, 10 mm. Height of Umbrella, 3 mm.

Locality: Tropic zone of the Pacific Ocean. Weber.

Genus. *Nauphanta.*

Ephyride with 8 marginal bodies and 8 tentacles. With 16 marginal flaps and 32 flap-pouches. (16 ocular and 16 tentacular), and 8 separate adradial Gonads, which are in regular groups, but not in pairs.

Species : *Nauphanta Challengeri.*

Haeckel, System der Medusen. Seite, 487.

Umbrella cap-shaped, with horizontal flat vertex and vertical side-wall, $1\frac{1}{2}$ times as broad as high. Exumbrella with deep circular furrows and 16 radial grooves. Margin of Umbrella with 16 pedaliæ (8 weak scapular and 8 stronger tentacular.) 16 marginal flaps oval nearly twice as high as broad, with deep clasp furrow, about $\frac{1}{4}$ as long as the radius of the Umbrella. Tentacles cylindrical, pointed, about as long as the radius of the Umbrella. Gonads 8, oval, thick, bulges twice as long as broad, their proximal halves a little broader than their intervals, their distal halves covered by the circular muscle.

Size : Breadth of Umbrella, 12 mm. Height of Umbrella 8 mm.

Locality : South Atlantic Ocean, not far from the Island Tristan de Acuhna. Lat. S. 32° 24′. Long., W. of Greenwich, 13° 5′. In 8,550 feet (1,425 fathom) depth. 16th of March, 1876. Station, 335 of the "Challenger" Expedition. Wyville Thompson.

Genus. *Atolla.*

Ephyride with 16-32 (rudimentary) marginal bodies, and the same number of tentacles, 32-64 marginal flaps, and 64-128 flap-pouches. 8 separate adradial Gonads, which are grouped in pairs. Rhopalia-pouches rudimentary, transformed into narrow glandular canals.

Species. *Atolla Wyvillei.*

Haeckel, System der Medusen. Seite. 488.

Umbrella quite flat, orbicular, about 6 times as broad as high. Radius of disk of the Umbrella nearly twice as high as the margin of the Umbrella, divided from it by a very deep radial furrow. Manubrium contracted in the middle, 3-4 times as broad as high. Gonads grouped in pairs (in their circumference there are 8 elliptic pouches), their perradial intervals are shorter than the interradial. 19-22 (16-32 ?) rudimentary marginal bodies, and as many short alternating tentacles (half as long as the radius of the Umbrella.) Tentacle-pedalia broader and shorter than the rhopalar pedalia. The rhopalar flap canals rudimentary, much narrower and shorter than the tentacular canals. Marginal flaps elliptic, truncate with a broad membranous fringe.

Size: Breadth of Umbrella, 58-66 mm. Height of Umbrella, 8-12 mm. Ontogenesis unknown.

Locality: Antartic Ocean (Indian and Atlantic part). Wyville Thompson.

Family. *Linergidæ.*

Discomedusæ with simple quadrangular Manubrium without mouth-arms, and simple quadratic Mouth. 8 marginal bodies, 8 tentacles and 16 marginal flaps, with broad radial-pouches, and branched sack shaped flap canals, without ring canal.

Genus. *Linantha.*

Linergidæ with 4 horse-shoe shaped interradial Gonads (ovaries the proximal arches of which are simple and not divided. On the Subumbrella there are small vesicular diverticals or Subumbral pouches.

Species. *Linantha lunulata.*

Haeckel, System der Medusen. Seite, 497.

Umbrella cap shaped with horizontal upper surface and flat declining side-walls, twice as broad as high. Umbrella flaps oval. pointed, nearly twice as long as broad. Flap canals much bent and branched dendritically. The longest, ⅓ as long as the flap itself. In every flap 60-70 *cul-de-sac* shaped, terminal branched. Tentacles cylindrical, nearly as long as the radius of the Umbrella, 1½ times as long as the flaps. 4 Gonads simple horse-shoe shaped without interradial septum, with flat, crooked, nearly semi-circular proximal arches.

Size: Breadth of Umbrella, 10 mm. Height of Umbrella, 6 mm. Ontogenesis unknown.

Locality: Tropical Coast of the Pacific, South America, Galopagos Island. Fuchs.

Genus. *Linerges.*

Linergidæ with 4 horse-shoe shaped interradial Gonads, the convex proximal arches of which are divided into 2 adjacent wings by an interradial median septum. On the Subumbrella a double circle of 48 Subumbral-pouches (scrota ?). 16 larger proximal (under and between the Gonads), and 32 smaller distal (on the upper margin of the circle of the muscle.)

Species. *Linerges aquila.*

Haeckel. System der Medusen. Seite, 496.

Umbrella cap-shaped with horizontal Exumbrella, and nearly vertical side-walls, 1½ times as broad as high. Marginal flaps oval, a little longer than broad. Flap canals broad, hand-shaped, the longest (medial) half as long as the flap itself, in every flap 20-30 *cul-de-sac* shaped terminal branches. Tentacles cylindrical, at their ends club-like, 1½ times as long as the flaps. 4 Gonads horse-shoe shaped, two-winged, both wings divergent, convex margin flat, on the concave side deeply incised.

Size: Breadth of Umbrella, 18 mm. Height of Umbrella, 12 mm. Ontogenesis unknown.

Locality: Indian Ocean, to the East of Madagascar. Rabbe.

Genus. *Liniscus.*

Linergidæ with 8 separate adradial Gonads (ovariæ) which are curved sickle-shaped or rectangular, and approach with their proximal ends, in pairs, in such a manner that they form a horse-shoe shaped group. On the Subumbrella there is a double circle of 48 Subumbrella pouches (scrota ?). 16 larger proximal (underneath and between the Gonads), and 32 smaller distal (at the upper end of the circle of muscles.)

Species. *Liniscus ornithopterus.*

Haeckel, System der Medusen. Seite, 497.

Umbrella cap-shaped, with quite flat vortex and nearly vertical side walls, 1½ times as broad as high. Marginal flaps oval, 1½ times as long as broad, covered with nettle-warts. Flap canals stretched straight and not bent out. The longest (medial) $\frac{2}{3}$ as long as the flap. In every flap 30-40 *cul-de-sac* shaped terminal branches. Tentacles cylindrical, conic at their ends, nearly twice as long as the flap. 8 Gonads wing-shaped. Both wings of each pair flapped, doubly broken in the inter-radius approaching nearly to touch.

Size: Breadth of Umbrella, 20 mm. Height of Umbrella, 17 mm. Ontogenesis unknown.

Locality: West Coast of the Tropic Africa, Angola, Congo. Brüggemann.

Genus. *Linuche.*

Linergidæ with 8 adradial Gonads of the same shape, which are placed in the same intervals, and are approximated in pairs to 4 interradial groups. There is a threefold circle of Subumbrella-pouches (scrota?), 16 larger proximal, 32 middling and 64 (or more) smaller distal.

Species. *Linuche Lamarckii.*

Haeckel, System der Medusen. Seite, 642.

Umbrella nearly square with horizontal vortex and vertical side-walls, as high as broad. Marginal flaps oval, pointed, nearly twice as long as broad. Flap canal repeatedly dichotomous branched, with straight branches, the longest (medial) $\frac{1}{3}$ as long as the flap; in each flap 20-30 *cul-de-sac* shaped terminal branchlets, Tentacles rod-shaped scarcely as long as the flaps. 8 Gonads globular, distributed at equal intervals.

Size: Breath of Umbrella, 20 mm. Height of Umbrella, 20 mm.

Locality: Atlantic Ocean, under the Equator. Smith.

Family. *Pelagidæ.*

With a simple cross-shaped mouth and 4 folded perradial moutharms, with simple broad radial-pouches, without branched distal canals, without ring-canal. Eight marginal bodies, 16—32 or more marginal flaps.

Genus. *Pelagia.*

Pelagidæ, with 8 adradial tentacles (alternating with the 8 marginal bodies), and with 16 marginal flaps.

Species. *Pelagia panopyra.*

Haeckel, System der Medusen. Seite, 509.

Pelagia panopyra. Péron et Lesueur, 1809. Tableaux des Méduses, etc., p. 349, N. 64.

Pelagia panopyra. Eschscholtz, 1829. System der Acalephen, p. 73. Taf. VI., fig. 2.

Pelagia panopyra. Lesson (p. p. !), 1830. Centurie Zool. p. 192, pl. 62, fig. 2.

Pelagia panopyra. Brandt, 1838. Memoir. Acad. Petersb. Tom. IV., p. 382. Taf. XIV., fig. 1 ; Taf. XIV., A. fig. 1—5.

Pelagia panopyra. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 164.

Pelagia tuberculosa. Couthouy, 1862 ; in L. Agassiz. Contrib. IV., p. 164.

(?) Pelagia Labiche. Eschscholtz, 1829. System der Acalephen, p. 78.

(?) Pelagia Labiche. De Blainville, 1834. Actinologie, p. 302, pl. 40, fig. 3.

(?) Pelagia Labiche. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 165.

Medusa panopyra. Péron et Lesueur, 1807. Voyage aux Terres Australes, pl. 31, fig. 2.

Dianaea panopyra. Lamarck, 1817. Hist. nat. An. s. vert. Tom. II., p. 507.

Cyanea Labiche. Quoy et Gaimard, 1824. Voyage de l'Uranie, etc. Zoologie, p. 571, pl. 84, fig. 1.

Umbrella semi-spherical, flattened above, nearly twice as broad as high. Nettle-warts of the Exumbrella small and scattered, elongated. Most dense on the margin of the Umbrella. Marginal flaps nearly quadratic, slightly crenated on the distal margin. Manubrium long and narrow, nearly twice as long as the radius of the Umbrella, 3 times as long as broad. Mouth-arms long and narrow, $1\frac{1}{2}$ times as long as the manubrium, about 3 times as long as the radius of the Umbrella; its membranous border is twice as broad as the thin cylindrical middle-rip, at its base.

Colour: Variable, generally pale rose or violet. Mouth-arms more violet. Gonads more purple. Nettle-warts violet.

Size: Breadth of Umbrella, 50 mm. Height of Umbrella, 33 mm. Ontogenesis unknown.

Locality: Tropic zone of the Pacific Ocean, from Australia to Peru. Péron, Eschscholtz, Lesson, von Mertens, Couthouy, etc.

Species: *Pelagia papillata.*

Haeckel, System der Medusen. Seite, 509.

Umbrella slightly vaulted. Orbicular 3 times as broad as high. Exumbrella thickly set, with high conic nettle-warts. Marginal flaps twice as broad as high, deeply crenated, nearly double flapped. Manubrium very long and narrow; 8 times as long as broad, twice as long as the radius of the Umbrella. Mouth-arms short and narrow, a little shorter than the manubrium, scarcely as long as the breadth of the Umbrella. Its membrane border narrow, nearly smooth, at the base narrower than the thin middle ribs.

Size: Breadth of Umbrella, 40 mm. Height of Umbrella, 14 mm. Ontogenesis unknown.

Locality: Indian Ocean. Schnehagen.

Species. *Pelagia discoidea.*

Haeckel, System der Medusen. Seite, 510.

Pelagia discoida. Eschscholtz, 1829. System der Acalephen, p. 76, Taf. VII., fig. 1.

Placois discoidea. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 125, 165.

Umbrella quite flat, orbicular, 4 times as broad as high. Exumbrella smooth, without projecting nettle-warts. Marginal-flaps very flat, deeply crenated. Manubrium very short. Mouth-arms very long and narrow, 3 times as long as the radius of the Umbrella. Its membrane border broad, very much folded and curved, at its base several times broader than the very thin cylindrical middle rib.

Colour: Pale reddish hue. Mouth-arms rose-coloured. Gonads whitish.

Size: Breadth of umbrella, 70-80 mm. Height of Umbrella, 15-20 mm. Ontogenesis unknown.

Locality: South Atlantic Ocean, near the Cape of Good Hope. Eschscholtz.

Genus. *Chrysaora.*

Pelagidæ with 24 tentacles (3 between 2 marginal bodies) and with 32 marginal flaps, 16 ocular, and 16 tentacular.

Species. *Chrysaora fulgida.*

Haeckel, System der Medusen. Seite, 514.

Rhyzostoma fulgidum. Reynaud, 1830; in Lesson's Centurie Zoologique, p. 79, pl. 25.

Chrysaora Renaudii. Lesson, 1843. Acaléphes, p. 401.

Chrysaora Renaudii. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 166.

Umbrella semi-spherical, twice as broad as high; 32 marginal flaps short and broad, nearly semi-circular, with continuous margin. The 16 ocular and the 16 tentacular ones nearly of the same size, and equally projecting (octantes therefore with simple marginal arches), Radial pouch? Mouth-arms spread out from a narrow base, with only few folds, lancet-shaped, in the middle about half as broad as the radius of the Umbrella, 2-3 times as long as the diameter of the Umbrella. Tentacles about as long as the radius of the Umbrella.

Colour: Umbrella yellowish brown. Star figure and marginal flaps reddish brown. Mouth-arms reddish, Gonads carmine.

Size: Breadth of Umbrella, 300-700 mm. Height of Umbrella 100-200 mm.

Locality: Cape of Good Hope, False Bay. Reynaud.

Species: *Chrysaora Blossevillei.*

Haeckel, System der Medusen. Seite, 514.

Chrysaora Blossevillei, Lesson, 1829. Voyage de la Coquille. Zool., p. 115, pl. XIII., fig. 2.

Chrysaora Blossevillei. Lesson, 1843. Acaléphes, p. 401.

Lobocrocis Blossevillei. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 166.

(!) Pelagia volutata. Couthouy. Manuscr. in L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 166.

(!) Zygonema volutata. L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 127-166.

Umbrella slightly vaulted to semi-spherical, twice as broad as high. 32 marginal flaps oval, all of the same size and equally projecting (octantes therefore with simple marginal arch), Radial pouches? Mouth-arms lancet-shaped, strongly curved, shorter than the diameter of the Umbrella. Tentacles filiform, longer than the diameter of the Umbrella.

Colour: Umbrella white, with yellow tinge, and brown design. Rust coloured mouth arms.

Size: Breadth of Umbrella 100 mm. Height of Umbrella, 40 mm.

Locality: Coast of Brazil, Island Santa Catharina. Lesson.

Species. *Chrysaora plocamia.*

Haeckel, System der Medusen. Seite, 516.

Cyanea plocamia. Lesson, 1829. Voyage de la Coquille. Zool., p. 116, pl. XII., fig. 4.

Cyanea plocamia. Lesson, 1843. Acaléphes, p. 385.

Stenoptycha plocamia. S. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 162.

Umbrella nearly semi-spherical, twice as broad as high. 32 marginal flaps nearly semi-circular. The 16 tentancular and 16 ocular flaps nearly the same size, equally projecting—(marginal arch of the octants therefore circular)—Radial pouches? Mouth-arms very broad and with many folds, in the middle nearly as broad as the radius of the Umbrella. $1\frac{1}{2}$ times as long as the diameter of the Umbrella. Tentacles shorter than the diameter of the Umbrella.

Colour: Umbrella rust-colour, with yellow-brownish design. Mouth-arms without colour, with yellowish frills. Tentacles carmine.

Size: Breadth of Umbrella, 100 mm. (and more). Height of Umbrella, 50 mm.

Locality: Pacific Coast of South America, Peru, Lima, Songallan. Lesson.

Species. *Chrysaora callipurea.*

Haeckel, System der Medusen. Seite, 516.

(?) Cyanea calliparea. Reynaud, 1830. In Lesson's Centurie Zoologique, p. 67, pl. XX.

(?) Stenoptycha calliparea. L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 162.

Chrysaora dinobrachia. Haeckel, 1877. Prodrom. System Med., Nr. 446.

Umbrella slightly vaulted, 3 times as broad as high. 32 marginal flaps, kidney shaped, narrower at the base than at the distal margin. The 16 broader ocular flaps are less projecting than the 16 narrower tentacular ones (therefore the margin in the radius of the eye retracted.) 16 ocular radial-pouches oval, the same breadth in the middle, and half the breadth on the distal margin of the 16 tentacular pouches. Mouth-arms curtain-shaped, very broad and long; 3-4 times as long as the radius of the Umbrella, and curved. Tentacles flattened at the base, and longer than the diameter of the Umbrella.

Colour: Exumbrella intensely reddish yellow, rays of the star-figure (with 32 radial stripes) and marginal flaps chestnut brown. Mouth-arms yellow speckled brown. Gonads yellow.

Size: Breadth of Umbrella, 160-200 mm. Height of Umbrella, 50-100 mm.

Locality: Indian Ocean. Reynaud, Zanzibar, Schnehagen.

Genus. *Dactylometra.*

Pelagidæ, with 40 tentacles and with 48 marginal flaps.

Species. *Dactylometra lactea.*

Haeckel, System der Medusen. Seite, 517.

Dactylometra lactea. L. Agassiz, 1862. Monogr. Acal. Contributions to the Natural History of the U.S.A., IV., p. 166.

Chrysaora lactea. Eschscholtz, 1829. System der Acalephen, p. 81. Taf., VII., fig. 3.

Umbrella vaulted, semi-spherical. Mouth-arms short and broad, the 8 primary (adradial) and the 16 secundary Tentacles of equal length, 2-3 times as long as the breadth of the Umbrella. The 16 tertiary Tentacles much shorter, not so long as the basal distance between two long Tentacles.

Colour: Milky-white, slightly rose coloured. Mouth-arms colourless. Tentacles pale purple. Marginal bodies yellow.

Size: Breadth of Umbrella, 50-80 mm. Height, 30-60 mm.

Locality: Atlantic Coast of South America, Rio Janeiro. (Eschscholtz.)

Family. CYANEIDÆ.

Discomedusæ, with a simple cross-shaped mouth, surrounded by four adradial, folded mouth-arms. Gastral cavity, with 16 or 32 broad radial pouches, and branched coecal flap-canals, without a ring-canal. 8 or 16 marginal bodies, and 8 or more long hollow tentacles.

Genus. *Procyanea.*

Cyaneidæ, with 8 marginal bodies and 8 adradial alternating tentacles of the Subumbrella. There are 8 pairs of flaps on the margin of the Umbrella.

Species. *Procyanea protosema.*

Haeckel, System der Medusen. Seite, 524.

Umbrella slightly vaulted; orbicular. 2-3 times as broad as high. Manubrium quadrilateral prismatic in the upper-half, in the lower-half split into 4 narrow lancet-shaped mouth-arms. Gonads, 4 narrow simple folded bands in the lower part of the gastral cavity, but not hanging down. 16 flaps of the margin of the Umbrella pentagonal. 8 tentacles simple, strong, and larger than the diameter of the Umbrella. A good distance from the margin of the Umbrella.

Size: Breadth of Umbrella, 40 mm. Height of Umbrella, 14-18 mm. Ontogenesis unkown.

Locality: Indian Ocean, to the East of Madagascar. Rabbe.

Genus. *Medora.*

Cyaneide, with 8 marginal bodies, and 24 tentacles on the Subumbrella: 3 on the lower side of every flap. (Umbrella, with 8 main flaps and 16-32 secundary flaps.)

Species. *Medora reticulata.*

Haeckel, Das System der Medusen. Seite, 525.

Medora reticulata—(et capensis?)—Couthouy, 1862. Manuscript of Wilke's, U.S. Exploring Expedition.

Medora capensis—(reticulata?)—L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 118-163.

Umbrella slightly vaulted, orbicular, mouth-arms? Gonads? Margin of Umbrella with 32 flaps, 8 pairs of narrow ocular flaps, and 8 pairs of broad tentacle-flaps. The margin of the 8 tentacle pouches with 2 broad flaps and 3 tentacles, (1 medial tentacle between two flap pouches and with two lateral flaps at its outer-margin.)

Locality: Coast of Terra del Fuego, Orange Harbour, Cape Horn. Couthouy.

Genus. *Stenoptycha.*

Cyaneidæ with 8 marginal bodies and 40 tentacles on the Subumbrella, 5 on the under side of each tentacle flap. Umbrella with 8 main flaps and 16-32 secondary flaps.

Species. *Stenoptycha rosea.*

Haeckel, System der Medusen. Seite, 525.

Stenoptycha rosea. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 162.

Cyanea rosea. Quoy et Gaimard, 1827. Voyage de l'Uranie, etc., Zoologie, p. 570, pl. 85, fig. 1, 2.

Umbrella slightly vaulted, semi-spherical 2-3 times as broad as high. Exumbrella set with warts, covered with pointed elevations. Mouth-arms tender, richly folded curtains, about as long as the radius of the Umbrella. The margin of the Umbrella has 16 small incisions of which the 8 ocular incisions are deeper than the 8 tentacular ones. 16 flaps quadrangular, truncate. There are 5 very large tentacles on the ventral side of each main flap, they are to 10 times as long as the diameter of the Umbrella.

Colour: Pink. Margin of Umbrella and tentacles darker.

Size: Breadth of Umbrella, 200 mm. Height of Umbrella, 100 mm. Length of tentacles nearly 2 metres.

Locality: Port Jackson, Sydney. Quoy and Gaimard.

Species. *Stenoptycha Goethana.*

Haeckel, System der Medusen. Seite, 642.

Umbrella slightly vaulted, orbicular. Manubrium quadrangular-prismatic, about as long as the diameter of the Umbrella, split in the distal half into 4 oval curled mouth flaps. Gonads 4 curled, slightly bent bands in the lower Gastral wall. They are not suspended. Sixteen marginal flaps pentagonal and pointed. On the ventral side of each of the eight main flaps five tentacles. The middle one is much larger than the others and as long as the diameter of the Umbrella. The others only a third as long.

Size: Breadth of Umbrella, 40 mm. Height, 20 mm.

Locality: South Atlantic Ocean, Coast of Argentina. Smith.

Genus. *Desmonema.*

Cyaneidæ with 8 marginal bodies and numerous tentacles, which are arranged in 8 adradial bundles on the Subumbrella; all tentacles of each bundle are in a single row. Margin of Umbrella with 8 main flaps, and 16-32 secondary flaps.

Species. *Desmonema Annasethe.*

Haeckel, System der Medusen. Seite, 526.

Umbrella flat, cap shaped, 2-3 times as broad as high, mouth-arms curtain shaped, very tender and richly folded, nearly as long as the diameter of the Umbrella. Gonads are four richly folded pendant pouches, a little shorter than the radius of the Umbrella. Margin of Umbrella with 16 broad nearly pentagonal flaps. Tentacles uniserial in 8 bundles, in each bundle 5 larger, and on each side 4-6 smaller tentacles. Exumbrella depressed in the middle with 16 pinnate radial ribs.

Size : Breadth of Umbrella, 100 mm. Height of Umbrella, 40-50 mm. Length of mouth-arms, 90 mm.

Locality : South Atlantic Ocean, West Coast of South Africa. Wilhelm Bleek.

Species. *Desmonema Gaudichaudi.*

Haeckel, System der Medusen. Seite, 527.

Desmonema Gaudichaudi. L. Agassiz. Monogr. Acal. Contrib. IX., p. 166. Chrysaora Gaudichaudi. Lesson, 1829. Voyage de la Coquille. Zoophyt., p. 114, pl. XIII., fig. 1.

Umbrella semi-spherical, twice as broad as high. Mouth-arms lancet shaped as long as the diameter of the Umbrella, with narrow arm-frills, which are not curtain shaped. Gonads not pendant. Margin of Umbrella with 8 (—12 ?) broad, rounded triangular, projecting flaps, between the 8 (—12 ?) pair of narrow hidden scular flaps. Ex-umbrella with 8 (—12 ?) pinnate radial ribs.

Colour : Bright yellow, canals rust-red, tentacles claret colour.

Size : Breadth of Umbrella, 100 mm. Height of Umbrella, 40-50 mm. Mouth-arms, 100 mm.

Locality : Falkland Islands (Soledad, Maluinen). and further south to Cape Horn. Lesson.

Species : *Desmonema pendula.*

Haeckel, System der Medusen. Seite, 528.

Couthouya pendula. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 118, 163.

Nerinea pendula. Couthouy, 1862. Manuscript of Wilke's "U. S. Exploring Expedition."

Umbrella slightly vaulted, orbicular. Mouth-arm exceptionally long (several times longer than the radius of the Umbrella), with narrow arm-frills, which are not curtain-shaped. Gonads not projecting much. Margin of Umbrella with 8 broad projecting tentacle flaps, between the 8 narrow clearly distinct ocular flaps. The 8 ocular-pouches nearly as long as the 8 tentacle-pouches.

Locality: Coast of Terra del Fuego, Orange Harbour, Cape Horn, Couthouy.

Genus. *Cyanea.*

Cyaneidæ, with 8 marginal bodies and numerous tentacles, which form 8 adradial bundles on the Subumbrella. There are several rows of tentacles, one behind the other in each bundle. Margin of Umbrella, with 8 main flaps and 16-32 secundary flaps.

Species. *Cyanea Annaskala.*

Von Lendenfeld, Zeitschrift für wissenschoftlich Zoologie, Band., XXXVII. Selte, 466, Taf. XVII.—XXIV.

The Umbrella flaps are rounded and not broader at the end than at the base. Every main-flap (Ephyra-arm) consists of four flaps. Two smaller ocular flaps and two larger flaps at the sides. The Umbrella is 5-7 times as broad as high, depressed, with a few protruding nettle-warts in the centre of the Exumbrella.

Ontogenesis. The embryos hang on to the Mouth-arms until they are nearly matured to young Scyphystomæ, and then affix themselves to bodies in the water producing a long stalk with a chitinous Perisark, and eight arms. The Ephyra passes into the adult animal by a complicated metamorphosis. The Umbrella flaps are produced by fission.

Colour: Umbrella and Tentacles colourless. Entoderm of the gastral cavity brown. Mouth-arms intensely purple. Genital organs in the male rose coloured, and in the female orange yellow.

Size: 70-150 mm diameter of the Umbrella. Length of Tentacles, 300 mm.

Locality: Port Philip. Von Lendenfeld. Abundant in January, February, and March.

Genus. *Drymonema.*

Cyaneidæ, with eight sense organs, which lie remote from the margin of the Umbrella, in deep excavations. Tentacles scattered over the whole surface of the Subumbrella and arranged radially, branched ridges of the gallert lie between them.

Drymonema Gorgo.

Fritz Müller. Zoologischer Anzeiger. Band., VI., Seite, 220.

The Mouth-arms are longer than in other species, attaining a length 2 or 3 times that of the breadth of the Umbrella. The Umbrella possesses $8 \times 20 \times 16 = 176$ marginal flaps.

Size : 300 to 500 mm., the diameter of the Umbrella. Tentacles, 10 meters or more.

Locality : Rio de Janeiro. Fritz Müller.

Genus. *Melusina.*

Cyanidæ, with 16 marginal bodies and 16 bundles of tentacles, they are attached in several rows. Margin of Umbrella, with 16 main and 64 secundary flaps.

Species. *Melusina formosa.*

Haeckel, System der Medusea. Seite, 535.

Umbrella, flat disc-shaped, 3-4 times as broad as high. Mouth-arms curtain-shaped, richly folded, longer than the diameter of the Umbrella. Gonads richly folded, suspended sacks, nearly as long as the Mouth-arms. Umbrella margin with 64 flaps, which are divided from each other by deep incisions. The 32 ocular flaps half as long as the 32 tentacular flaps. Tentacles numerous and long.

Size : Diameter of Umbrella, 100 mm. Height, 32 mm.

Locality : Pacific coast of South America. Station 299, of the "Challenger." W. Thomson.

Family. *Flosculidæ.*

Discomedusæ, with simple unbranched narrow radial canals and with a ring canal. With central mouth and mouth-arms at the end of a mouth tube.

Genus. *Floscula.*

Flosculidæ, with 8 marginal bodies and with 8 adradial tentacles, alternating with the organs of sense. 16 marginal flaps.

Floscula Promethea.

Haeckel, System der Medusen. Seite, 536. Tafel, XXXII., figs. 1, 4.

Umbrella flat, slightly vaulted, 2-3 times as broad as high Exumbrella, with an octoradiate pigmented star. Marginal flaps nearly pentagonal, as long as broad. Tentacles about as long as the diameter of the Umbrella. Mouth-tube about as long as the radius of the Umbrella, and of the same length as the lancet-shaped curled mouth-arms.

Size : Breadth of Umbrella, 20 mm. Height, 8 mm.

Locality : Indian Ocean, in the vicinity of the Cocos Islands. Rabbe.

Floscula Pandora.

Haeckel, System der Medusen. Seite, 643.

Umbrella, semi-spherical, twice as broad as high. Exumbrella, with pigment-star. Marginal flaps oval, $1\frac{1}{2}$ times as broad as long. Tentacles as long as the radius of the Umbrella. Manubrium half as long as the Umbrella radius, scarcely a quarter of the length of the narrow lancet-shaped mouth-arms.

Size : Breadth of Umbrella, 30 mm. Height, 15 mm.

Locality : Tropic Zone of the Pacific Ocean. Weber.

Genus. *Floresca.*

Flosculidæ with 8 marginal bodies, 24 tentacles and 32 marginal flaps.

Floresca Parthenia.

Haeckel, System der Medusen. Seite, 538. Tafel, XXXII., figs. 5, 8.

Umbrella flat, barrett-shaped, twice as broad as high. Exumbrella with a pigment star of 16 rays. Marginal flaps oval, pointed, broadest in the middle, twice as broad as long. Tentacles

2-3 times as long as the diameter of the Umbrella. Manubrium $1\frac{1}{2}$ times as long as the Umbrella radius, the same length as the richly folded oval mouth-arms.

Size: Diameter of Umbrella, 30 mm. Height, 3 mm.

Locality: New Caledonia. Levasseur.

Floresca palladia.

Haeckel, System der Medusen. Seite, 539.

Umbrella slightly vaulted, 3-4 times as broad as high. Exumbrella with a pigment star of 16 rays. Marginal flaps nearly quadratic. Tentacles as long as the diameter of the Umbrella. Manubrium scarcely as long as the Umbrella. Umbrella radius not quite half as long as the 4 narrow lancet-shaped mouth-arms.

Size: Breadth of Umbrella, 40 mm. Height, 12 mm.

Locality: New Guinea. Koch.

Family. *Ulmaridæ.*

Dicomedusæ with simple central mouth, and four mouth-arms, with branched, narrow, radial canals, and with a ring canal. Tentacles hollow and long.

Genus. *Ulmaris.*

Ulmaridæ with 8 marginal bodies, with 8 adradial tentacles, which alternate with the sense organs, and with sixteen marginal flaps.

Ulmaris prototypus.

Haeckel, System der Medusen. Seite, 445. Tafel, XXXIII. Figur. 1-4.

Umbrella flat, 2-3 times as broad as high. Manubrium square in its proximal part, in its distal part split into four oval mouth-arms, which are much curled and as long as the Umbrella radius. Gonads 4 narrow slightly bent bands, forming nearly a closed ring. Marginal flaps pointed, about as long as broad. Tentacles as long as the diameter of the Umbrella.

Size: Breadth of Umbrella, 30 mm. Height, 12 mm.

Locality: St. Helena. Levasseur.

Genus. *Aurelia.*

Ulmaridæ with 8 marginal bodies and with 8 broad adradial, sometimes bipartate velar flaps, each of which bears on its dorsal side, some distance away from the margin, a row of numerous short tentacles. Alternating with as many dorsal flaps. Mouth-arms simple.

Species. *Aurelia colpota.*

Haeckel System der Medusen. Seite, 555.

Aurelia colpota. Brandt, 1838. Memoires de l'Academie Imp. des Sciences, St. Petersburgh. Tome IV., p. 370, tab. IX.

Aurelia colpota. L. Agassiz, 1862. Monogr. of Acal. Contrib. to the Nat. H. of the U. S. A. Vol. IV., p. 160.

Monocraspedon colpotus, 1835. Brandt. Prodrom. Descript. Animal. Mertens, p. 25.

Umbrella flat or vaulted, 2-3 times as broad as high. 8 velar flaps of the Umbrella margin not protruding, divided from each other by small and shallow ocular incisions only. Mouth-arms slightly longer than the radius of the Umbrella. Much flapped. Deeply incised and broad at the base. Umbrella radius double the size of the radius of the Genital Organs. At every Genital bay, 5 canal roots. 16 anastomosing canal nets, with very elongate meshes.

Colour: Pale reddish. Gonads and tentacles rose-coloured.

Size: Diameter of Umbrella, 100-120 mm. Height, 40-50 mm.

Locality: Indian Ocean, 35° S., 334° W. Mertens. Coast of Capland. Bleek.

Species. *Aurelia clausa.*

Haeckel, System der Medusen. Seite, 558.

Aurelia clausa. Lesson, 1829. Voyage de la Coquille. Zool., p. 119.

Aurelia clansa. L. Agassiz, 1862. Mongr. of Acal. Contrib. to the Natural pl. of the U. S. A. Vol. IV., p. 160.

Claustra pissinbogue. Lesson, 1843. Acalèphes, p. 78.

Ocyroe lineolata ? Péron et Leseur, 1809. Tableaux des Meduses, p. 355.

Cassiopæa lineolata? Lamarck, 1817. Système des Animaux sans vertèbres. Tome. II., p. 511.

Umbrella semi-spherical, twice as broad as high. 16 velar flaps of the Umbrella margin protruding. Mouth-arms narrow, thin, and curled; they coalesce at the base; with a large oval, pointed lip-like thickening. The four labial thickenings can close (?) the entrances to the sub-genital pouches.

Colour: Ovaries, canals, and tentacles rose coloured.

Size: Breadth of Umbrella, 80-100 mm. Height, 40-50 mm.

Locality: South Pacific Ocean, Port Proslin, New Ireland. Lesson. Australia (?) Péron.

Aurelia coerulea. nov. sp.

The Umbrella is very flat, about 5 times as broad as high, with 16 small ocular and 16 velar flaps, divided from the former by deep incisions, but from each other only by a shallow groove. The mouth-arms are broad and a little longer than the margin of the Umbrella. They are rounded at the end. The centrifugal branches of the canal system, divide at larger angles than in other species, so that the ramification has by no means a slender appearance. There are very few amostomoses only.

It differs from Aurelia aurita, Lamark, by its broader mouth-arms, the margins of which are not curled, and by the stubby appearance of the canal system. In these respects Aurelia colpota, Brandt, resembles A. coerulea. The colour of our species is similar to that of A. aurita, but fainter and always decidedly blue. A. colpota also differs from our species in colour A. flavidula, Péron et Leseur, possesses flaps at the base of the mouth-arms, and has a yellow tinge. A. marginalis, L. Agassiz, has much smaller mouth-arms. A. hyalina, Brandt, again possesses lancet-shaped mouth-arms. A. labiata Chamisso et Eysenhardt possesses 16 velar flaps like our species, but these are divided from each other by deep incisions. In A. clausa, Lesson, the mouth-arms are narrow and curled, and the colour is red. In A. limbata, Brandt, there also are 16 very distinct velar-flaps, and the tentacles are brown.

Similar in appearance, to one or other of these species, it still appears advisable to distinguish Aurelia coerulea from these. The main feature of our species are the broad and smooth mouth-arms.

Colour: Transparent and blue. Only the hoof-shaped Gonads reflect the light, and appear white or light rose-coloured as in Aurelia aurita.

Size: Diameter of Umbrella, 110 mm. Height, 20-30 mm.

Ontogenesis: I have obtained a single Larva measuring 9 mm, this being similar to corresponding stages in Europæon Aurelias, we may suppose that the Ontogenesis of our species is similar to that of Aurelia aurita.

Locality: Port Jackson. Von Lendenfeld.

Genus. *Aurosa.*

Ulmaridæ, with 8 marginal bodies, and 8 broad adradial velar-flaps, each of which bears at its upper side, a little distance from the margin of the Umbrella, a row of numerous short tentacles alternating with the same number of much smaller dorsal flaps. Mouth-arms dichotomous.

Species. *Aurosa furcata*

Haeckel, System der Medusen. Seite, 559.

Umbrella flat, orbicular. The 8 velar-flaps of the margin of the Umbrella slightly projecting, divided by small ocular-pouches. Mouth-arms a little longer than the Umbrella radius, very thick. Divided into two lobes by a deep incision in their distal part. Very much curled at the margin. Umbrella radius twice as long as the genital radius. At every genital bay five canal roots connected with each other, and with the four perradial ocular canals by numerous Anastomoses. Canal-net dense with rounded meshes, which are half as large in the outer than in the inner zone.

Size: Diameter of Umbrella, 80 mm. Height, 30 mm.
Locality: Indian Ocean, Cocos Islands. Rabbe.

Family. *Toreumidæ.*

Discomedusæ without tentacles and without central mouth, with four sub-genital cavities, and with ventral suction crisps on the mouth-arms.

Genus. *Archirhiza.*

Toreumidæ, with 8 simple mouth-arms, neither branched nor furcated. Mouth-arms without vesicles and filaments with 16 radial canals and a ring canal, with 8 marginal bodies.

Archirhiza aurosa.

Haeckel, System der Medusen. Seite, 645.

Umbrella flat, disc shaped, margin with 80 flaps, in every Octant 8 oval, pointed velar flaps between 2 broad triangular ocular flaps. Mouth-arms $1\frac{1}{2}$ times as long as the Umbrella-radius, conic, simple, with simple suction crisp.

Size : Breadth of Umbrella, 50 mm. Height, 20 mm.

Locality : New Zealand. Weber.

Species. *Archirhiza primordialis.*

Haeckel, System der Medusen. Seite, 565. Tafel, XXXVI. Figur. 1, 2.

Umbrella slightly vaulted, hat-shaped or semi-spherical. 2-3 times as broad as high. Umbrella margin with 48 marginal flaps. In every Octant four large pointed velar flaps and two small ocular flaps. Mouth-arms about as long as the Umbrella-radius, cylindrical, simple and undivided ; on the axial margin with simple zig-zag shaped suction crisp.

Size: Diameter of Umbrella, 40 mm. Height, 20 mm.

Locality : Bass's Straits. Smith.

Genus. *Toreuma.*

Toreumidæ with 8 feathered or trichotome branched mouth-arms. The upper arm is continued in the adradial main branch of the underarm. Numerous club-shaped vesicles between the arm-crisps. 16 radial canals, 8 marginal bodies.

Toreuma theophila.

Haeckel, System der Medusen. Seite, 566.

Cassiopaea dieuphila. Péron et Leseur, 1809. Tableau des Meduses, p. 356.

Cassiopaea theophila. Lamarck, 1817. Hist. Nat. Animaux sans Vertébres. Tome, II., p. 511.

Rhizostoma theophila. Eschscholtz, 1829. System der Acalephen. Seite, 53.

Polydoma theophila. L. Agassiz, 1862. Monogr. of the Acal. Contrib. to the Nat Hist. of the U. S. A. Vol. IV., p. 159.

Umbrella semi-spherical 2-3 times as broad as high. Margin with 96 short coalescing flaps, in each Octant 10 velar flaps between two very small ocular flaps Ex-umbrella roughly granulated, studded with warts with small oval white spots on the marginal flaps. 8 arms about as long as the Umbrella-radius. With 3 or 4 pair of broad and flat main branches. Between the clusters of crisps numerous, small, and 10 or 20 large club-shaped vesicles. The latter 2 or 3 times as long as the breadth of the main branches.

Colour: Umbrella brownish-red, with white spots on the margin flaps. Gonads and vesicles white.

Size: Diameter of Umbrella, 60-80 mm. Height, 20-30 mm.

Locality; N.W. Coast of Australia, de Witt's Land. Péron.

Species. *Toreuma thamnostoma.*

Haeckel, System der Medusen. Seite. 567.

Umbrella flat, hat-shaped. 3-4 times as broad as high, with 120-160 marginal flaps which are short, truncate, and scarcely protrude. In every Octant 14-18 velar flaps between two very small ocular flaps. Ex-umbrella finely granulated with umerous white spots on a dark ground. Mouth-arms double as long as the Umbrella radius, branched in corymbose manner, with 6-8 pair of cylindrical main branches. Numerous small vesicles not larger than the marginal flaps.

Colour: Umbrella, dark brown, with numerous white spots, dorsal side of arms white, ventral side brown. Vesicles white.

Size: Breadth of Umbrella, 90 mm. Height, 30 mm.

Locality: Indian Ocean. Schnehagen.

Species. *Toreuma Gegenbauri.*

Haeckel, System der Medusen. Seite, 645.

Umbrella flat. In every Octant 8 rectangular velar, between two rudimentary ocular flaps. Ex-umbrella papillous, with an oval white spot on every flap. Arms $1\frac{1}{2}$ times as long as the Umbrella-radius with 4-6 pair of flattened main branches. Between the crisps numerous small vesicles, one very large at the base of each arm, half as long as the arm.

Size: Diameter of Umbrella, 60 mm. Height, 20 mm.

Locality: Tropic part of Indian Ocean. Rabbe.

Genus. *Cassiopea.*

Toreumidæ, with 8 pinnate or trichotome branched mouth-arms. The upper arm extends as main branch to the end of the lower arm. Numerous club-shaped vesicles. 32 radial canals, 16 marginal bodies.

Species. *Cassiopea Andromeda.*

Haeckel, System der Medusen. Seite, 569.

Cassiopea Andromeda. Eschscholtz, 1829. System der Acalephen. Seite 43.

Cassiopea Andromeda. Tilesius, 1829. Nova Acta. phys. med., N. C. Band., XV. Seite, 266. Tafel., LXIX., LXX.

Cassiopea Andromeda. Milne Edwards, 1849. Cuvier, Regne. Animal Zoophytes, pl. LI., fig. 1.

Cassiopea Forskalea. Péron et Leseur, 1809. Tableau des Meduses, p. 356.

Medusa Andromeda. Forskal, 1775. Descript. Icones. Anim. itin. orient., p. 107, Tab. XXXI.

Medusa Andromeda. Modeer, 1791. Nova. acto. Phys. med. VIII. Appendix p. 30, Nr. 24.

Umbrella flat. In each of the 16 paramers 3 velar flaps between two ocular flaps.

Exumbrella, with 96 white radial spots. 16 large ocular and 16 × 5 smaller marginal spots. Arms broad and compressed, flat, scarcely as long as the Umbrella radius, with 2-3 pair of flat and short, curled main branches. Numerous small and 8-10 large vesicles on each arm.

Colour: Very variable. Exumbrella reddish—or violet—brown, with white spots between the black radial stripes; margin mostly blueish or violet, arms olive green or red brown, with white spots.

Size: Diameter of Umbrella, 100-120 mm. Height, 20-30 mm.

Locality: Red Sea. Tur., Forskal, Ehrenberg, Haeckel. India, Smith. Sundasea, Sumatra, Tilesius.

Species. *Cassiopea ornata.*

Haeckel, System der Medusen. Seite, 570, Tafel, XXXVII.

Umbrella flat. In each paramere 3 velar flaps between two rudimentary ocular flaps.

Exumbrella, with 96 radial white spots. 16 tongue-shaped ocular specs and 16 × 5 smaller marginal spots. Arms slender, cylindrical, a little longer than the Umbrella. Radius, with 3-4 slender, densely pinnate main branches. Numerous small vesicles.

Size: Diameter of Umbrella, 100-120 mm. Height, 30-40 mm.

Locality: New Guinea, Koch. Pelew Islands, Weber. Australia, Godeffroy.

Species. *Cassiopea depressa.*

Haeckel, System der Medusen. Seite, 572.

Umbrella flat. Margin in each paramer, with 7 velar and two ocular flaps. Exumbrella without radial spots. Arms very flat shorter than the radius of the Umbrella, with 3-4 pair of short, broad and curled main branches. Very small white vesicles.

Size: Breadth of Umbrella, 100-120 mm. Height, 15-20 mm

Locality: Madagascar, Levasseur. Querimba Islands, Mossambique, Peters, Genus. *Cephea.*

Toreumidæ, with eight bifurcated mouth-arms, the branches of which are simple and not dichotomous. The upper arm does not extend beyond the bifurcation. Between the suction crisps numerous filaments. 8 broad ocular canals, between which there are numerous narrow radial canals. Without ring canal. 8 marginal bodies.

Species. *Cephea fusca.*

Haeckel, System der Medusen. Seite, 575.

Cephea fusca. Péron et Leseur, 1809. Tableau des Meduses, p. 361.

Cephea fusca. Eschscholtz, 1829. System der Acalephen. Seite, 57.

Cassiopea fusca. Dussumier, 1835. Musée. du Jardin des plantes. Nr. 111.

Polyrhiza fusca. L. Agassiz, 1862. Monogr. of Acalephæ. Contrib. to the Nat. Hist. of the U.S.A., Vol. IV., p. 156.

Umbrella cap-shaped. Central dome flat, vaulted. Covered with 16 or 20 large conic excrescences. Divided from the thin margin of the Umbrella by a deep circular furrow. In every Octant 8 flaps which appear as secundary flaps of one large primary one which lies between the two ocular flaps. The two flat branches of the under arm three times as long as the simple upper arm. They do not reach to the margin of the Umbrella. Filaments numerous decreasing in size centrifugally. The longest as long as the Umbrella radius.

Colour: Umbrella, dark brown. Exumbrella with 8 white radial stripes. Arms yellowish, filaments white.

Size: Breadth of Umbrella, 150 mm.; height, 30 mm.

Locality: N.W. coast of Australia, de Witt's land. Péron et Leseur. Malabar. Dussumier.

Species. *Cephea conifera.*

Haeckel, System der Medusen. Seite, 576. Tafel, XXXVI., figs. 3-6.

Umbrella similar to a mitre. Central dome with a very thick wall, flat bell-shaped, thickly set with 20 or 30 large and many small granulated conic protuberances. Deep circular groove. In every Octant 8 large rectangular coalescing velarflaps between two small deeply-set ocular flaps. The two compressed forks of the arm double as long as the upper arm. Their distal ends projecting beyond the margin of the Umbrella. Filaments long and numerous. Four particularly stout ones on the Pillar-forks.

Size: 100-120 mm. diameter of Umbrella; height, 30-40 mm.

Locality: Carolina Islands, Samoa Islands. Godeffroy.

Genus. *Polyrhiza.*

Toreumidæ with 8 bifurcate mouth arms, the branches are doubly bifurcate or dichotomous. The upper arm extends beyond the first bifurcation. Long brachial filaments between the crisps, 8 large ocular canals, and between them numerous smaller radial canals. Without evident ring canal. 8 marginal bodies.

Species. *Polyrhiza homopneusis.*

Haeckel, System der Medusen. Seite, 577.

Homopneusis frondosa. Lesson, 1829. Voyage de la Coquille, Mollusques, plate. XII.

Homopneusis frondosa. L. Agassiz, 1862. Monogr. of Acal. Contrib. to the Nat. H. of the U.S.A. Vol. IV., p. 159.

Umbrella flat cap-shaped. The central Umbrella disc flat. Depressed in the centre. With 16 simple radial furrows. Deep circular groove. Margin centrifugal of this groove as broad as the central part. In every Octant 8 short, pointed velar flaps between two small ocular flaps. Arms much dichotomously branched, each with 6 or 8 thicker branches. Filaments short and numerous. Arm branches projecting far beyond the margin of the Umbrella.

Size: Diameter of Umbrella, 60-80 mm. Height, 15-20 mm. (?)

Locality: New Guinea. Waigan Islands. Lesson.

Species. *Polyrhiza orithyia.*

Haeckel, System der Medusen. Seite, 578.

Orinhyia incolor. Quoy et Gaimard, 1833. Voyage de l'Astrolabe. Zoophytes. Tom IV., p. 297, pl. XXV., figs. 6-10.

Salamis toreumata. Lesson, 1843. Acalèphes, p. 343.

Salamis toreumata. L. Agassiz, 1862. Monogr. of Acal. Contrib. to the Nat. H. of the U.S.A. Vol. IV., p. 159.

Umbrella deep cap-shaped. The central Umbrella-disc flat and thick. Depressed in the centre with ramified radial furrows. With deep circular groove. In every Octant 8 short and truncate velar, and 2 small ocular flaps. Arms much dichotomously branched; with 8-10 larger branches. Filaments numerous and short. Longer towards the centre. Arm branches projecting beyond the Umbrella.

Locality: Molucca Sea. Quoy et Gaimard.

Family. *Pilemidæ.*

With no mouth, and many suction openings along the arms, without tentacles. With 4 sub-genital cavities, and with dorsal and ventral suction crisps on the arms.

Genus. *Toxoclytus.*

Pilemidæ without scapulets with 8 free triangular pyramidal arms, the three broad pinnate wings of which bear simple suction crisps on their free margins, with long filaments.

Species. *Toxoclytus roseus.*

Haeckel, System der Medusen. Seite, 586.

Toxoclytus roseus. L. Agassiz, 1862. Monogr. of Acal. Contrib. to the Nat. H. of the U.S.A.

Rhizostoma resea. Reynaud, 1830. Lesson. Centurie Zoologique, p. 97, pl. XXXIV.

Umbrella flat hat-shaped; in every Octant 5 or 6 velar-flaps between 2 ocular flaps (?). Arms scarcely as long as the radius of the Umbrella. The upper arm cylindrical, and about as long as the triangular prismatic lower arm. Suction crisps broad and deeply incised.

Colour: Pale rose-coloured Gonads; marginal flaps and suction crisps, deep rose-coloured.

Size: Not mentioned.

Locality: Tropic zone of the Atlantic. Reynaud.

Genus. *Lychnorhiza.*

Pilemidæ without scapulets, with 8 free triangular pyramidal arms. The wings bear on their free margin numerous thick suction crisps and filaments.

Species. *Lychnorhiza lucerna.*

Haeckel, System der Medusen. Siete, 587. Tafel, XXXIV.

Umbrella flat. Every Octant with 4 large pointed oval velar, and 2 small triangular ocular flaps. Arms nearly as long as the diameter of the Umbrella. Upper arm $\frac{2}{3}$ as long as the lower arm. Laterally compressed and extending below to a broad triangular shoulder-flap. Lower arm triangular pyramidal, with 2 very broad and much flapped dorsal wings, and one smaller ventral wing. Suction crisps much flapped with numerous long, ribbon-shaped filaments.

Size: Diameter of Umbrella, 120-150 mm. Height, 50-60 mm.

Locality: Rio de Janeiro. Von Martens.

Genus. *Eupilema.*

Pilemidæ with 8 pair of scapulets, and with free triangular pyramidal lower arms. The three wings of these bear suction crisps on their free margins, but no other appendages. Without terminal bulbs.

Species. *Eupilema scapulare.*

Haeckel, System der Medusen. Seite, 590.

Umbrella flat hat-shaped, with vaulted dome. In every Octant 8 pair rectangular, narrow and long truncate velar flaps. The 16 intra-circular canal nets touch the distal basis of the mouth-pillars Stem of disc cubic, narrow, not broader than the pillars. Arms about as long as the radius of the Umbrella. Scapulets of the same size and shape as the free part of the upper arm; a little shorter than the broad lower arms.

Size: Diameter of Umbrella, 150 mm. Height, 50 mm.

Locality: Sunda Archipel. Sumatra. Weber.

Species. *Eupilema claustra.*

Haeckel, System der Medusen. Seite, 591.

(?) Claustra Mertensii. Lesson, 1843. Acalèphes, p. 379.

(?) Cyanea (!) Rhizostoma. Brandt, Mem. Acad. St. Petersburgh. Tom. IV., p. 388, 407, tab. XXXI.

Umbrella flat hat-shaped. In every Octant 6 broad tri-angular velar, and two small lancet shaped ocular flaps. The intra-circular canal net arcades are distant from the mouth-pillars as much as their own breadth.

Stem of disc, cubic, double as thick as the mouth pillars, arms $1\frac{1}{2}$ times as long as the radius of the Umbrella. Scapulets half as long as the free part of the upper arm, which is a little longer than the broad lower arm.

Size: Diameter of Umbrella, 200 mm. Height, 70 mm.

Locality: Marquesas Islands. Smith.

Genus. *Pilema.*

Pilemidæ with 8 pair of scapulets, with free, triangular, pyramidal, lower arms. The three wings of these bear on their free margin suction crisps, but no other appendages. At the terminal end of each arm a club-shaped or triangular bulb without suction crisps.

Species. *Pilema capense.*

Haeckel, System der Medusen. Seite, 645.

Cephea capensis. Quoy et Gaimard, 1824. Voyage de l'Uranie, p. 568, pl. LXXXIV., fig 9.

Rhizostoma capensis. Lesson, 1843. Acalèphes, 417.

Umbrella semi-spherical. In every Octant six broad semicircular velar flaps between two pointed triangular ocular flaps. (?)

Upper arm about as long as the lower arm. Terminal bulb adnate, triangular, pyramidal with toothed edges, half as long as the upper arm.

Size: 200-300 mm., the diameter of the Umbrella, and 80-100 mm. in height. (?)

Locality: Table Bay, Cape Town. Quoy et Gaimard.

Genus. *Rhopilema.*

Pilemidæ with 8 pair of scapulets and with 8 free triangular, pyramidal lower arms. The three wings bear on their free margin between the suction crisps numerous club-shaped appendages of similar shape as the terminal bulbs.

Species. *Rhopilema rhopalophora.*

Haeckel, System der Medusen. Seite, 596.

Umbrella, hat-shaped, in every Octant 16 narrow rectangular velar flaps between two short lancet-shaped ocular flaps. Scapulets as long as the free part of the upper arms, half as long as the lower arm. On the free margin of the three wings there are between the flapped suction crisps numerous triangular pyramidal gallert bulbs of the same shape as the larger terminal bulb of the arms.

Size: Diameter of Umbrella, 100 mm. Height, 50 mm.

Locality: To the East of Madagascar. Rabbe.

Genus. *Brachiolophus.*

Pilemidæ with 8 pair of scapulets and with dichotomous branched lower arms, which coalesce at their base with their lateral margins, but otherwise remain free. The coecal thick-walled Manubrium does not reach as far down as the first bifurcation of the arms.

Species. *Brachiolophus collaris.*

Haeckel, System der Medusen. Seite, 597.

Umbrella semi-spherical, twice as broad as high. In every Octant 8 quadratic velar flaps between two oval ocular flaps.

Armbush truncate, conic, extending laterally downward. Projecting a good deal beyond the margin of the Umbrella. Scapulets with their upper margin in the level of the margin of the Umbrella.

Size : Diameter of Umbrella, 80 mm. Height, 40 mm.

Locality : Galopagas Islands. Fuchs.

Genus. *Stomolophus.*

Pilemidæ, with 8 pair of scapulets and dichotomous branched lower arms; which coalesce in the greater part of the length of their sides. Only the terminal branches remain free. The coecal thick walled Manubrium extends beyond the first bifurcation of the arms.

Species. *Stomolophus fritillaria.*

Haeckel, System der Medusen. Seite, 598. Tafel, XXXV.

Umbrella highly vaulted; higher than semi-spherical. In every Octant 24 stump rectangular velar flaps between two oval, pointed protruding ocular flaps. Armbush stubbed conic extended downward protruding beyond the margin of the latter, scarcely $\frac{1}{4}$ of the height of the Umbrella. Scapulets hidden in the depth of the Umbrella.

Size : Breadth of Umbrella, 80 mm. Height, 60 mm.

Locality : Atlantic Coast of South America. Surinam.

Family. *Chaunostomidæ.*

With a single sub-genital cavity, and a mouth in the lower side of the brachial disc, with eight arms, the ventral side of which contains a deep groove. Arms branched dichotomously. Secundary and tertiary branches arranged somewhat pinnate, without marginal tentacles.

Genus. *Pseudorhiza.*

With one large filament at the bifurcation of the arm.

The canal system consist of 16 radial canals, and a ring canal. Centrifugally from the ring-canal we find an anostomosing network of canals, whilst centripetally there are between two adjacent main radial canals, 10 canals running from the ring-canal in a radial direction centripetally.

Species. *Pseudorhiza aurosa.*

PLATE III.

Von Lendenfeld. Zoologischer Auzeiger, Nr. 116. Band V., Seite, 380.

Umbrella 3 or 4 times as broad as high, with a reticulate figure on the dorsal side. In every octant between the two long and narrow ocular flaps there are 6 velar flaps, each of which consists of three secundary flaps. Arms about as long as the diameter of the Umbrella.

Colour: Umbrella colourless, with a violet reticulate figure covering the Exumbrella. Entoderm of Gastral cavity, brown. Upper part of mouth, arm-grooves, rose-coloured. Arm colourless and transparent. Frills along the margin of the grooves, and distal end of long filament richly violet.

Size: Diameter of Umbrella, 400 mm. Thickness of gallert of Umbrella, 30 mm. Brachial disc, 220 mm. in diameter, and 25 mm. in thickness.

Ontogenesis: The embryos are carried about in pouches suspended in great number from the radial canals, which run centripetally from the ring canal. They remain there till they are fit to turn into Scyphystomas, then escape and affix themselves with the aboral pole to any free submerged surface. The Scyphystoma does not differ from other Scyphystomas.

Locality: Port Phillip. Von Lendenfeld. Glenelg. Haacke.

Family. *Versuridae.*

Discomedusæ without tentacles and central mouth, with a single central sub-genital porticus, and with ventral suctorial crisps of the 8 mouth arms (without dorsal suctorial crisps).

Genus. *Hoplorhiza.*

Versuridae with 8 simple, free, neither branched nor fork-shaped, mouth-arms, which do not coalesce with their lateral walls.

Species. *Hoplorhiza simplex.*

Haeckel, System der Medusen. Seite, 609.

Umbrella flat orbicular with 48 marginal flaps (in each Octant 4 large square velar-flaps between 2 tongue-shaped projecting ocular-flaps), 8 arms quite simple, cylindrical, as long as the radius of the Umbrella. Sub-genital ostia about as broad as the distance between them.

Size : Breadth of Umbrella, 50 mm. Height of Umbrella, 20 mm. Ontogenesis unknown.

Locality : South Australia. Bass' Straits. Mueseum, Godeffroy.

Species. *Hoplorhiza punctata.*

Haeckel, System der Medusen. Seite, 604.

Umbrella slightly vaulted with 176 marginal flaps (in each Octant 10 pair of narrow round velar flaps, between 2 small recurved ocular flaps), 8 arms quite simple, cylindrical, half as long as the radius of the Umbrella. Sub-genital-ostia 3 times as broad as the pillars.

Colour : Exumbrella dark violet-brown, equally speckled with white spots.

Size : Breadth of Umbrella 40 mm. Height of Umbrella, 20 mm. Ontogenesis unknown.

Locality : Coast of North Australia, Arnheim's Land. T. M. Elsey.

Genus. *Cannorhiza.*

Versuridæ with 8 simple, neither branched nor fork-shaped mouth-arms, which are connected with their side-margins, and form together a octagonal tube with an opening underneath.

Species. *Cannorhiza connexa.*

Haeckel, System der Medusen. Seite, 605.

Umbrella flat, orbicular, with 80 marginal flaps (in each Octant 8 narrow rectangular velar flaps between 2 oval pointed ocular flaps.) Brachial tube formed by the lateral concrescing of 8 cylindrical simple mouth-arms, a little longer than the radius of the Umbrella. Above half as broad as long, below the same breadth. The 4 wide sub-genital ostia about as broad as the strong and free pillars between them. Brachial disk about as broad as the radius of the Umbrella.

Size: Breadth of Umbrella, 80 mm. Height of Umbrella, 30 mm. Oetogenesis unknown.

Locality: South Pacific Ocean, near New Zealand. Smith.

Genus. *Versura.*

Versuridæ with 8 pinnate or trichotome branched mouth-arms, the upper part of the arm continues to the under adradial main branch of the under arm as far as its distal end. Numerous club-shaped vesicles between the branchial frills. Mouth cross with 4 rays, with perradial forked suetorial crisps, without central frills.

Species. *Versura palmata.*

Haeckel, System der Medusen. Seite, 606.

Umbrella quite flat, scutiform, with continuous margin, 8 slight ocular incisions. and 112 marginal flaps which coalesce (in each Octant 12 narrow, rectangular velar flaps, between 2 rudimentary ocular-flaps which are quite joined). Sub-genital-ostia twice as broad as the pillars between. Arms a little shorter than the radius of the Umbrella, pinnate nearly hand-shaped, flat, spread out, as long as broad.

Size: Breadth of Umbrella, 60 mm. Height of Umbrella, 20 mm. Ontogenesis unknown.

Locality: Sunda Sea, Java, Cherebon, Andréa.

Species. *Versura pinnata.*

Haeckel, System der Medusen, 607.

Umbrella, flat, orbicular, with 8 deep ocular incisions and 144 marginal flaps which coalesce, (in each Octant 16 quadratic velar flaps between two small triangular ocular flaps). Sub-genital-ostia as broad as the pillars between. Arms a little longer than the radius of the Umbrella, pinnate flat, spread out twice as long as broad.

Size: Breadth of Umbrella, 80 mm. Height of Umbrella, 3 mm. Ontogenesis unknown.

Locality: Indian Ocean, near the Cocos Islands. Rabbe.

Species. *Versura vesicata.*

Haeckel, System der Medusen. Seite, 645.

Umbrella flat, scutiform, with 8 deep ocular incisions, 208 coalescing marginal flaps (in each Octant 24 narrow rectangular velar flaps between 2 rudimentary ocular flaps). Sub-genital ostia half as broad as the pillars between them. Arms about as long as the radius of the Umbrella, doubly pinnate, flat, spread out as long as broad.

Locality: Australia (North-west Coast. ?). Weber.

Genus. *Phyllorhiza.*

Versuridæ, with 8 pinnate mouth-arms. The Pinnæ are only rudimentary and appear connected by a membrane, so that the whole arm attains an extended leaf-shaped appearance.

Phyllorhiza punctata. Nov. sp.

Plate IV.

The Umbrella is nearly semi-spherical, and about half as high as broad. The Umbrella margin bears in every Octant two sickle-shaped ocular flaps, four simple and four double flaps, all of which taper centrifugally and are truncate. These flaps consist of thick gallert and are connected by thin membranes. Radial furrows extend centripetally from the fissions towards the centre of the disc. The sub-genital ostia are large and oval, more than twice as broad as the pillars of the brachial disc. The brachial disc is thick and a little more than half as broad as the Umbrella. octagonal, with a canal system of its own, and thickly set on its ventral side with filaments to which the young gastrulæ-embryos adhere. The mouth-arms are $\frac{2}{3}$ as long as the diameter of the Umbrella.

Colour: Brachial disc, and stem and branches of mouth-arms and also the ground substance of the gallert of the Umbrella colourless. In the gallert of the Umbrella, close to the surface, are groups of "yellow cells," Zooxanthellæ which give the whole a brown colour. Towards the Exumbral surface there are clouds of strongly refracting minute bodies in the gallert, which give our animal the spotted appearance, from which I have derived the specific name. The suctorial crisps are brown. The long stalked suction naps (Peitschen filamente) are colourless and transparent.

Size: Breadth of Umbrella, 500 mm. Thickness of Exumbrella, 50 mm. Mouth-arms, 300 mm. Filaments, 200 mm. long, and at the base 10 mm. thick.

Ontogenesis: The young embryos adhere to the mother's filaments until they have nearly attained the scyphystoma stage. The ephyra is brown spotted. The young medusa goes through a complicated metamorphosis, passing through stages with 24 and 16 marginal bodies.

Locality: Port Jackson. Von Lendenfeld.

Family. *Crambessidæ.*

Discomedusæ, without central mouth and tentacles, with a single central sub-genital porticus and with dorsal and ventral suctorial crisps and 8 mouth-arms.

Genus. *Cramborhiza.*

Crambessidæ with free strong upper arm, and strong, triangular-pyramidal under-arm, the 3 pinnate wings of which possess numerous long filaments between the corymbiated suctorial crisps.

Species. *Cramborhiza flagellata.*

Haeckel, System der Medusen. Seite, 676.

Umbrella slightly vaulted, hat-shaped, with 48 marginal flaps. In each Octant 4 broad, oval, velar-flaps, between 2 small triangular ocular flaps. Exumbrella finely granulated. Ostia of the sub-gential-porticus 3 times as broad as the 4 perradial pillars between them. Arms about as long as the radius of the Umbrella. Upper arm strong, cylindrical, about as long as the triangular pyramidal under arm, the 3 broad wings have strong flapped suctorial crisps, and numerous long filaments.

Size: Breadth of Umbrella, 80 mm. Height of Umbrella, 30 mm.

Locality: Coast of Brazil, Cotingeriba. Hygon. Pernambuca. Leseur.

Genus. *Crambessa.*

Crambessidæ with free strong upper-arm, and strong triangular-pyramidal under-arm, the 3 broad wings of which possess suctorial crisps without especial appendages, without terminal knots or crispless appendages at the distal-end.

Species. *Crambessa cruciata.*

Haeckel, System der Medusen. Seite, 620.

Rhizostoma cruciata. Lesson, 1829. Voyage de la Coquille, Zoophyt., p. 121, pl. XI., fig. I.

(?) Rhizostoma cyanolobata. Couthouy, 1862; manuscript.

Rhacopilus cruciatus. L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 153.

Rhacopilus cyanolobatus. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 152.

Umbrella semi-spherical, twice as broad as high, with 48 marginal flaps. In each Octant between 2 rudimentary ocular flaps, 4 large equally sided triangular velar flaps. Exumbrella with 32 (?) deep radial furrows. Brachial disc as broad as the radius of the Umbrella. Mouth-arms $1\frac{1}{2}$ times as long as the radius of the Umbrella. The upper arm short and narrow, the under arm nearly 4 times as long, surrounded by thick suctorial crisps, conic, pointed at the distal end.

Colour: According to Lesson, yellowish white; Gonads and ring canal pink. According to Couthouy, blue-white, marginal flaps dark blue, suctorial crisps and arms, carmoisin-red.

Size: Breadth of Umbrella, 120-150 mm. Height of Umbrella, 50-70 mm. Ontogenesis unknown.

Locality: Coast of Brazil, Island Santa Catharina. Lesson Rio de Janeiro. Couthouy.

Species. *Crambessa palmipes.*

Haeckel, System der Medusen. Seite, 620.

Umbrella semi-spherical, twice as broad as high, with 64 marginal flaps. In each Octant 6 square truncate velar-flaps between 2 projecting oval ocular-flaps, which are half as long as the former. Exumbrella finely granulated. Arms a little shorter than the radius of the Umbrella. Under-arm triangular-pyramidal, pointed, surrounded by suctorial crisps, twice as long as the short and cylindrical upper arms, which are connected with a thin membrane.

Size: Breadth of Umbrella, 40 mm. Height of Umbrella, 20 mm. Ontogenesis unknown.

Locality; Coast of North Australia, Koch. Museum, Godeffroy.

Species. *Crambessa mosaica.*

Haeckel, System der Medusen. Seite, 622.

Cephea mosaica. Quoy et Gaimard, 1827. Voyage de l'Uranie, Zoologie, p. 569, pl. 85, fig. 3.

Rhizostoma mosaica. Eschscholtz, 1829. System der Acalephen, p. 53.

Rhizostoma mosaica. Huxley, 1849. Philosoph. Transact., 1849. pp. 422, 432, pl. 38, figs. 26, 27 ; pl. 39, figs. 28-34.

Catostylus mosaicus. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 152

Catostylus mosaicus. Grenacher und Noll, 1876. Abhandl. Senkenberg, Ges. Bd. X., p. 38.

Catostylus Wilkessii. L. Agassiz, 1862. Monogr. Acal. Contrib. IV., p. 152.

Crambessa mosaica. Von Lendenfeld, 1883. Zeitsch. f. wiss. Zool. Bd., 38.

Umbrella slightly vaulted, nearly semi-spherical, 2-3 times as broad as high, with numerous narrow marginal flaps. (To 200 ? about 24 velar flaps on each Octant). Sides of the gastrogenital-cross nearly rectangular. The same breadth at the distal, and at the proximal end ; mouth-arms a little shorter than the diameter of the Umbrella. Under-arm conic, pointed below surrounded by thickly set suctorial crisps. 3 times as broad as the thin and short upper arm.

Colour: Blue or brown, with a net of white lines on the Exumbrella; male genital organs grey-green, ovaries deep orange-red.

Size: Breadth of Umbrella, 200-350 mm. Height of Umbrella, 80-120 mm. Ontogenesis unknown.

Locality: East coast of Australia, Port Jackson, Quoy et Gaimard, Huxley; Illawarra Lake, T. Drayton; Port Phillip, Port Jackson, von Lendenfeld.

Genus. *Mastigias.*

Crambessidæ, with free strong upper-arms and with strong three-cornered pyramidal under-arms, the 3 wings of which have suctorial crisps. At the distal end of each arm there is a club-shaped, mostly three-cornered, gallert appendage (or terminal knot), without suctorial crisps.

Genus. *Mastigias papua.*

Haeckel, System der Medusen. Seite, 123.

Mastiguas papua. L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 152.

Cephea papua. Lesson, 1829. Voyage de la Coquille Zoophyt., p. 122, pl. XI., figs. 2, 3.

Cephea papuensis. Griffiths, 1832. In Cuvier's Anim. Kingd., pl. III., fig. 3.

Cephea ocellata? Huxley—(non Péron!)—1877. Manual Invert. Anim., p. 137, figs. 19, 21.

Rhizostoma papua. Lesson, 1843. Acalèphes, p. 715.

Umbrella semi-spherical, with 8 marginal flaps (in each octant 8 semi-circular velar flaps between 2 narrower ocular flaps.) Arms (without appendix) about half as long as the radius of the Umbrella. Upper arm and under arm nearly the same length. Terminal appendix three-cornered prismatic, a little longer than the diameter of the Umbrella.

Colour: Exumbrella bluish green to brownish green, some times more blue or more green, or more brown, with numerous large white spots. Subumbrella light brown, with 8 blue or bluish green ocular canals. Marginal flaps and Gonads rust-colour, brown, blue-green, with brown spots and suctorial crisps. Terminal appendage blue or green towards the end reddish brown.

Size: Breadth of Umbrella, 60-80 mm. Height of Umbrella, 30-40 mm.

Locality: New Guinea (Waigon and Dorey), Lesson; Louisiade-Archipelago, Huxley; Philippines, Wendt; China Sea. H. Koch.

Species. *Mastigias ocellata.*

Haeckel, System der Medusen. Seite, 623.

Medusa ocellata, Modeer, 1791. Nova. Acta. phys. med. n.l., VIII., Apend., p. 27, nr. 11.

Cephea ocellata, Péron et Leseur, 1809. Tableau des Meduses, etc., p. 361, nr. 98.

Cephea ocellata, Eschscholtz, 1829. System der Acalephen, p. 56.

Cephea ocellata, L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 156.

Hidriticus rufus, L. Agassiz, 1862. Monogr. Acal. Contrib., IV., p. 158.

Umbrella semi-spherical, with 112 marginal flaps (in each Octant 12 truncate, rounded velar flaps between 2 oval projecting ocular flaps.) Arms (without appendage) shorter than the radius of the Umbrella. Upper arms a little longer than the shortened broad under arm. Terminal appendage, club-like, three-cornered, as long as the radius of the Umbrella.

Colour: Exumbrella bright reddish, with numerous white, spots surrounded by brown. Margin of Umbrella and Gonads darker red. Arms reddish with small white papillæ, Terminal appendage transparent at the end with a blue stripe.

Size: Breadth of Umbrella, 50-60 mm. Height of Umbrella, 20-30 mm.

Locality: East part of the Indian Ocean, near the Cocos Islands, Rabbe; Sunda Straits, W. W. Wood.

Species. *Mastigias pantherina.*

Haeckel, System der Medusen. Seite, 624.

Umbrella semi-spherical, with 144 marginal flaps (in each Octant 16 narrow rectangular truncate velar flaps, between 2 small lancet-shaped ocular flaps. Arms (without appendage), nearly twice as long as the radius of the Umbrella. The upper arm scarcely as long as the slender three-cornered pyramidal under-arms. Terminal appendage three-cornered prismatic, very thin and long, filiform, 2-3 times as long as the diameter of the Umbrella.

Colour: Exumbrella (in spirits of wine), dark brown, with numerous and large white spots, which are surrounded by a broad black border.

Size: Breadth of Umbrella, 50-60 mm. Height of Umbrella, 20-30 mm.

Locality: Tropic Pacific Ocean, Samoa Islands, Museum. Godeffroy.

Genus. *Eucrambessa.*

Crambessidæ with free strong upper arm, and strong three-cornered pyramidal under arm, the 3 wings of which possess numerous clublike appendages without frills. Appendages of the suctorial crisps, of the same shape as the terminal gallert knots.

Species. *Eucrambessa Mülleri.*

Haeckel, System der Medusen. Seite, 624.

Umbrella slightly vaulted, 3 times as broad as high, with 80 marginal flaps (in each Octant 8 large quadratic velar flaps between 2 small three-cornered ocular flaps.) Arms about as long as the diameter of the Umbrella, between the suctoral crisps of their wings there are numerous three-cornered gallert clubs, of the same shape as the larger terminal knot of each arm.

Size: Breadth of Umbrella, 120 mm. Height of Umbrella, 40 mm.

Locality: Indian Oceān, Madagascar. Levasseur.

Genus. *Thysanostoma.*

Crambessidæ with weak, shortened and mostly coalescent upper arm, and strap-shaped, very elongated, three-cornered, prismatic under arm, the three narrow wings possess suctorial crisps in their whole length, without terminal knot.

Species. *Thysanostoma thysanura.*

Haeckel, System der Medusen. Seite, 625.

Umbrella nearly orbicular, 2-3 times as broad as high with 96 marginal flaps (in each Octant 10 truncate rounded velar flaps between two pointed three-cornered ocular flaps.) Exumbrella polygonal, slabbed with irregular and granulated slabs, which are scarcely half as broad as the marginal flaps. Sub-genital ostia 4-6 times as broad as the pillars. Arms 2-3 times as long as the diameter of the Umbrella, very narrow, ribbon shaped, three-winged, the same breadth nearly throughout their whole length to the rounded end.

Size: Breadth of Umbrella, 8 mm. Height of Umbrella, 3 mm.

Locality: Australia, Museum. Godeffroy.

Species. *Thysanostoma melitea.*

Haeckel, System der Medusen. Seite, 626

Melitea brachyura. Lesson, 1830. Centurie Zoologique, p. 227, pl. 80.

Rhizostoma brachyura. Lesson, 1829, Voyage de la Coquille, Zoopht., Tom. II., p. 120.

Thysanostoma Lessoni. L. Agassiz, 1862. Mongr. Acal. Contrib. IV., p. 153.

Umbrella semi-spherical, twice as broad as high, with 80 (?) marginal flaps (in each Octant 8 rectangular flaps, the sides of which coalesce. The velar flaps are truncate and lie between two elongated ocular flaps.) Exumbrella prettily and regularly slabbed with polygonal (5 or 6 cornered) slabs, which are as broad as the marginal flaps. Arms several times as long as the diameter of the Umbrella, very thin, getting gradually thinner towards the pointed end.

Colour: Umbrella whitish, with rust-coloured margin, Gonads yellowish, arms dark yellowish-red.

Size: Breadth of Umbrella, 300-400 mm. Height of Umbrella, 100-200 mm.

Locality: New Guinea, Harbour of Dorey. Lesson.

Genus. *Leptobrachia.*

Crambessidæ without free upper-arms, with ribbon-shaped, very long and thin under arms, which possess suctorial crisps towards the distal end above the terminal knot. Mouth-cross with 4 rays without special frills.

Species. *Leptobrachia leptopus.*

Haeckel, System der Medusen. Seite, 630.

Leptobrachia leptopus. Brandt, 1838. Bulletin Acad. Petersb., Tom. I., Nr. 24, p. 191.

Leptobrachia leptopus. L. Agassiz, 1862. Monogr. Acal, Contrib., IV., p. 154.

Rhizostoma leptopus. Chamisso et Eysenhardt, 1821. Nova, Acta phys. med. n. c., Tom. X.. p. 356. Taf., 27.

Rhizostoma leptopus. Eschscholtz, 1829 System der Acalephen, p. 52.

Rhizostoma leptocephalus. De Blainville, 1834. Actinologie, p. 298.

Umbrella semi-spherical, with 48 marginal flaps. In each Octant 4 rectangular velar flaps between 2 small ocular flaps (?). Subgenital ostia twice as broad as the pillars between; the mouth cross smooth. Arms very long and thin, ribbon-shaped, about twice as long as the diameter of the Umbrella, with a bundle of frills, at the end from which there protrudes a pointed terminal knot.

Colour : Pale violet; marginal flaps, margin of the arms and terminal suctorial crisps, dark violet; Gonads, yellow.

Size : Breadth of Umbrella, 8 mm. Height of Umbrella, 40 mm.

Locality : Tropics of the Pacific Ocean, Radack Island. Chamisso.

Genus. *Leonura.*

Crambessidæ without free upper arms, with ribbon-shaped, very long and slender under-arms which only have suctorial crisps towards the distal end above the terminal knot, mouth cross with 8 rays and 8 adradial suctorial crisps, which form especial frills round the centre of the brachial disc.

Species. *Leonura leptura.*

Haeckel, System der Medusen. Seite, 631.

Umbrella flat, orbicular, with 80 marginal flaps. In each Octant 8 rectangular velar flaps, between 2 pointed triangular ocular flaps. Sub-genital-ostia 3 times as broad as the pillars between them. Mouth cross of the brachial disc with frills; the 8 rays in pairs. Arms very long and slender, ribbon-shaped, nearly three times as long as the diameter of the Umbrella, a bundle of frills, at the end which surrounds a pointed three-cornered terminal knot.

Size : Breadth of Umbrella, 100 mm. Height of Umbrella, 50 mm.

Locality : South Pacific Ocean, near New Zealand. Weber.

Species. *Leonura terminalis.*

Haeckel, System der Medusen. Seite, 696.

Umbrella slightly vaulted with 80 marginal flaps. In each Octant 8 pointed 3-cornered velar flaps between 2 small divergent ocular flaps. Sub-genital-ostia 3 times as broad as the pillars between. Mouth cross of the brachial disc with regular frill with 8 rays. Arms not very long, ribbon-shaped, about as long as the diameter of the Umbrella, with a tassel-shaped bundle of frills, which surround a 3-cornered, projecting terminal knot.

Size: Breadth of Umbrella, 80 mm. Height of Umbrella, 20 mm.

Locality: Pacific Ocean, "Challenger" Expedition. Wyville Thomson.

Explanation of Plates.

Plate III.—Pseudorhiza aurosa, von Lendenfeld, painted from life, 0·5 natural size.

Plate IV.—Phyllorhiza punctata, von Lendenfeld, painted from life, 0·5 natural size.

NOTE ON THE DEVELOPMENT OF THE VERSURIDÆ.

Plate V.

By R. Von Lendenfeld, Ph.D.

Although the early stages of development, the Gastrula and Scyphistoma of some of those Rhizostomæ which possess a single Sub-genital space, the Monodenmia of Haeckel, are known of one or two species; the later stages, the Ephyra and the Metamorphosis of these Medusæ is unknown. Only Haeckel observed young stages of a Medusa belonging to the Crambessidæ, but these also had attained a size of from 30 to 40 mm., and appeared similar to the adult animal. (1.)

I have had the luck to capture some very young stages of the Phyllorhiza punctata, a new species described in another paper (2), which is very abundant in Port Jackson. The smallest of these measured 15 mm. across the disk, and I obtained an unlimited number of specimens from this size upward to the adult animal, which measures half a meter across the Umbrella. In colour and shape these small larvæ are similar to the adult animals.

Claus (1) has described the development of the Mouth-arms in Rhizostoma Cuvieri (Pilema pulmo. Haeckel), which belongs to the Family Torenmidæ. In our species the Mouth-arms follow in their development a similar course as that described by Claus.

The Sub-genital space appears to be formed in the way that Haeckel supposes, but I am as yet not quite sure on this point.

(1.) Since this paper was read I received "*Untersuchungen über die Organisation und Entwickelung der Medusen.*" By *C. Claus*, in which paper the Metamorphosis of Catylorhiza tuberculata is described (page 43, f. f.) The characteristic peculiarity in the Metamorphosis of Phyllorhiza punctata—the decrease of the number of marginal bodies does not occur in Cotylorhiza. The cause of the brown colour in the latter is ascribed by *Claus* to Zooxanthellæ in a similar manner as by myself in Phyllorhiza.

(2.) Proc. Lin. Soc. N.S.W., Vol., IX., p. 296.

The number of marginal bodies or organs of sense (Sinneskolben) is in the Discomedusæ nearly always eight, only very few possess more, none less. The number hardly ever exceeds 32. The development of the forms with more than eight marginal bodies is unknown. Haeckel (1) supposes that in these cases already the Scyphystoma possesses a greater number of tentacles.

Our Phyllorhiza, in its adult state possesses eight marginal bodies, between every two of which there are two ocular flaps, four simple and four double marginal flaps (plate V., fig. 4.)

I have never observed any variation in the number of the marginal bodies of the adult animal except when the margin had been injured, in which case, marginal bodies are produced irregularly in the regenerated and irregular part of the margin. The young stages (plate V., figs. 1-3) possess a greater number of marginal bodies. It is not likely that Phyllorhiza punctata will differ in this respect from all the other members of the Family, and so we may assume it as not unlikely, that the development described below for Phyllorhiza punctata is met with in many of the other Versuridæ.

The youngest stage which I have observed, measuring 15 mm. (fig. 1) possesses 24 marginal bodies. In the radii of the first, second, and fourth order. The margin of the Umbrella bears in each Octant between two ocular flaps, four broad and low flaps which are to be considered as two flaps only, each possesses an indenture in the middle, the accessary marginal bodies are situated in these indentures.

These sense-organs are slightly smaller than the persisting eight, but do not differ from them in shape. Larvæ measuring 30 mm. across the Umbrella show these marginal bodies in a few Octants only, whilst in the others there is situated only one sense-organ in the Radius of the *third* order. It is evident that the larvæ lose these marginal bodies of the quarternary Radii at the time of their attaining this size. They are slowly replaced by others, one always taking the place of two. A form is in that way attained,

(1.) *E. Haeckel.* Das System der Medusen. Seite 458.

which possesses eight accessory marginal bodies besides the eight persistent ones. (Fig. 2.) The flaps of the Umbrella margin adjacent to these adradial marginal bodies grow out to greater length and commence to divide into two flaps by fission.

Larvæ, with a diameter of 50 mm., loose these adradial bodies also (fig 3), and by a continued fission of the maginal flaps the configuration of the Umbrella margin of the adult animal is attained.

Such a formation of marginal bodies has, to my knowledge, not been observed before, and tends to prove the great fundamental difference between these Scyphomedusæ which have more marginal bodies in the young than in the adult state, and Hydromedusæ, which often possess fewer sense-organs, when young, than when grown up.

Explanation of Plate.

Plate V.—Part of the Umbrella margin of Phyllorhiza punctata, all enlarged so as to be of the same size.

Fig. 1. Larva with 15 mm. diameter.
Fig. 2. Larva with 30 mm. diameter.
Fig. 3. Larva with 50 mm. diameter.
Fig. 4. Adult with 250 mm. diameter.

A MONOGRAPH OF THE AUSTRALIAN SPONGES.

By Dr. R. von Lendenfeld.

II.—Continued.

MORPHOLOGY AND PHYSIOLOGY OF THE SPONGES.

I will endeavour to give a brief account of our present knowledge on the subject, without entering into detail, which will be described below in the classificatory portion of this work.

I.—The Anatomy of the Sponges.

1. *Shape and size.*

Although many Sponges have a constant shape, which is characteristic for the species, still the greater number do not possess a definite form. The same species will always be characteristic in outer appearance, but a certain shape which could be minutely described and set up for a standard is not met with in most Sponges. Just as a tree although growing irregularly, will have peculiar points about it, which give the character to the landscape so it is with the Sponges.

The irregular Sponges appear in every conceivable shape. Those which have a constant shape are generally cylindrical, always with a circular transverse section, which points to the fact that we have here animals before us, which originally irregular, are just commencing to attain a regular radially symmetrical shape, or *vice versa.* The latter appears more probable.

In detail the form of a species is very constant, so that Sponges from the same locality growing in the same depth, and under similar outer circumstances, will always at first sight prove their identity, may their shape differ ever so much.

The configuration of the surface, the height of the projecting conuli, and their distance from each other, and the size of the Oscula are alike. Also, the structure of the skeleton is much more constant than the shape.

The more we go into detail the more constant peculiarities are met with, so that the microscopic investigation will often prove two specimens to be identical, which are very different in shape.

The size is subjected even to greater variations than the form. Many Sponges certainly do not grow beyond a certain limit, but there are others which grow indefinitely—that is all those forms, which are found in the shape of incrustations. Spongecrusts may extend for miles. The margins of different crusts coalescing, and finally covering the whole of the area in which the Sponge in the struggle for life has the upper hand.

Such a Sponge is for instance our Aplysilla violacea (1) which covers many thousand square meters in Port Phillip. In such cases it is difficult to say what should be considered as an individual.

Whilst the Sponges with characteristic shape can be easily recognised either as single persons or as colonies of such, whereby all individuals are alike and more or less separate, these unlimited sponges can only be understood as Zoa Impersonalia (Oscar Semidt.) Together with the characteristic and constant shape we find the individuality of the Sponge slowly disappearing, whereby not clearly personified individuals are derived from personified species of definite shape. This certainly tends to prove that these indefinite Sponges are not to be confounded with higher individualized Cœlenterata, but we must always bear in mind, that they pass an embryonic stage, which is of characteristic, constant and

(1) R. von Lendenfeld. *Ueber Cœlenteraten der Südsee II. Neue Aplysinidæ.* Zeitschrift für wissenschaftliche Zoologie. Band, XXXVIII.

definite shape, so that the loss of individuality which occurs later is not the original, but only a coenogenetic peculiarity. The largest Sponge of definite shape and attaining a height of one metre or more is Poterion.

2. *The color.*

In many Sponges the color is less variable than shape and size, even in the indefinitely shaped species it never varies near as much as often in higher animals. I consider the colour in life as a very constant and characteristic feature, so much so, that I would always be inclined to consider a Sponge as belonging to another species; when the color differs though otherwise similar in shape and structure. Unfortunately the colour is very delicate and always fades in spirits or changes even totally in a few minutes.

The outer surface is mostly monochromatic, although it happens sometimes that one part of a Sponge is lighter than another. Spots or figures of any kind never occur in the surface color. Sponges may have all colors except green. (Spongilla sometimes contains chlorophyll and then appears green.)

When the colour is not uniform then the lower side is always lighter than the upper, as in fishes. This appears to be less of a protective arrangement than a consequence of the photographic effect of the light, which causes the exposed surfaces of the Sponge to attain a darker hue than those which are always in shade. If the colour of the Sponge is not uniform then the lighter part is always the same tint as the darker, only a lighter shade. We have here apparently the same difference as between the colours of the soles and palms and the other part of the skin of dark human tribes. Deep sea Sponges are always colorless.

The Calcareous Sponges are white or light yellow, the Horn-sponges always richly coloured, yellow, orange, blue, red or violet; the Siliceous Sponges, with the exception of those from great depths (Hexactinellidæ and Lithistidæ) also appear coloured, but not so intensely as the Ceraospongiæ. The interior of the Sponge is mostly of a similar hue as the surface but always more dull.

The color may be diffuse, but is also often exclusively found in granules which may be imbedded in the gallert or in the cells of the Sponge.

Of the changes which the colours of Sponges undergo when dying, those are most remarkable, which are met with in the yellow Aplysinidæ and Aplysillidæ, they turn dark blue.

3. *Internal structure.*

The skin or outermost layer of the Sponge is often only loosely connected with the main part of the body, and can be removed from the concave fields between the conuli.

The body appears on a transverse section, more or less porous. The pores are the orifices of the channels which traverse the body of the Sponge in every direction. The lumen of these canals varies very much so that in some cases the Sponge appears very porous, only about 30% of the space being taken up by the Sponge substance itself, whilst all the rest is canals. In other cases again the canals become rare and narrow and are often quite invisible. This, for instance, often occurs, when a living Sponge is cut, because the whole of the body contracts so much that all the vacant space is filled up by the Sponge tissue and all the water ejected.

Also the hardness is subject to great variations. Some Sponges, without skeleton, appear very soft, nearly slimy; whilst others again, particularly the Lithistidæ, attain the hardness of a stone. But not only does the skeleton make a difference in this respect, the ground substance of the Sponge itself varies greatly in its density between the slimy appearance of a soft gallert and the resistent form of cartilage.

4. *The Canal-system.*

The canals are mostly crooked and irregular, only in a few Sponges they appear, as more or less, parallel and straight tubes. Their breadth varies very much, although it often happens that they will all appear of the same width in a section. From the microscopic pores of the surface the water either enters cavities which lie underneath the skin, the subdermal cavities (Carter) or flows through small canals which join and form larger tubes.

These tubes afterwards again give rise to smaller ones, which by continual ramification finally supply the greater part of the whole Sponge. In no part of the Sponge this system of canals, through which the water flows centripetally, is in direct connection with those canals through which the water passes on to the oscular tube. There is always a layer of ciliated chambers present in the Sponge, which layer separates the ectodermal canal system which brings the water to the ciliated chambers, from the canal system which carries the water away from the chambers to the oscular tube, these latter canals are coated with Entoderm. The layer of ciliated chambers is mostly folded in a very complicated manner. Originally it has always been of a simple sack-shape, from which shape the complicated structure of the adult Sponge is derived. (F. E. Schulze Plakinidæ.)

The Ectodermal water-supplying canals are to be compared with trees which grow from the sub-dermal cavities or corresponding parts. Also, the Entodermal drain-channels are tree-shaped.

The narrow canals arising from the ciliated chambers unite to form larger branches which again, like tributary streams, run together, uniting to a main drain which opens into the oscular tube or cloaca. Only in a few Sponges, particularly the Syconidæ, the canal system is simple and unbranched. The Asconidæ (Leucosolenia) possess no canal system.

All the mains open into a tube very much wider than any of the others, which stands vertical on the surface of the Sponge. This Oscular tube is mostly very wide, always when expanded visible to the naked eye. It can be compressed, and may under circumstances be quite oblitered if the Sponge contracts very much. (Lipostomie.) This Oscular tube opens on the surface of the Sponge, with a simple, circular aperture. In the case of the Sponge being cylindrical, or consisting of a lot of parallel cylinders, there is nearly always an Osculum or opening of the Cloaca at the terminal face of every cylinder. Complications of this simple form of Osculum may arise, by a net-work being formed which closes the wide Osculum (Euplectella). Sometimes a thin chimney-shaped membrane projects from the Osculum. (Caminus.)

Sometimes a frill of large spicules surrounds the opening (many Calcareous Sponges, Holtenia.) The tube itself may possess transverse membranes, which by being more or less tightened regulate the current of water (some Spongidæ).

5. *The Skeleton.*

By far the greater portion of known Sponges possess a skeleton, which in its shape and size is as variable as the shape of the Sponge itself, but which in its minute structure appears rather unvarying. The daughters may have a very different skeleton from the mother as far as shape and size, probably also as far as strength is concerned; but the minute structure will resemble that of the parent so closely, that we are justified in looking on the minute structure of the skeleton as a very important feature of the Sponges in as much as their mutual relationship is concerned.

Some Sponges—and as we may safely assume, those resembling the ancestral forms—have no skeleton. One or several of such ancestral soft forms attained a skeleton, consisting of carbonate of lime (Calcarea.) Others again produced fibres, which were originally composed of fibrillous tissue only (Gumminæ.) In the course of time horny fibres were produced in the centre of the fibrellous fibres, and these of course followed the direction of the large canals (Oscar Schmidt). Originally they had a tree-shape (Aphysillidæ, von Lendenfeld, Vosmaer.) The branches coalesced, and a reticulate structure was produced, in which main centrifugal stems could be distinguished from tangental connecting fibres (Spongidæ, Aplysinidæ.) Foreign bodies, sand and the like, adhering to the surface of the Sponge, in most cases entered the horny fibres and filled the core of them in a varying degree. Such foreign bodies are mostly only to be found in the radial fibres, but sometimes also in the tangental ones.

Within these horny fibres sometimes cells are to be found, which like the Osteoklasts of the vertebrate animals destroy the hard substance, here the Spongiolin or horn, and cause the skeleton to appear as a system of tubes filled with a soft core. (Aplysillidæ, von Lendenfeld.) It is perhaps possible that these cells are Algæ symbyotic in the Sponge.

Silicious spicules may be formed within the horny fibres, and these always belong to the Monactinellid type, a rod with one or two points. They are small in number and size at the beginning (Veluspa, Miklouho-Maclay), but get larger and more numerous until the horny fibres are nearly entirely replaced by dense bundles consisting of Monactinellid spicules only.

At the same time in all of the stages from a soft non-skeletous Sponge (Halisarca), to a Sponge with a strong skeleton of silica-cords (Suberites), silicious spicules may be produced *outside* the fibres in the ground substance of the Sponge. These *never* belong to the Monactinellid type. They are always originally characterized by possessing more than two ends—more than one axis. These "flesh spicules" attain very extraordinary shapes. If they appear in Sponges, which already possess a strong fibrous skeleton, they remain small and loose (Desmacidonidæ, O. Schmidt); if on the other hand they make their appearance in Sponges which are destitute of a fibrous skeleton they attain a larger size and coalesce to form a hard, continuous skeleton (Hexactinellidæ, Tetractinellidæ, Lithistidæ. Monactipyalea.) Originally these spicules were small and scattered. Such ancestral forms were probably allied to the Plakinidæ (F. E. Schulze); or to those Chondrosidæ, which possess silicious bodies in their outer layer.

The Sponges are therefore, as far as the skeleton is concerned, to be grouped along two divergent directions, both of which take their origin in the Sponges without a skeleton. The one row comprises the calcareous, the other the horny and silicous Sponges. (Grant, Vosmaer.) The latter group appears as a straight row (stem) culminating in those fibrous Sponges, in which all the horny substance has been replaced by Monactinellid silicous spicules, and comprising the horny Sponges, Ceraospongiæ (O.

Schmidt), and Monoctinellidæ (Zittel.) From the whole extension of this line or stem, branches take their origin, which are parallel to one another and run in the same direction. Large at the bottom, these branches taper towards the top ; they include the Desmacidonidæ (small branch near the top.) Plakinidæ, Tetractinellidæ, Lithistidæ and the Hexactinellidæ, two large branches at the bottom, and some Sponges which are allied to the Ceraospongiæ, near the middle of the stem, but nevertheless possesses flesh spicules. (Das System der Monactinellæ, von Lendenfeld and elsewhere.)

We will return to this subject further on, under the heading "Classification."

II.—The minute structure of Sponges.

As every other Metazoan, the Sponge consists of a great many cells, different in form and function ; and the products of these cells. It appears quite logical to call the Sponge a colony of Protozoa, but it must be borne in mind that every other Metazoan is just as much a colony of Protozoa, as the Sponge. The latter view is generally accepted. only that we do not *call* higher animals colonies of Protozoa.

The mass of the Sponge consists, like the Umbrella of the large Medusæ of connective tissue (Bindegewebe) which may be of a more gallerty or a more cartilage-like texture. It is to be compared to the tissue which forms the umbilical cord known as Wharton's galiert. This ground substance is in many cases without visible structure, in others again it attains the characters of fibrous tissue, and then the whole Sponge accordingly has a tenacity like leather (Chondrosia.)

In this ground substance we meet with cells and all the surfaces of it are covered with Epithelia, so that the ground substance comes in contact with the surrounding water nowhere. These Epithelia are of a simple structure, and consist of one layer of cells only. The muscular fibres are not in connection with Epithelial cells, but produced from cells imbedded originally in the gallert, so that the main cause of the formation of a Sub-epithelial layer in other Cœlenterata does not influence the Sponges. And as there also do not seem to be any nervous elements in the Epithelia of the Sponge, no reason exists why a Sub-epithelial layer should be formed. (The origin of the Sub-epithelial layer in other Cœlenterata; compare O. and R. Hertwig, Das Nervensystem und die Sinnesorgane der Medusen.)

The ground substance, together with the cells imbedded therein, is to be considered as Mesoderm, whilst the Epithelia are partly Ectodermal and partly Entodermal. We shall commence with the description of the Ectoderm.

1. *Ectoderm.*

The whole outer free surface of the Sponge is covered with a low Epithelium, consisting of flat covering cells, each of which may possess one swinging cilia. The tubes which connect the outer surface with the inner canal system direct, or with the subdermal cavities are covered by a continuation of the Ectodermal Epithelium of the outer surface. The subdermal cavities and the canals leading from them to the ciliated chambers are also covered with the same Epithelium. Here the Ectoderm ends and all other surfaces of the Sponge are covered with Entoderm. (F. E. Schulze. Plakinidæ.)

According to the interesting observations of Marshall, it does not appear improbable, that the Epithelium on the surface also of those canals through which the water flows towards the ciliated chambers is to be considered as Entoderm.

In Reniera filigrana the parts of these canals adjacent to the ciliated chambers certainly are covered with Entoderm. But Marshall shows also in an extremely ingenious manner, that in those cases where these canals are originally rarely formed by the Ectoderm, they may be considered as Entodermal structures, because they are formed by an invagination, which takes place very early, and may therefore be considered as a sort of Gastrular invagination.

Whether numerous invaginations as those which according to F. E. Schulze form these canals, ought to be compared to the invagination of the Gastrula, it is here not the place to discuss, but if we followed this custom throughout, we would have to call the sweat glands in our skin also Entodermal, because they are produced by an invagination of the Ectoderm.

I think that an invagination of *Ectoderm* can never produce an Entoderm, but that an Entoderm can only be produced from an *indifferent* Blastula which does *not* consist of Ectoderm. In the case of the Sponge Embryo the outer surface is covered by Ectoderm, and the invaginations take place after the Entoderm has been formed.

The statement of Marshall, that the canals taking their origin between the Entodermal ciliated chamber, and the Ectodermal surface layer, by these two layers moving away from each other, after they have grown together (Plakina), may be formed *as likely* from the ciliated chambers as from the Ectodermal surface, appears indisputable; and I gladly accept it, because the digestive functions which I ascribe to the Epithel of these canals and the subdermal cavity, perhaps also point to an Entodermal origin of those cells.

2. *Entoderm.*

Whilst the Ectodermal cells, although performing manifold duties, are apparently (only few Sponges have been investigated with sufficient care) of a uniform shape, the Entodermal Epithelia are different in the different parts of the Sponge. In the ciliated chambers they are elongate, cylindrical, and contain a Protoplasma which imbibes colors very freely; in the canals leading from the chambers to the oscular tube, and on the surface of the latter they resemble the Ectodermal cover cells, although they never appear quite so low as these (Aplysillidæ, von Lendenfeld). The ciliated chambers in the Calcispongiæ often have the shape of long tubes (Radial tubes Syconidæ). In all other Sponges they are pear-shaped, sometimes elongated and sometimes nearly spherical They vary very much in size. (Sack-Birn-Halb.-Kugel förmig, F. E. Schulze).

These ciliated chambers are the main characteristic of the Sponges and have no homologue in other Cœlenterata. The cells which cover the inner surface of the chambers, always possess a frill at their free end, and a cilia in the middle of the free surface. Standing close together, and pressing each other laterally, they attain the shape of hexagonal prisms. At the vaulted end of the chamber a few of these cells here and there are wanting; here the pores are situated, through which the water enters the chambers from the supplying Ectodermal canals. These apertures are always very small, and it appears that the Sponge has the power of closing some or all of them.

Towards the other end of the chamber the cells get gradually lower and pass into the Entodermal Epithel of the drainage canals. There always is only one outlet, and this is of a large size, generally about half as wide as the chamber itself. It cannot be closed by the Sponge.

The Entoderm covers the surfaces of all the drainage-canals, and the oscular tube and ends at the margin of the latter. The boundary between Ectoderm and Entoderm lies in the circumference of the Osculum.

3. *Mesoderm.*

The same difference between the structure of the Mesoderm of the Polypomedusæ on the one hand and the Ctenophoræ on the other, (Hertwig der Bau der Ctenophoren, Chun die Ctenophoren des Golfes von Neapel), also appertains between the Mesoderm of Polypomedusæ and the Mesoderm of Sponges.

In some respects the Sponge mesoderm shows affinities to the Mesoderm of the Ctenophoræ. Whilst the cells in the ground substance of the Polypomedusæ, that is the primary Mesoderm, (von Lendenfeld: Encopella campanularia) have only a nourishing function and are derived from the Entoderm; the Mesoderm cells of the Ctenophoræ and Sponges have other functions also, and are in the Ctenophoræ (Kawolevsky) and, perhaps, also in the Sponges derived from the Ectoderm.

If we compare the Histology of the Sponges, Polypomedusæ, Actiniaria, and Ctenophoræ, we shall find that the four groups differ from each other in the following manner :—

The principal organs in the Ectodermal Epithel, Polypomedusæ.

The principal organs in the Entodermal Epithel, Actiniaria.

The principal—or many—organs in the primary Mesoderm or ground substance, Sponges and Ctenophoræ.

As mentioned above, the ground substance, which is a product or secretion of the Meso-dermal cells, mostly has the appearance of structureless gallerts, or harder substance, which in every case contains a large proportion of water. The minute fibrelles found in it run in every direction and are often dense and wavy so as to resemblance for instance the connective tissue in the cervical tendon of a bullock.

Cells of the Mesoderm.

The numerous cells of the Mesoderm have very different shapes. They possess a spherical or oval nucleus around which the Protoplasm is amassed. These cells are destitute of a cell-wall. From the central mass of Protoplasme prolongations extend exceeding in length the diameter of the central part manifold. These processes are not numerous 2-6 The most indifferent forms have processes which may extend in every direction. With a higher development of these elements their processes get fewer in number, and extending along one plane only. In the case of only two such excrescences being developed, they always lie at opposite ends of the cell and in one line—here we have arrived at a form of Mesodermal cell, which is to be termed a musular cell. Near the surface of the Sponge in the membrane which divides the Sub-dermal cavities from the outer water these cells have their prolongations extended in a tangental plain, they are mostly two in number but sometimes also three are met with. Around the canals and the Oscular tube we often find these cells in dense masses, and their prolongations mostly running parallel to the adjacent surface. The extensive movements of the outer skin and the canals is doubtlessly the result of the contraction of the processes of these cells. The interesting fact of their being sometimes, particularly in the skin, such cells with three processes, show a mode of the formation of muscular tissue, very different from that known in the other Cœlenterata in detail, but still essentially the same. (von Lendenfeld neue Aplysinidæ, Kleinenberg Hydra.)

A tube consisting of a dense mass of such Mesodermal cells covers in some Sponges the fibres of the skeleton. These cannot be considered as muscular, but rather as a sort of tissue like the periost.

Another interesting and much more differentiated form of Mesodermal cells are large gland-cells, which invest the growing horn-fibres of Ceraospongiæ and secrete the horn substance. (F. E. Schulze, Spongidæ). Similar cells are met with along the outer surface of the sponge. These produce a slime which protects the Sponges from noxious influences from without. (Merejkovsky, Eponges de la mér blanche, von Lendenfeld neue Aplysinidæ.)

These cells have the shape of round balls of Protoplasm, investing the spherical nucleus from which threads of Protoplasm 3-10 in number take their origin, and remaining parallel with each other connect the body of the cell with the surface where the secretion is to be poured forth. These threads are as long or longer than the main body of the cell and stand vertical on the surface of secretion.

Cells in the core of the hollow-fibred Sponges, which act like the Osteaklasts, and produce the pith in the fibres of the Sponges, are also derived from the Mesoderm. (von Lendenfeld das Hornfaserwachsthum der Aplysinidæ.) (1)

It appears from this that the skeleton of the Ceraspongiæ is a Mesodermal structure.

The cells in the Protoplasm in which the calcareous and silicious spicules take their origin, also belong to the Mesodermal layer, and are of an indifferent shape.

We now have to review a series of Mesodermal elements, which are alike in shape at certain stages of their development, but which perform very different functions.

(1.) Possibly symbiotic Algæ, compare Brandt Chlorophyll bei Thieren.

Amœboid wandering cells, very much like amœbæ with lobate Pseudopodia are common in all parts of the Sponges, their function is merely to serve as vehicles of food and oxydized substances, as we shall see in the chapter on Physiology.

Some of these cells are developed into the generative elements. The form ova and Spermasacks around which an endothel-like Follicle is formed by other Mesodermal cells.

The sperma forming cells are of a peculiar kind (Polejaeff Spermatogenese von Sycandra raphanus) with a Protoplasm which refracts the light in a greater degree than any other cells. By continuous partition of this cell, finally a heap of small cells are produced, which produce a tail and turn into Spermatozoa. These always consist of a narrow, sharp, lance-point-shaped head and a long tail. The proximal part of the tail is immovable and thick, it tapers abruptly to the thin moving distal part.

The ova are not produced in the same manner as the Spermatozoa, it is probable that each amæboid cell only produces one ovum. (von. Lendenfeld. Neue Aplysinidæ.)

All these amœboid cells, the wandering cells always, and the sexual cells in their young stages creep about very actively in the ground substance of the Mesoderm.

Similar amœboid cells are known in the Medusæ, but of course the sexual products do not take their origin from these in the higher Cœlenterata.

III.—Embryology.

The development of the Sponges, and particularly the first stages, can easily be studied, because the embryos remain within the mother until they have attained a pretty high degree of development. In the shape of oval ciliated Gastrulæ they leave the mother and swim about in the sea water for a short time. They then fix themselves to anything suitable and grow out into the Sponge. This latter part of the Ontogenesis is the most difficult to investigate, it is only of late that F. E, Shulze, Keller, and Marshall have succeeded in attaining an insight into the changes which the ciliated and free swimming embryo undergoes before it produces the Sponge.

The cell division does not take place in the same manner throughout. In the Calcispongiæ the young Morula consist of a ring of cells with a hole right through the centre, connecting the oral pole of the larvæ with the aboral. In other Sponges such a stage does not exist, but only a solid morula which produces secundary in the interior, a space, or a Furchungshöhle. All Sponges seem, however, to pass a Blastula stage. The single layer of cells which constitutes the wall of the Blastula may be produced by the coalescing of the oral and aboral apertures (Calcispongiæ), or by the ordinary process of an imbibition of water by the solid morula.

In the central mass, which Marshall calls Cœnoblostem, first Nuclei seem to make their appearance. Marshall thinks that the whole Cœnoblostem resembles a Syncitium. Other observers are inclined to consider these Nuclei as belonging to cells, the limits of which escape observation.

In this state the embryo leaves the brooding place, swims about for some time in the canals of the mother and finally leaves them. The cells of the outer layer, which now can be called Ectoderm, produce one cilia each, and the movements of these cilia propel the young Sponge. In some groups (Ceraospongiæ, Reniera, and other Silicispongiæ) the embryo has a pigmented spot on one end of the oval body, which might perhaps be considered as an eye. The embryos of Reniera filigrana, a Sponge which grows on the lower-side of stones, &c., shuns the light and always seeks the darkest corner of the aquarium. In some cases a ring of particularly long cilia surround the pigmented spot. The bulk of the Cœnoblostem increases in size continually and soon bursts the formerly continuous Ectoderm and protrudes slightly from the apertures. The Ectoderm is always torn at the end of the rotation-axis of the oval Embryo. The pigmented cells are thereby pushed aside and form a ring which surrounds the naked Cœnoblastem. The Ectodermal cells retract their cilia and the embryo, after showing irregular movements for some time, finally affixes itself. The Cœnoblastem flows towards the aboral aperture, which is greatly dilitated and soon sticks to the surface, which the embryo has chosen as his abode for life.

Now a small cavity makes it appearance in the centre of the Cœnoblastem, which may have the shape of a ring (Plakina) or a lens. This original Gastral cavity is perfectly homologous to the Gastral cavity of all those Embryos of other Metazoa which produce their Entoderm by delamination and not by direct invagination. From this simple cavity soon sack-shaped excresences grow forth. The ciliated chambers produced at their termini form short excrescences which connect them with the surface. In this manner tubes are formed, the commencement of the introductory canal system. In a similar manner the Oscular tube is formed from the gastral cavity.

As to the further development of the Sponge from this indisputed stage, there are two opposite opinions, and both from such authorities, that it will be best to state both without commentary.

Schulze believes that by a complicated process of continual folding the sponge is finally produced in such a manner that the introductory canals are nothing else than parts of the original free surface of the Sponge, at the sides of which two portions of the outer surface which have come in close contact by the formation of a fold, have coalesced.

Marshall on the other hand thinks that all these canals are formed from the ciliated chambers by sending tubes centrifugally, which when they reach the surface open there and so form the introductory canal. The outer surface remaining from beginning to end unfolded and unchanged.

Further investigations will be necessary to show which Sponges are developed in the former and which in the latter way. I refer the reader to the statements made above under the heading Ectoderm.

IV. Physiology.

The investigations on this subject are still fewer in number than those on the former subject, and as yet hardly permit of generalisation.

1. *Skeleton.*

a. Calcispongiæ

The skeleton of the Calcareous Sponges consists as the name indicates partly of Calcium.

The chemical composition which is met with in the Sponges, is the carbonic acid salt; $Ca\ C\ O_3$, with very little organic substance, which mainly forms the narrow and often invisible axial canals.

The calcareous spicules, which sometimes attain a considerable size, are produced as a *secretion* by cells and grow by apposition. $Ca\ C\ O_3$ and $Ca\ S\ O_4$ are always in abundant solution in sea water. These substances are taken up by the Sponge-cells in contact with the water (Canal Epithelæ), and transmitted to Meso-dermal cells, which produce the skeleton.

b. Silicispongiæ.

The skeleton of the silicious Sponges consists, of $Si\ O_2$ chiefly. There is always an axial canal, composed of organic substance, and it appears that there are also sometimes concentric layers of siliceous acid and organic substance intermittent. The young spicules contain more organic substance in proportion than the old ones, and appear therefore softer and can easily be dissolved in re-agents.

Also, these spicules seem to originate always in cells, sometimes (Hyalonema), they attain a length of 10 Cm. and a thickness of 2-4 mm. They grow, as the concentric layers in their substance indicates by apposition. The silica is procured from hydrate of siliceous acid, $Si\ H_2\ O_3$, or from soluble siliceous salt, which are met with in small proportions in solution in the sea water. $Si\ Ka\ O_3$ for instance.

c. Ceraospongiæ.

The horny substance which forms the greater part of the substance in the skeleton of these Sponges, and many of the Monactinellæ is a substance similar to hornchitin or silk. F. E. Schulze calls it Spongiolin. Several chemical analysis have been made of it. The percentage of nitrogen is very great.

The horny fibres of the Sponges are the product of certain gland cells Spongoblasts, described above, which *secrete* horny substance. The fibres always consist of concentric layers and grow by apposition only and not by apposition and intussusception. (F. E. Schulze: Die Familie der Spongidæ. Von Lendenfeld: Das Hornfaserwachsthum der Aplysinidæ.)

d. The fibrils of Hircinia.

In the European Sponges belonging to the Genera Hircinia and Oligoceras, and also in some Sponges not belonging to these Genera, which I have found on our shores, we meet with a dense mass of fibrillæ, long threads with a nob at each end, which may be considered as a peculiar kind of skeleton. They never form the only skeleton of the Sponge, but are always associated with a well developed hornfibre skeleton, and sometimes also with siliceous spicules (Von Lendenfeld das System der Monactinellæ.) Their accessary appearance makes it not improbable that they are, or belong to a parasitic organism. The researches which were carried on to elucidate this point at the Zoological Laboratory in Graz, under F. E. Schulze, by myself, and others, did not lead to any positive result. The analysis shows that these fibrils also contain a great proportion of nitrogen.

2. *The ground substance.*

The ground substance appears as a secretory product of the numerous star-shaped cells imbedded therein and has a similar chemical constitution as glue.

3. *Foreign bodies.*

Sponges are often rich in foreign bodies, which may be of any nature, provided they have the proper size. Nevertheless certain Sponges generally select certain foreign bodies. The most common are sand and spicules of other Sponges, which, after the death and decay of these, have dropped to the bottom of the sea.

Ceraospongiæ nearly always contain, more or less sand and other particles in their main radial, sometimes also in their tangental fibres. Sometimes also such bodies are met with in the ground substance of body or skin. They fall on the surface of the Sponge, the Ectodermal epithel cells give way to them, they enter the body of the Sponge and are lead to their place of destination. Particularly interesting are pointed bits of quartz (sand) which are selected with great care. They are always of the same shape, and placed in the skin of a Ceraosponge, with the points centrifugally as weapons of defence. (Von Lendenfeld, Neue Aplysinidæ.)

4. *Digestion.*

This most important subject is unfortunately also one of the most difficult to investigate. Experiments with carmine-feeding nd other observations seem to show that the digestion is *intra-cellular.* The carmine particles are taken up freely by all Epithelia of the Sponge, but they are soon ejected from all the cells except those which cover the introductory canals.

These cells do not eject all the carmine at any rate, but pass some of it on to the wandering cells which carry it about, dissolve some of the substance (the angular particles loose their sharp edges), and finally seem to pass it on to the cells of the ciliated chambers.

Whether the Sub-dermal cavities and introductory canals really are the digestive cavity as I believe, or not, cannot yet be known. (von Lendenfeld, Neue Aplysinidæ), although my experiments have convinced me of the high probability of it.

The cells of the ciliated chambers are in my opinion to be excluded from all functions which have to do with the taking up of nourishment. (Polejaeff Challenger-Calcarea.)

Excretary functions and breathing.

I assume (von Lendenfeld, Neue Aplysinidæ), that the cells of the ciliated chambers are the excretary elements, that they act as kidneys, and I am also enclined to believe that through them the exchange of oxygen and carbonic acid is effected. Their shape, and also other observations point that way. The wandering cells transport the chemical substances which are either necessary for the organism or superfluous to the places where the former are wanted and the latter ejected.

V. The Systematic Position of the Sponges.

The Sponges are, as I have had occasion to mention above, like all Metazoa, colonies of single cells or roughly speaking, Protozoa. They are very low animals, and so the similarity of them with a congregation of Protozoa is greater than that of higher Metazoa.

There has existed since 1867, when Leukart placed the Sponges under the Cœlenterata, a dispute, whether the Sponges are Metazoons or Protozoons. The greatest authorities on the subject consider them as Cœlanterata (Leukart, Haeckel, Claus, F. E. Schulze, Marshall, Vosmaer, Ray Lankaster), whilst others, particularly the majority of English authors, who in otio cum dignitate, do not take much notice of what anyone else does (O. Schmidt, Vorwort zu den Spongien des Meerbusens von Mexico), and the Americans consider it ridiculous to call the Sponges Cœlenterata, but persistently call them colonies of Protozoa.

To me this dispute seems very useless, and in fact ridiculous. Of course the Sponges are colonies of Protozoa, but so are the Medusæ and corals; of course the sexual propagation is initiated by conjugation—but so it is in the Medusæ and corals. Of course the Sponges consist of a zoaglealike ground substance in which cells are imbedded and which is surrounded by Epithelia—but so do the Medusæ and corals.

There are of course great differences between Medusæ and Sponges—but are there not as great difference between a parasitic cirrhiped and a lobster? Among the essays on this subject which have been published recently, there is particularly one which I shall translate here, because it points out the matter so clearly and simply. (Marshall, Die Ontogenesis von Reniera filigrana. Zeitschrift für wissenschaftliche Zoologie Band, XXXVII. Seite, 239-246.

It is known (but it does no harm to point to it from time to time) that Leukart (1) drew attention to the fact that the Porifera belonged to the Cœlenterata in the first instance. This was in his review of Lieberkühn's Essays on the Anatomy of the Calcispongi .

(1.) Jatresberichte, 1864-65, p. 196 and 197.

Here he follows the results gained by this author "in die letzten Konsequenzen hinein," and proves his theory for the first time in a decided manner.

He, in the first place, drew attention to the homology between the ciliated cavity of the simple Calcispongiæ (Grantiæ), and the gastral cavity of a Hydroid Polyp. He compared the mouths of these two with one another, and he dwelt on the accessory difference between them; that in the one case tentacles surround the mouth whilst the other has no arms. The pores of the Sponges he compares with the numerous cases of waterholes in the Cœlenterata. (1.)

"Allerdings," Leucart continues:—"Sind nun nicht alle Poriferen so einfach organisirt, wie die Kalkschwämme, vielmehr ist die Mehrzahl derselben mit eniem Höhlensystem versehen, welches mit der weiten Leibeshöhle der Grantien und Syconen nur geringe Æhnlichkeit hat, allein es ist zur Genüge beckannt, dass der coelenterische Apparat auch sonst durch peripherische Ausstülpungen und Verästelungen die mannigfachsten Formen annimmt."

In these words nearly everything is contained that concerns the comparison between the morphological structure of the Sponges and the Coelenterata; only that these ideas can be further worked out and that a few words can be added about the Ontogenesis and Phylogeny of these two large groups.

Balfour (2) is inclined to consider the Sponges as a type of Metazoa developed separately for itself from the Protozoa. And this appears to him to be proved by the following facts:—(1.) By the peculiar structure of the free larvæ; (2.) By the early development of the Mesoblast in the Sponges, and particularly (3) by the remarkable structure of the digestive canals.

As far as the first reason is concerned, I am not inclined to consider it as sufficiently general; the remarkable peculiarities of

(1.) Haeckel, who, extraordinary to say, did not know Leukart's deductions, compares six years later the Sponges and Acalephes in nearly the same manner. Kalkschwämme. Band I. Seite 462, M.A.O.

(2.) Balfour. A Manual of comparative Embryology, Vol. II., p. 309.

the larvæ of Sponges compared with those of other Cœlenterata are only met with apparently in the Calcispongiæ. The Ceraospongiæ have precisely the same larvæ as some higher Cœlenterata, Eucope for instance. Of course one might consider the larvæ of Eucope as consisting of two layers, and Balfour does that, but it is the question whether this procedure is not somewhat arbitrary. One might consider it also in the following light: Into the cavity of a Blastosphæra cells enter from the Ectoderm, which in time fill this cavity, and in this manner form a coenoblastem. Now delamination occurs in this coenoblastem and hereby it separates into a Mesoderm and an Entoderm which surrounds the delamination cavity and (compare also Kowalensky's original plate, fig. 8) consists of cells, which are differentiated in another manner as the cells forming the Mesoderm.

Also the second reason of Balfour's admits of a discussion.

The Sponges are a very old branch of the Cœlenterata and for a long time sessile in the adult stage, probably for a longer time than any other sessile Cœlenterata, as we can easily conclude from the early time of the affixing of the larvæ and the numerous adaptations which the Sponges have attained in connection with this way of living.

The sessility again caused the appearance of a skeleton here as in nearly all other cases where animals become sessile, which, whether it be of a calcareous, silicious, or horny nature (with the exception of a few very rudimentary Sponges) increased in size and density, from generation to generation, as most important to the Sponges. But the skeleton is not only a product of the Mesoderm of these organisms, it is even its principal product, and so the Mesoderm must have also increased in importance and size, the more the Sponges ceased to be solitary individuals and the more they commenced to form colonies, until it finally, as we see in many adult Sponge-colonies, overgrows the gastral cavities and depresses them nearly to a rudimentary organ.

The otherwise rare obliteration of mouth and gastral cavity which is sometimes met with, is caused by changes which have taken place in their function in the Sponges. These changes have caused the original water holes of the Cœlenterata to assume the function of taking up nourishment, whilst the digestive functions have been assumed by the Epithelia of the coelenteric canals. (1.) Another consequence of this change of function is the wonderful variety in shape which we meet with in the Sponges. Intercanal system, Pseudogastral cavities, &c., are transformed in all these changes, the outer surface of the Sponge always increases in size, and the number of pores through which nourishment is taken up is increased. The sum of all these peculiarities not only favoured the development of the Mesoderm but it was an efficient cause.

This deduction only would explain why the Mesoderm in the adult Sponges appears so much more developed than the other layers, but it would not be sufficient to disprove the second reason of Balfour's why the Sponges cannot be Cœlenterata. For this it is necessary to consider certain laws of heredity.

The law of heredity in the corresponding age (Haeckel's homochrone law) may be correct in general, but appears to be modified in some cases, particularly if it is in competition with settled heredity.

This later kind of heredity has the inclination to let peculiarities appear earlier and earlier from generation to generation, if these are particularly advantageous to the organism. *The sooner the progeny attains possession of peculiarities which have shown themselves as useful for the ancestors, the better for them.* (If not a pure recapitulation of the Phylogeny offers still better chances.) This is the main cause of the series of appearances called "shortened heredity." These peculiarities do by no means always appear in so striking a form, as for instance, among the crustations, they form moreover a finely shaded series, corresponding to the infinite variable conditions of existence in the living beings.

(1.) The whole process of this retrograde development can be compared to certain consequences of Parasitism.

It follows from this that the high development of the Mesoderm of the Sponges which has doubtlessly been developed and fixed in such a degree, during a very long series of generations, must finally have commenced to make its appearance in the larva, particularly if this was not only not disadvantageous but useful for the larva. This latter is doubtlessly the case with the silicious spicules which make their appearance so very early in the larva, and have saved many of them from being eaten. I don't believe that the free ancestors of the Sponges ever possessed a skeleton, this will, according to all analogy, have been formed as a consequence of the sessility.

The third reason, lastly, which Balfour brings forward to prove that the Sponges are not Cœlenterata, is therefore of particular interest, because it is one of those which induced Leukart to decide *for* the Cœlenterate-nature of the Sponges, only that the one author puts the differences between the development of the gastral cavity in Sponges and Cœlenterata forward, whilst the other attaches particular importance to the similarity of the two; but we know that when we have to do with modifications of homologous organs, as evidently in this case, the *affinity* must be considered as a proof of the old genetic connection, and is therefore the *essential* part, whilst the difference points to a special attainment, and is therefore *accidental.*

In both groups we see that a canal system has been differentiated which extends centrifugally from the gastral cavity, which often penetrates the Ectoderm (in Sponges, with the exception of the problematic Physemaria always), and which opens with constant or variable pores outward; where tentacles are met with, the canal can enter them and here (Actinia) or also in other places (Rhizostomæ), can open outward with pores; and as in the latter case astomy occurs, nourishing materials are taken up through these pores just as in the Sponges.

Ciliated cells are widely spread in the gastral cavity of Cœlenterata, if they also don't mass themselves locally to form ciliated chambers. But this is also by no means the case with all Sponges.

(1.) If Balfour (2) says that the ciliated cells which cover the ciliated chambers or radial tubes of the Sponges undoubtedly originate from the invaginated cells (*i.e.*, the ciliated cells of the Ectoderm), then I would like to state that they certainly did *not* originate from those, they are moreover in Sponges and Cœlenterata modified elements of the Ectoderm which *may* be produced originally from the Ectoderm in some cases, (invagination) but not necessarily must be produced by the Ectoderm (delamination.)

If we once more compare the canal system of Sponges and higher Cœlenterata, we shall see that it can open outward free in both, that it can be covered with entodermal ciliated cells for a greater or smaller extent, and that lastly it can take up nourishment through its terminal pores in both.

Another reason which is generally brought forward against the Cœlenterate nature of the Sponges is, that the Sponges never possess tentacles or Cnidoblasts.

Without placing too great a weight on the want of both in Beroë which is a rudimentary form in this respect I only wish to discuss: Have the ancestors of the Sponges ever possessed tentacles and Cnidoblasts? and if yes, how have they lost them? If no, why were these not attained in the course of time.

Cnidoblasts or their Homologa, respectively Analoga and tentacles are so widely spread among low marine animals, and are met with in so very different animals, that they cannot be used as a determinant for the relationship, as they are arrangements doubtlessly often attained sua sponte. But as they are met with in higher Cœlenterata (3) in different modifications, nearly without exception, they appear to be a very old peculiarity of these animals, which has proved itself as very useful in the struggle for existence, and which therefore could find such a wide distribution by heredity, in some cases perhaps by an adaptation sua sponte.

(1.) Kölliker. *Icones Histologicæ.* 1 Heft., p. 66.
(2.) F. Balfour, l.c., Vol. I., p. 144.
(3.) Which might be separated from the Sponges as Telifera or as Nematophora, Huxl., (because the name Cnidaria, nettle animals does not cover the meaning.)

The great phylogenetic age of these nettling organs is made likely by the fact that the Cnidoblasts are met with already, in the free swimming larvæ of some species, which is to be considered more as an exception than as the rule. This appearance of Cnidoblasts in the larvæ is probably produced by a very long-continued heredity, as this happened in an analogous manner with the mesoderm in the larvæ of the Spongiæ, as mentioned above. According to my idea, Cnidoblasts and their Homologa have been developed in connection with the tentacles firstly in the adult animal, as they have again disappeared in Beroë, together with the tentacles (1) they are parts of these (according to Chun, modified muscular cells) which have been changed in such a remarkable manner for purposes of catching prey. That they afterwards should have attained the functions of defensive weapons, and should then have been distributed all over the body does not appear so very wonderful. (2)

It is certainly difficult to ascertain whether the Sponges are—as not possessing tentacles and Cnidoblasts—rudimentary in this respect or not; whether their ancestors possessed them or not; is not of very great importance, this does not seem to have to do with the question whether the Sponges are Cœlenterata or not.

In the ontogenesis of the Sponge we never find a stage where anything homologous could be met with, just as little as we find any trace of anything of the kind in the adult Sponge. But both these facts do not prove that they really never had been present: also here the ontogenetic image of the Phylogeny might be dimmed, by a very long continued uselessness. It is, in case that the Sponge-ancestors rarely possessed these organs, not difficult to understand how they have been lost.

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(1) If Protohydra, accepted as an adult animal, had been as lively and energetic as Beroë, also that animal could dispense with the protection of Cnidoblasts if it had no mouth-arms. But, if in reality the tentacles were the primary, and the Cnidoblasts the secundary thing, then Protohydra is certainly not an ancestral but a rudimentary form.

(2) Compare Cnidoblasts and their distribution among Cœlenterata, Pagenstecher Allgemeine Zoologie, Band II., pp. 24-27; particularly Band IV., pp. 259-263. Chun, Mikroskopische Waffen d. Cœlenteraten, Humboldt, Band I., Heft 2, 1882.

This was the natural consequence of the change of function of the water-pores and the Cœlenteric apparatus, — the ciliated chambers with their cilia-motion introducing nourishing material took the place of apprehensive tentacles, and with the latter the Cnidoblasts vanished, and the easier, the less the Sponges needed further protection in consequence of their extremely well developed skeleton, which also often contains very sharp spicules which are perfectly analogous to Cnidoblasts (for instance, the superficial floricome spicules of Euplectella (1). Sponges, which besides this often smell very badly, don't appear to have many enemies. In fact they seem not to be edible by other animals, which we may also conclude from the frightening colours (yellow, orange, vermillion, &c.,) of the sponges which grow in shallow water. Also, the animals which so often live in the cavities of the Sponges are, with the exception of a few minute parasitic algæ, not parasites, but only commensals, which find shelter in the detested Sponges.

It is, of course, possible that the Sponges branched off at a very early stage from the stem of the Cœlenterata, when they possessed neither tentacles nor Cnidoblasts.

Of much importance in this question the fact appears, that a radial structure is just as much exception in the Sponges as it is the rule in the higher Cœlenterata: both probably had bilateral symmetrical ancestors, out of which, perhaps in correlation with the tentacles, the higher Cœlenterata were developed as radial animals (? the Author).

This structure is also sometimes met with in young sponges (compare the Protactinia-stage of Reniera), and sometimes also in the adult.

The following may be the points of coincidence between Sponges and the higher Cœlenterata (2).

(1) F. E. Schulze. On the Structure and Arrangement of the soft parts in Euplectella aspergillum. Voyage of H.M.S. Challenger. Sponges Hexactin, pl. A, figs. 3, 4, 5. (Proc. Phil. Soc., Edinburgh, 1879, the Author.)

(2) This comparison, of course, is carried out with an ideal form which has been constructed out of the single peculiarities of different Cœlenterata, which are nothing else but different modifications of the same type.

Both groups are Metazoa with gastral cavities. Mesenterial pouches (which can, in the case of Sponges, be developed into ciliated chambers, ? the Author), centrifugal canals, which originate from the gastral cavity and open with pores outward, and (in some cases also in higher Cœlenterata) take in nourishment. These canals are,-(in Reniera) like the gastral cavity, clothed with Entoderm, which in both cases produces ciliated cells (probably not in all sponges, the Author). The genital elements of both are developed in the Mesoderm, but both can also multiply non-sexually by budding, (Tethya and Halisarca, the Author,) and form colonies by the same process, and both are very much inclined to become sessile. Both (the Sponges always and the other Cœlenterata mostly) possess a highly developed Mesoderm and extensive skeletons. In both groups there are forms which are developed in the same manner until they become sessile.

We can now, modifying Haeckel's (1) statement slightly, and comprising our investigations, say: *Porifera and Telifera (sit venia verba) are two divergent branches of the Cœlenterats, which have been developed from the common ancestral Protactinia.*

VI. Classification.

Several classificatory systems have been mentioned in the historic introduction, and I have had occasion to mention that here Zittel's classification shall be adopted. This of course concerns the orders of Sponges only, and also these I will have to modify slightly.

The opening up of a hitherto nearly unknown field of research, always necessitates a change in the previous ideas on classification, and the system which I have arrived at has the advantage of being based on a more extensive experience than any of the previous ones.

The material to be found in the northern hemisphere is in great part well enough described to admit of recognition, and to this, as

(1.) Haeckel. Die Kalkschwämme. Band I., p. 461.

one might say, codified knowledge, now is added the experience gained by the investigation of the rich and previously unknown Australian Sponge fauna.

In the systematic part of this Monograph the following classification shall be adopted. The reasons which have induced me to adopt this system shall be expounded anon, under the headings of the different groups.

SPONGIÆ.

CŒLENTERATA, WITH A GASTROVASCULAR SYSTEM WHICH OPENS ON THE SURFACE WITH MANY SMALL AND ONE OR A FEW LARGE APERTURES. NOURISHING MATERIAL FLOWS IN THROUGH THE SMALL PORES, THE LARGE PORES OR OSCULA ARE CLOACÆ. FRILLED CILIATED CELLS ARE GENERALLY AMASSED IN CERTAIN PORTIONS OF THE CANAL SYSTEM. ALL THE EPITHELIA CONSIST OF SINGLE LAYERS OF CELLS, THE MESODERM IS ALWAYS HIGHLY DEVELOPED.

I. ORDO CALCISPONGIÆ.

SPONGIÆ POSSESSING A SKELETON COMPOSED OF CARBONATE OF LIME WITH A LITTLE ORGANIC SUBSTANCE, GASTRULA FORMED BY INVAGINATION.

1. FAMILY ASCONIDÆ.

Calcispongiæ consisting of a thin walled porous sac.

2. FAMILY SYCONIDÆ.

Calcispongiæ with a thick wall, traversed by radial tubes (canals).

3. FAMILY LEUCONIDÆ.

Calcispongiæ with thick walls, which are traversed by ramified canals, which are partly in connection with the Oscular tube, and partly with the pores. Small ciliated chambers connect the two systems of canals.

II. ORDO MYXOSPONGIÆ.

SPONGIÆ WITHOUT ANY SKELETON, OR WITH ONLY FEW AND SCATTERED SILICIOUS BODIES.

1. FAMILY HALISARCIDÆ.

Myxospongiæ. The ground substance without a fibrillous structure.

2. FAMILY CHONDROSIDÆ.

Myxospongiæ the ground substance of which is tough, and has a fibrillous structure.

1. SUB-FAMILY CHONDROSINÆ.

Chondrosidæ without Flesh spicules.

2. SUB-FAMILY CHONDRISSINÆ.

Chondrosidæ with Flesh spicules.

III. ORDO CERAOSPONGIÆ.

SPONGIÆ WHICH POSSESS A SKELETON COMPOSED OF HORNY FIBRE, WHICH MAY CONTAIN FOREIGN BODIES BUT NEVER PROPER SPICULES. SILICEOUS BODIES RARELY DEVELOPED AS SMALL SCATTERED SPICULES IN THE GROUND SUBSTANCE.

1. FAMILY SPONGELIDÆ.

Ceraospongiæ with a skeleton composed of anastomosing horny fibres, with a narrow axial canal, The ground substance clear and transparent without granules. Ciliated chambers large sack-shaped.

1. SUB-FAMILY SPONGELINÆ.

Spongelidæ without Flesh-spicules.

2. SUB-FAMILY SPONGELISSÆ.

Spongelidæ with Flesh-spicules.

2. FAMILY SPONGIDÆ.

Ceraospongiæ with a skeleton composed of anastomosing horny fibres with very narrow axial canals. The ground substance filled with highly refractory granules and intransparent. Ciliated chambers small, semi-spherical.

1. SUB-FAMILY SPONGINÆ.

Spongidæ without Flesh-spicules.

2. SUB-FAMILY SPONGISSINÆ.

Spongidæ with Flesh-spicules

III. FAMILY APLYSILLIDÆ.

Ceraospongiæ with a skeleton composed of tree-shaped and originally not anatomosing horny fibres, with a thick core surrounded by a thin layer of horny substance only. Ground substance transparent without granules. Ciliated chambers large and sack-shaped.

1. SUB-FAMILY APLYSILLINÆ.

Aplysillidæ without Flesh-spicules.

2. SUB-FAMILY APLYSILLISSÆ.

Aplysillidæ with Flesh-spicules.

IV. FAMILY APLYSINIDÆ.

Ceraospongiæ with a skeleton composed of anastomosing fibres which consist of a thick core and a thin horny wall. Ground substance filled with granules, intransparent. Ciliated chambers small and pear-shaped.

1. SUB-FAMILY APLYSININÆ.

Aplysinidæ without Flesh-spicules.

2. SUB-FAMILY APLYSISSINÆ.

Aplysinidæ with Flesh-spicules.

V. FAMILY HIRCINIDÆ.

Ceraospongiæ with a skeleton composed of anastomosing horny fibres with a narrow axial canal. The ground substance filled with granules. Besides there are dense masses of long and thin thread-shaped fibrilles with a knob at each end.

1. SUB-FAMILY HIRCININÆ.

Hircinidæ without Flesh-spicules.

2. SUB-FAMILY HIRCISSNIÆ,

Hercinidæ with Flesh-spicules.

IV. ORDO MONACTICERÆ.

SPONGIÆ WITH A SKELETON COMPOSED OF ANASTOMOSING HORNY FIBRES, WITHIN WHICH THERE ARE MONOAXIAL SPICULES. SOMETIMES WITH FLESH-SPICULES.

1. FAMILY CHALARCHIDÆ.

Monacticera with anastomosing horn fibres in the axes of which there are longitudinal minute biacerate spicules.

1. SUB-FAMILY CHALARCHINÆ.

Chalarchidæ wihout Flesh-spicules.

2. SUB-FAMILY CHALARCHISÆ.

Chalarchidæ with Flesh-spicules.

2. FAMILY CHALCŒNIDÆ.

Monacticera, with a dense mass of biacerate spicules in the axis of the anastomosing horny fibres.

1. SUB-FAMILY CHALCŒNINÆ.

Chalcœnidæ, without Flesh-spicules.

2. SUB-FAMILY CHALCISSINÆ.

Chalcœnidæ, with Flesh-spicules.

3. FAMILY CLATHRIDÆ.

Monacticeræ, with predominating truncated spicules in the axes of the anastomosing horny fibres.

1. SUB-FAMILY CLATHRINÆ.

Clathridæ, without Flesh-spicules, and without foreign bodies in any of the fibres.

2. SUB-FAMILY CLATHRISSINÆ.

Clathridæ, with Flesh-spicules and without any foreign bodies in any fibres.

3. SUB-FAMILY CLATHRILLINÆ.

Clathridæ, with foreign bodies in the connecting horny fibres, and without Flesh-spicules.

4. FAMILY ECHISPIDÆ.

Monactieeræ, with an anastomosing network of horny fibres, which contain biacerate or truncated spicules in their axis, and are clad with truncate spicules, the points of which are free. These spicules are always inserted at an angle of 45° and point centrifugally.

V. ORDO HYALOSPONGIÆ.

SPONGIÆ, WITH A SKELETON COMPOSED OF SILICIOUS SPICULES, WHICH HAVE ORIGINALLY BEEN FORMED AS FLESH-SPICULES, AND AFTERWARDS MAY COALESCE TO FORM HARD SKELETONS.

1. FAMILY PLAKINIDÆ.

Hyalospongiæ, with originally tetraradiate spicules, which do not coalesce but tend to become biacerate.

2. FAMILY HEXACTINELLIDÆ.

Hyalospongiæ, with hexaradiate spicules, which partly coalesce. Without a drainage canal system the large sack-shaped ciliated chambers open direct into a large oscular tube, which is closed at the osculum by a silicious net work.

3. FAMILY TETRACTINELLIDÆ.

Hyalospongiæ, with loose tetraradiate spicules, which are of variable shape, and partly tend to coalesce, with an outer hard layer containing dense masses of Flesh-spicules and often with subdermal crypts.

4. FAMILY LITHISTIDÆ.

Hyalospongiæ, with a skeleton, consisting of dense hard silica, which is developed by the coalescing of tetraradiate spicules.

VI. ORDO MONACTIHYALÆ.

SPONGIÆ, WITH A SKELETON, CONSISTING OF BIACERATE OR TRUNCATE SPICULES, WHICH MAY COALESCE SLIGHTLY, AND WHICH HAVE ORIGINALLY BEEN FORMED AS FLESH-SPICULES.

1. FAMILY RENIERIDÆ.

Monactihyalæ, with biacerate spicules, which tend in some cases to become truncate.

2. FAMILY SUBERITIDÆ.

Monactihyalæ, with predominant truncate spicules.

THE AUSTRALIAN HYDROMEDUSÆ.

CONTINUED.

BY R. VON LENDENFELD, PH.D.

PART II. PLATE VI.

THE 1ST SUBORDO HYDROPOLYPINÆ.

THE FAMILIES HYDRIDÆ, CLAVIDÆ, MYRIOTHELIDÆ AND EUDENDRIDÆ.

In Part I. of this Monograph the reasons are given, which have induced me to relinquish the old classification of the Hydromedusæ, and I now intend to apply the classification pointed out above to the Australian Hydromedusæ. In this part all known Australian species, together with a number which I have discovered, and which will be described here for the first time, belonging to the above Families of the Hydromedusæ, shall be registered with the necessary references.

ORDO, HYDROMEDUSÆ. Carus, 1864.

POLYPOMEDUSÆ, WHICH OFTEN FORM COLONIES WITH A CHITINOUS SKELETON, AND WHICH IN THE FREE SWIMMING STATE ARE GENERALLY SOLITARY MEDUSÆ. IN THE COLONIES ALIMENTARY POLYPS WITH A SIMPLE SACK-SHAPED GASTRAL CAVITY, WITHOUT ENTODERMAL FILAMENTS, ARE ALWAYS PRESENT. BESIDES WE GENERALLY MEET WITH DIFFERENTIATED, DEFENSIVE AND GENERATIVE ZOOIDS.

THE FREE SWIMMING MEDUSÆ HAVE A CENTRALIZED DOUBLE NERVE-RING, A VELUM, NO MARGINAL FLAPS AND NO ENTODERMAL FILAMENTS IN THE GASTRAL CAVITY. THESE MEDUSÆ BUD ORIGINALLY ON POLYP COLONIES, BUT MANY OF THEM HAVE TAKEN TO A DIRECT DEVELOPMENT WITHOUT INTERMEDIATE POLYP COLONIES.

FREE SWIMMING POLYP COLONIES ALWAYS POSSESS A CHITINOUS SKELETON (GRAPTOLITHIDÆ.)

I.—SUBORDO HYDROPOLYPINÆ. Von Lendenfeld, 1884.

HYDROMEDUSÆ, WHICH MULTIPLY BY BUDDING AND BY SEXUAL PRODUCTS, WHICH DO NOT APPEAR IN THE SHAPE OF MEDUSÆ. THE BUDDING POLYPES MAY BE DISINTEGRATED FROM THE PARENT AND SO ALL REMAIN SOLITARY, OR THEY MAY REMAIN ATTACHED AND SO FORM A COLONY. IN BOTH CASES SEXUAL MULTIPLICATION ALTERNATES WITH THE PROCESS OF BUDDING.

THE SEXUAL PRODUCTS ARE MATURED IN THE WALL OF THE BODY-CAVITY, WHICH MAY FORM HOLLOW TENTACULAR PROCESSES IN WHICH THE OVA AND SPERMATOZA ARE FOUND. ORIGINALLY ALL POLYPES ARE SEXUAL. IN SOME HYDROPOLYPINÆ ONLY SOME OF THE MEMBERS OF A COLONY MATURE THE SEXUAL PRODUCTS, AND THESE BECOME ADAPTED TO THE PURPOSE AND DIFFERENT FROM THE NOW EXCLUSIVELY ALIMENTARY ZOOIDS. IN THIS PROCESS THEY LOOSE MOUTH AND TENTACLES AND SO BECOME POLYPOSTYLES, WHICH ARE IN SOME CASES SO SIMILAR TO RUDIMENTARY MEDUSÆ, THAT SUCH SPECIES MIGHT ALSO BE PLACED, AND PERHAPS WITH GREATER ADVANTAGE, IN THE SECOND SUBORDO HYDROMEDUSINÆ. IN SOME CASES, SOME POLYPES ARE ALSO TRANSFORMED INTO DEFENSIVE MACHOPOLYPS WITHOUT A MOUTH.

This Suborder comprises forms which have hitherto been separated widely from each other, but as I think, only because an undue weight was attached to the structure of the chitinous exoskeleton, which invests sometimes only the stem and branches of the plant-like colony, and sometimes also forms cup shaped extensions around the Trophosoms. The structure of the generative zooids seems to me of a much more important nature. I combine in this Suborder some Calyptoblastea, some Gymnoblastea, and Allman's Eleutheroblastea, I do not doubt that everyone will agree with me, that this Suborder Hydropolypinæ is perfectly natural. The difficulty lies, as pointed out above, in the uncertainty of the origin of the Blastostyles. It is clear that the Hydromedusæ, which are descended from species with free swimming Medusæ, are fundamentally different from those which possess Blastostyles, which are not homologous to Medusæ, but must be considered as Polypostyles.

But the question whether a given Blastostyl is medusoid or not can only be decided by careful histological researches, such as those recently published by Weismann. (1)

This author found morphological peculiarities in many Hydromedusæ, which show that their Blastostyles are doubtlessly Medusoid. In others again the evidence is not so clear, and in many the careful investigator has not been able to detect any trace in the morphology of the Gonophor, which would point to a Medusoid origin.

All the Genera enumerated under the Hydropolypinæ, with the exception of Hydra, would according to Weismann (l.c.) have to be placed under the Hydromedusinæ. The main features of our classification would of course not be affected by this, only that some of the Families placed here would then appear there. I think it highly probable, that some of the Genera placed in this Suborder will subsequently have to be placed in the second Suborder.

1. FAMILY HYDRIDÆ. Claus, 1876.

Solitary Polyps, which mature the sexual products in the Gastral wall.

The budding or fission (Protohydra), with which the Hydridæ are propagated non-sexually is perfectly similar to and analogous

(1.) A. Weismann. *Ueber den Ursprung der Geschlechts Zellen bei den Hydroiden*, 1883.

with the budding in other Hydromedusæ, which form colonies. The fact, that in the case of the Hydridæ, these buds become detached, and so the Polyp remains solitary, cannot be considered as sufficient reason for placing the Hydridæ in a separate Suborder. We would have to make a Suborder for Myriothela also, if we did that for Hydra, for Myriothela also remains solitary. *Claus* and others consider the Hydridæ as a Family of the Hydromedusæ only.

1. GENUS HYDRA. Linné.

Non-sexual propagation by budding. This genus has been studied particularly by Kleinenberg (1), F. E. Schulze (2), Parker (3), and Jickeli (4.)

There are no sub-epithelial muscular cells nor Ganglia, or epithelial sensitive cells.

The histological structure is simpler than in any other Hydroid.

The "Epithelmuskelzelle" is the predominent element.

1. HYDRA OLIGACTIS. Pallas.

Bale (5) refers a Hydra which is found in the vicinity of Melbourne, to this species.

2. HYDRA FUSCA. Linné (?).

T. Parker, (6) of Dunedin, N.Z., gives an excellent account of the Histology of this species, but it does not appear from his paper whether he got his material from Europe or New Zealand.

3. HYDRA VIRIDIS. Linné.

Coughtrey (7) refers a Hydra, found in New Zealand, to this species.

(1.) Nicholaus Kleinenberg, *Hydra.* Leipzig, 1872.

(2.) F. E. Schulze. *Cordylophora lacustris.* Leipzig, 1871.

(3.) Parker. *On the Histology of Hydra fusca.* Proceedings of the Royal Society, No. 200, 1880.

(4.) Jickeli. *Der Bau der Hydroidpolypen.* I. Morphologisches Jahrbuch. Band, VIII. Seite, 373.

(5). W. M. Bale. *Catalogue of the Australian Hydroid Zoophytes,* p. 187.

(6.) T. Parker. *On the Histology of Hydra fusca.* Proceedings of the Royal Society, No. 200, 1880.

(7.) *Coughtrey.* On New Zealand Hydroida. Annals and Magazine of Natural History, 4th Series, Vol. XVII., p. 24.

2. FAMILY CLAVIDÆ. Von Lendenfeld, 1884.

Colonies consisting of a creeping stolon from which Polypes grow up. All the Polypes are the same. They possess scattered tentacles, and mature the sexual products on tentacular excrescences of the gastral wall.

I. SUB-FAMILY CLAVINÆ. Von Lendenfel, 1884.

Clavidæ, with filiform tentacles.

2. GENUS CLAVA. Gmelin.

With the characters of the family.

4. CLAVA SIMPLEX. Nov. sp.

Clava, with few scattered filiform tentacles, only 10 to 15 in number, which taper slightly toward their terminal ends. The club-shaped Polypes are about 1 mm. long and sit on 2-3 mm. long stalks which rise from a creeping stolon. Polypes colourless. The sexual products are matured in the lower part of the gastral wall.

At low water mark.

Port Jackson.

Clava simplex differs from the known species by its Hydrocaulus, being well developed in this respect it resembles Tubiclava, but it appears more natural to place our species under the genus Clava, in consequence of its small size and the want of a chitinous Perisarc on the Hydrocaulus. The Hydrocaulus of our Hydroid is never branched as in Tubiclava.

II. SUB-FAMILY CORYNINÆ. Von Lendenfeld, 1884.

Polyps with scattered capitate tentacles.

No representatives of this group are known to occur in Australian waters.

3. FAMILY MYRIOTHELIDÆ. Allman, 1872.

Large solitary Polyps with numerous and dense scattered filiform tentacles, the sexual products are matured on tentacular extensions of the gastral wall.

No representatives of this Family are known to occur in Australian waters.

4. FAMILY EUDENDRIDÆ. Allman, 1872.

The alimentary Zooids possess one verticil of filiform tentacles, and mature the generative elements on tentacular appendages.

During the maturing of the sexual products the sexual zooids often become rudimentary and loose their tentacles.

3. GENUS EUDENDRIUM. Ehrenberg.

Every Polypostyl is actually a rudimentary Polyp, and the generative elements make their appearance before tentacles and mouth become rudimentary. This latter does not always take place, and then the mature generative elements are found partly on Polypostyls and partly on ordinary Polys. The colonies consist of an anostomising Hydrorhiza from which branched stems arise. The structure of Eudendrium has been investigated particularly by Weismann (1.) Jikeli (2), and myself (3.)

The Ectoderm, and particularly the Entoderm, are very much higher developed than in Hydra. We meet with separate epithelial and sub-epithelial layers. The Ectoderm consists of a superficial layer of covering, sensitive and glandular elements, and cnidoblasts of two different kinds, and the sub-epithelial cells. In a ring around the base of the Hydranth gland-cells of a peculiar kind, are amassed on the two sides of a deep groove which surrounds the Polyp. Below these elements we met with longitudinal muscles, with ganglia cells, and with a few indifferent insterstitial cells.

The Entoderm also consists of more layers than one. Superficially we find ciliated cylindrical cells and gland-cells of various kinds. The sub-epithelial layer below these is particularly highly developed in the proboscis, and contains in that region ganglia cells and circular muscles, the cells of which are intra-epithelial.

(1.) A. Weismann. *Die Entstehung der Sexualzellen bei den Hydromedusen.* Seite, 91, 109.

(2.) C. Jikeli. *Der Bau der Hydroidpolypen* I. Morphologisches Jahrbuch. Band, VIII. Seite, 376, 391.

(3.) R. von Lendenfeld. *Das Nervensystem der Hydroidpolypen,* Zoologischer Anzeiger. Band, VI. Seite, 69.

5. EUDENDRIUM GENERALIS. Nov. spec.

Plate VI.

On stones, near low water mark, this Hydroid is very abundant in Port Phillip. Rising from an anastomosing stolon, the stem attains a height of 18 mm. The Perisarc of the stem is not much thicker than that of the branches, and only slightly darker. The Perisarc is in its greater part cylindrical, and appears annulated only at the proximal ends of branches and stem. In size and general appearance it might be taken for Eudendrium capillare Alder. The Trophosome possesses one verticil of twenty-four filiform tentacles, a very large and moveable proboscis, which mostly appears slightly dilated laterally and a broad and short body. The ring of gland cells at the base of the Trophosome is very well marked.

Weismann (1) has discovered that in Eudendrium racemosum the Hydranths possess large processes which he terms Cnidophors. Such structures are absent in our species.

Allman (2) alludes to an external difference between the male and female Polypostyls in some species of Eudendrium. Such a difference is still more marked in our Eudendrium generalis and I have selected the specific name to express this peculiarity. Our species is distinguished from those described by other authors by its small size. E. ramosum Linné, E. rameum Pallas, E. dispar Agassiz, E. annulatum Normann, are very much larger. The male Polypostyls in Eudendrium capillare bear clusters of two-chambered scrota, whilst in our species they are not in clusters, and only contain a single pouch. E. arbuscula Wright "forms a bushy tree" and also bears a cluster of scrota on the male Polypotyls. In Eudendrium insigne, Hincks again, the perisarc is annulated throughout; the same is the case with E. vaginatum, whilst in E. tenue A. Agassiz, the scrota are in clusters.

(1) A. Weismann. *Ueber ein eigenthümliches Organ bei Eudendrium racemosum Cav.* Mittheilungen aus der Zoologischen Station in Neapel. Band III. Seite 1.

(2.) Allman. *A Monograph of the Gymnoblastic or tubularian Hydroids*, Vol. II., p. 332 ff.

The structure of the male Polyps is in fact the most important characteristic feature of our species, and we shall find that this peculiarity is one of greater morphological importance.

Whilst the ova are borne on irregular verticils of tentacles, the spermatophores are always four in number, and lie radially symmetrical occupying the same position as in the Medusæ (Eucope for instance.) Looked at from above. (Plate VI., fig. 2), the whole has the shape of a Medusa, from the aboral end of the Gastral cavity of the male Polypostyle four canals are given off similar with and homologous to the four radial canals of the Medusa.

The Polypostyles not only phylogenetically but also ontogenetically are developed from a Polyp with mouth and arms. After the genital products have commenced to grow the tentacles are retracted and also the mouth obliterates. (Plate V), so that finally the mouthless Polypostyl is the bearer of the large and adult sexual tentacles.

If this process was arrested, when the tentacles are retracted, and if then the whole of the *lower* part of the Hydranth would grow out and form a wall between the Radial Canals, which in our case appear as sexual tentacles, then we would have a Medusa before us.

It appears from this that the Gastral cavity of the Medusa is not homologous to the Proboscis of the Hydranth only, and that the Umbrella is not to be compared to a membrane connecting the *oral* tentacles of the Hydranth, but rather as a lateral extension of the aboral sexual tentacles.

The Polypostyls of Laomedea flexmosa and Eucopella campanularia which are intermediate between Hydranths and Medusæ, also tend to prove the correctness of the above statement.

6. EUDENDRIUM PUSILLUM. Nov. sp.

On Ascidians and other submerged bodies just below low-water mark this Hydroid is extremely abundant in Port Jackson.

From a creeping Hydrorhiza which covers sometimes very extensive surfaces, stems grow to a height of 12 mm. They are densly and irregularly branched, so that every stem appears shrub-like. The Polypes on which the male and the female genital products ripen soon get rudimentary. The male and female Polypostyls are similar to each other. Their stems are always short, and they always grow out from the base of the stems, so that they are generally hidden between the undergrowth of other organisms whilst the alimentary zooids which do not become sexual appear high above on the centrifugal branches. All the Polypes, and particularly the clusters of genital products are intensely brick red, and can easily be distinguished by their color.

The Perisarc is in its greater part smooth and simple cylindrical, only just above the branching places a few rings are met with.

Compared with other species it appears characterised by its small size, the smoothness of its Perisarc and the colour of the zooids and genital products. E. ramosum Linné, E. rameum Pallas, E. dispar Agassiz, E. annulatum Norman, and E. racemosum Cavalini are very much larger.

E. insigne Hincks and E. vaginatum Allman have a Perisarc which is annulated throughout. In E. tenue A. Agassiz again the ultimate ramuli only are annulated.

In shape E. capillare Alder and E. arbuscula Wright most resemble our zoophyte, but both these do not possess that intense orange-red colour as E. pusillum.

From the foregoing species it can readily be distinguished by color, mode of branching, and particularly by the male Polypostyls.

Explanation of Plate.

Plate VI.—Eudendrium generalis, von Lendenfeld. The formation Polypostyle.

Fig. 1. Side view, C. Oc I (1).
Fig. 2. View from above, C. Oc I.

(1.) The figures are drawn with a camera lucida, the lenses used are from Zeiss.

REVISION OF THE RECENT RHIPIDOGLOSSATE AND DOCOGLOSSATE MOLLUSCA OF NEW ZEALAND.

By Professor F. W. Hutton, F.G.S.

Order. Rhipidoglossa.

Family. Neritidæ.*

Genus. Nerita. Linné.

Nerita saturata. Hutton (1884); *N. atrata* (variety of) Chemnitz, Conch. Cab. V., p. 296; *N. atrata*, Lamarck, Anim. sans. Vert., VIII., p. 603, Reeve Conch. Icon., fig. 16 [not of Chemnitz]; *N. nigra*, Gray in Dieffenbach's New Zealand, ii., p. 240 (1843) [not of Lamarck].

Habitat.—Bay of Islands to Wellington. Found also in Australia and Tasmania.

Shell finely spirally grooved; blue-black, or occasionally olive black; columella white.

I cannot agree with Dr. von Martens and Mr. Tenison-Woods that this shell is identical with *N. punctata* (Quoy and Gaimard). *N. punctata*, according to Quoy, is from the Mauritius, and is probably the same as *N. nigra* of Lamarck. It is not from Australia, as stated by Dr. von Martens; nor from South America, as stated by Mr. Tenison-Woods in the Pro. Roy. Soc., Tasmania, 1877, p. 38.

Family. Turbidæ.†

* The following species is omitted as not really inhabiting New Zealand: *Neritina Zealandica*, Reclus. *Habitat* unknown.

† The following are omitted as not really inhabiting New Zealand:—
Turbo undulatus, Chemnitz; inhabits Australia
Turbo stramineus, Martyn; inhabits Australia
Turbo torquatus, Gmelin; inhabits Australia
Turbo singularis, Solander; inhabits Australia
Turbo lajonkairii, Deshays; inhabits Indian Archipelago
Turbo novæ-Zealandiæ, Chemnitz; *habitat* unknown
Phasianella australis, Gmelin; inhabits Australia.

Genus. TURBO. Linné.

TURBO SMARAGDUS. Martyn, Univ. Conch., pl. 73, 74 (1784); Chemnitz, Conch. Cab. V., fig. 1815 and 1816; Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 219, pl. 60, fig. 6-8; Gray, Figs. Moll. Anim., pl. 38, fig. 1; Reeve, Conch. Icon., fig. 13.

Habitat.—Auckland to Dunedin.

Shell blackish green covered with a brown epidermis; inside white, the mouth and operculum stained with green. Outer surface of operculum smooth.

Variety. TRICOSTATUS. Hutton (1884).

Habitat.—Wellington to Dunedin.

Body whorl, with three spiral ribs.

The dentition is figured by Troschel in Gebiss den Schnecken II., pl. 19, fig. 1, and also in the Trans. N.Z. Institute, XIV., pl. 7, fig. G.

Sub-genus. *Modelia*. Gray.

TURBO GRANOSUS. Martyn, Univ. Conch. Trochus, pl. 37 (1784); *T. rubicundus*, Reeve, Conch. Icon., fig. 11.

Habitat.—Dunedin and Foveaux Straits; Auckland Islands; Chatham Islands.

Shell with spiral moniliform ribs, the umbilical region impressed, callous. Reddish purple varied with white.

The operculum is figured by Adams in Genera of Recent Mollusca III., pl. 43, fig. 5A-5B. The dentition is figured by Hogg in the Trans. Micro. Soc., 1866, pl. 11, fig. 51.

Sub-genus *Callopoma*. Gray.

TURBO SHANDI. Hutton. Catalogue Marine Moll. of N.Z., p. 35 (1873).

Habitat.—Chatham Islands.

Shell with three smooth spiral ribs near the periphery, with two or three nodulous ribs both above and below. White spotted with reddish or purplish brown.

As the operculum and dentition are unknown, the position of this species is doubtful.

Genus. Cookia. Lesson.

Cookia sulcata. Martyn, Univ. Conch. plate 35 (1784); *Trochus cookii*, Spengler Journ. Naturforscher IX., p. 155, pl. 3, fig. 5-6 (1776); Chemnitz Conch. Cab. V., fig. 1540 (1781); Quoy and Gaimard Voy. Astrolabe, Zool. III., p. 224, pl. 60, figs. 19-23; Grays Figs. Moll. Anim. I., pl. 40, fig. 2; *cookii nobilis*, Lesson, Illus. Zool., pl. 15 (1832).

Habitat.—North Ireland and the Southern shores of Cook's Straits; Chatham Islands.

Whorls rounded, with oblique rough imbricating laminæ.

Variety davisii. Stowe, Trans. N.Z. Institute IV., p. 218 (1871).

Habitat.—Blind Bay.

Whorls keeled.

The operculum is figured by Quoy and by Adams in Genera of Recent Mollusca III., pl. 45, figs. 3a-3b. The dentition is figured in Trans. N.Z. Institute XV., pl. 14, fig. p.

Genus. Imperator. Montfort.

Imperator imperialis. Chemnitz (Trochus) Conch. Cab. V., pl. 13, figs. 1714-1715 (1781); Quoy and Gaimard Voy. Astrolabe, Zool. III., p. 226, pl. 61, figs. 1-4; Gray Figs. Moll. Anim. I., pl. 40, fig. 1. *Trochus heliotropium*, Martyn, Univ. Conch., pl. 30 (1784); Reeve, Conch. Icon. Trochus, fig. 30. *Imperator aureolatus*, Montfort, Conch. Syst. (1810).

Habitat.—Hauraki Gulf and Foveaux Straits.

Periphery with recurved triangular spines. The operculum is figured by Quoy; the dentition by Hogg in the Trans. Micro. Soc., 1866, pl. 11, fig. 46.

Family. Liotiidæ.

Genus. Cyclostrema. Marryat.

Cyclostrema fluctuata. Hutton, N.Z. Journal of Science I., p. 477 (1883); Trans. N.Z. Institute XVI., p. 215.

Habitat.—Foveaux Straits.

Shell minute, spirally grooved, narrowly umbilicated; yellowish white with irregular bands of pale brown; peristome not continuous. As the dentition of this species is unknown, its generic position is doubtful. It may belong to *Adeorbis*.

Family. ROTELLIDÆ.

Genus. ROTELLA. Lamarck.

ROTELLA NEOZELANICA. Hombron and Jacquinot, Voy. Pole Sud., Zool. V., p. 53, pl. 14, fig. 5-6 (1854); Reeve Conch. Icon., fig. 11.

Habitat —Auckland to Dunedin.

Variable in colour; yellowish white with purple or chestnut rays, sometimes brownish pink.

The operculum and dentition are unknown.

Family. TROCHIDÆ.*

Genus. EUCHELUS. Philippi.

Sub-genus. *Huttonia*. Kirk.

Columella with a deep notch instead of a tooth.

EUCHELUS BELLUS. Hutton, Cat. Marine Moll. of N.Z., p. 37 (1873).

Habitat.—Chatham Islands,

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* The following are omitted as not really inhabiting New Zealand:—

Trochus inæqualis, Martyn; inhabits Australia
Trochus annulatus, Martyn; inhabits Australia
Trochus caniliculatus, Martyn; inhabits Australia
Trochus gibberosus, Chemnitz; inhabits Australia
Trochus niger, Chemnitz; not recognised
Trochus lugubris, Gmelin; not recognised
Polyodonta tricarinata, Lamarck
Clanculus variegatus, Adams; inhabits Australia
Clanculus floridus, Philippi; inhabits Australia
Thalotia conica, Gray; inhabits Australia
Thalotia pulcherima, Wood; inhabits Australia
Zizyphinus scitulus, Adams; inhabits Australia
Zizyphinus doliarius, Chemnitz
Cantharidus jucundus, Gould; *habitat* unknown
Trochocochlea tæniata, Quoy and Gaim.; inhabits Australia
Labio zebrinus, Philippi; inhabits Australia
Labio tessellatus, Chemnitz; inhabits Mediterranean
Labio sulcata, Wood
Labio scorpio, Gray; not described.

Shell imperforate; pinkish white varied with darker, interior white.

Variety. IRICOLOR. T. W. Kirk, Trans. N.Z. Inst. XIV., p. 282 (1882).

Habitat.—Auckland to Waikanae.

Granules coarser; dirty chocolate, interior bluish green.

The operculum and dentition are figured in Trans. N.Z. Institute XV., pl. 14, fig. 1.

EUCHELUS HAMILTONI. T. W. Kirk, Trans. N.Z. Institute XIV., p. 283 (1882).

Habitat.—Wellington.

Shell perforate; granules very fine. Pinkish white with spots of darker in diagonal rows.

Genus. TROCHUS. Linné.

Sub-genus. *Anthora.* Gray.

TROCHUS VIRIDIS. Gmelin, from Chemnitz Conch. Cab. V., figs. 1643-1644 (1781); Reeve Conch. Icon., fig. 79; *Polyodonta tuberculata,* Gray in Dieffenbach's New Zealand II., p. 239 (1843); Voy. Erebus and Terror, Moll., pl. 1, fig. 6. *Trachus acinosus,* Gould, Pro. Boston Soc., Nat. Hist. III., p. 57 (1848). *Trochus fulvilabris,* Homb. and Jacq., Voy. Pole Sud., Zool. V., p. 56, pl. 14, figs. 14-16 (1854). *Tr. tritonis,* Adams, Pro. Zool. Soc. of London, 1854, p. 132.

Habitat.—Auckland to Dunedin.

Shell with four nodulose spiral ribs on each whorl. Colour purplish brown, the base pale brown.

The operculum and dentition are figured in the Trans. N.Z. Institute XV., pl. 14, fig. K.

Sub-genus. *Cœlotrochus.* Fischer.

TROCHUS TIARATUS. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 256, pl. 64, figs. 6-11 (1834); Gray Figs. Moll. Anim. I., pl. 40, fig. 3. *Polyodonta elegans,* Gray, in Yate's New Zealand, p. 309 (1835).

Habitat.—Auckland to Dunedin.

Shell with six, sub-equal, nodulose spiral ribs on each whorl above the periphery. Colour purplish white, spotted with darker both on the spire and on the base.

The dentition is figured in the Trans. N.Z. Institute XIV., pl 7, fig. N.

TROCHUS CHATHAMENSIS. Hutton, Cat. Marine Moll. of N.Z., p. 36 (1873).

Habitat.—Wellington (T. W. Kirk); Chatham Islands.

Whorls spirally striated and with a thick sub-nodulose keel at the periphery, above which they are obliquely plaited; suture margined. Colour white with purplish red markings, the base spotted with red.

Genus. ZIZYPHINUS. Gray.

A. whorls flattened.

ZIZYPHINUS DECARINATUS. Perry, Conchology, Trochus, pl. 47, fig. 2 (1811); *Z. Cunninghami*, Gray in Griffith's Animal Kingdom, Mollusca, pl. 1, fig. 7; Reeve, Conch. Icon., fig. 6.

Habitat.—Cook's Straits to Auckland.

Shell trochiform, thin; about ten spiral moniliform lines on the body whorl above the mouth; umbilical region with a large callosity; lower surface nearly white. Periphery angled.

The operculum and dentition are unknown.

ZIZYPHINUS SELECTUS. Chemnitz, Conch. Cab. XI., figs. 1896-97 (1789); Reeve, Conch. Icon., fig. 1. *Trochus pellucidus*, Valenciennes, Voy. de la Venus, Moll., pl. 4, fig. 2.

Habitat.—Auckland and Cook's Straits.

Shell trochiform, thin; about ten spiral moniliform lines on the body whorl above the mouth, sometimes with smaller smooth lines between them; umbilical region with a small callus. Base with distant fine sub-moniliform spiral striæ; pale with distant elongated spots. Periphery rounded.

The dentition is figured in Trans. N Z. Institute XV., pl. 14, fig. L.

ZIZYPHINUS SPECTABILIS. Adams, Proc. Zool. Soc. of London, 1854, p. 37, pl. 27, fig. 7; Reeve, Conch. Icon., fig. 5.

Habitat.—Auckland; Auckland Islands (Martens).

Shell trochiform, rather solid; about six spiral moniliform ribs on the body whorl above the mouth; umbilical region without any callus. Base with rather coarse moniliform spiral ribs, and round spots.

The dentition is not known.

B. whorls convex.

ZIZYPHINUS GRANATUM. Chemnitz, Conch. Cab. V., figs. 1654-55 (1780). *Trochus tigris*, Martyn, Univ. Conch., pl. 75 (1784); Reeve, Conch. Icon., fig. 4.

Habitat.—Auckland to Cook's Straits, Chatham Islands.

Shell sub-trochiform, periphery rounded, rather solid. About 18 to 25 fine-spiral moniliform ribs on the body whorl above the mouth. Umbilical region with a small callosity, the base similar to the upper surface

The dentition is unknown.

ZIZYPHINUS PUNCTULATUS. Martyn, Univ. Conch. pl. 37, (1784) after Spengler (1776); Reeve, Conch. Icon, fig. 95. *Turbo diaphanus* Lamarck, An. sans Vert.; Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 254, pl. 64, figs. 1-5; Gray Figs. Moll. Anim. I., pl. 40, fig. 1. *Turbo grandineus* Valenciennes Voy. de la Venus, Zool. pl. 4, fig. 4.

Habitat.—Cook's Straits to Dunedin.

Shell turbinate, rather solid, suture impressed. About ten or twelve spiral moniliform ribs on the body whorl above the mouth. Umbilical region without any callus, the base similar to the upper surface.

The dentition is figured in the Trans. N.Z. Institute, XIV., pl. 8, fig. II.

Genus. CANTHARIDUS. Montfort.

Cantharidus iris. Gmelin, after Walch in Naturforscher IV., p. 42, pl. 1, figs. 5-6 (1774). *Trochus iridis.* Chemnitz Conch. Cab. V., figs. 1522-23 (1781). *Trochus opalus,* Martyn, Univ. Conch. pl. 24 (1784). *Canth. zealandicus,* Adams, Pro. Zool. Soc. of London, 1851, p. 169.

Habitat.—Auckland to Cook's Straits, Chatham Islands.

Shell elevated, smooth, spirally streaked: periphery more or less angled. Pinkish purple with longitudinal zig-zag reddish markings.

The young shell is perforated but the perforation gets covered over. The dentition is not known.

Cantharidus purpuratus. Martyn, Univ. Conch. pl. 68, fig. 2 (1784). *Trochus elegans,* Gmelin in Linné Syst. Nat. 13th edition. *Phasinella rubella,* Menke, Synops. Moll. (1530.) *Trochus texturatus,* Gould, Pro. Bost. Soc. Nat. III., p. 90, (1848). *Trochus pallidus,* Hombron and Jacquinot, Voy. Pole Sud., Zool. V., p. 55, pl. 14, figs. 12-13, (1854).

Habitat.—Auckland to Banks' Peninsula.

Shell elevated, imperforate, spirally ribbed and striated, the surface roughened with growth line. Pinkish white, streaked or spotted with pinkish brown.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 14 fig. o.

Cantharidus pruninus. Gould, Otia Conch., p. 55, (1846). *Trochus episcopus,* Hombron and Jacquinot, Voy. Pole Sud., Zool. V., p. 55, pl. 14, figs. 9-11, (1854.)

Habitat.—Auckland Island and Campbell Island.

Shell elevated, imperforate, suture impressed; whorls finely and equally spirally ribbed. Blackish purple, columella and aperture white or reddish, interior highly iridescent.

The dentition is not known.

Cantharidus tenebrosus. Adams, Proc. Zool. Soc. of London 1851, p. 170. *Gibbula plumbea,* Hutton, Jour. de Conch., 1878, p. 3.

Habitat.—Throughout New Zealand.

Shell more or less elevated, imperforate; whorl spirally ribbed. Bluish or purplish black, the grooves lighter; columella white, margin of the aperture dark purple, interior pearly.

The dentition is figured in Trans. N.Z. Inst. XIV., pl. 7, fig. L.

Variety. HUTTONII. Smith, Jour. Linn. Soc. of London, Zool. XII., p. 558 (1876).

Habitat.—Throughout New Zealand.

More depressed than the last, and the spiral sculpture finer.

The dentition is figured in Trans. N.Z. Inst. XIV., pl. 7, fig. M.

CANTHARIDUS RUFOZONA. Adams, Proc. Zool. Soc. of London, 1851, p. 170.

Habitat.—Auckland.

Shell imperforate, spirally ribbed; about eleven ribs on the body whorl, five of which are above the periphery; columella with a blunt tooth, white; the ribs purplish red; interior white.

Dead specimens from Auckland are referred with doubt to this species. It is distinguished by the blunt tooth on the columella.

The dentition is unknown.

CANTHARIDUS PUPILLUS. Gould, Proc. Bost. Soc. Nat. Hist. III., p. 91, (1848); United States Exploring Expedition, XII., p. 186, Atlas, fig. 208.

Habitat.—Bank's Peninsula to Dunedin.

Shell depressed, or sometimes more elevated, imperforate or narrowly perforated; whorls spirally ribbed. Dark brown, or greenish brown with brown and reddish markings; margin of the aperture greenish brown.

A very variable shell, smaller than *C. tenebrosus.* The dentition is figured in the Trans. N.Z. Inst. XIV., pl. 7, fig. K.

CANTHARIDUS SANGUINEUS. Gray in Dieffenbach's New Zealand, II., p. 238, *(Gibbula)*, 1843; Voy. Erebus and Terror, Moll. pl. 1, fig. 12.

Habitat.—Auckland to Wellington, Chatham Islands.

Shell imperforate spirally grooved. Pinkish white, with red spots on the ribs, or with red flexuous longitudinal markings; interior and mouth white.

Variety. CÆLATUS. Hutton, (1884).

Habitat.—Foveaux Straits.

Smaller but more deeply ribbed and the grooves wider.

I have seen dead specimens only. The dentition is unknown.

CANTHARIDUS DILATATUS. Sowerby Proc. Zool. Soc. of London, 1870, p. 251, (*Eleuchus*).

Habitat.—Hokianga, Auckland.

Shell smooth, spirally striated; whorls flattened; columella without any tooth. Reddish brown, the interior greenish blue and highly iridescent.

The dentition is unknown.

CANTHARIDUS SIMULATUS. Hutton, Cat. Marine Moll. of New Zealand, p. 36, (1873).

Habitat.—Chatham Islands.

Shell smooth, finely spirally striated; whorls convex. Pink or pinkish brown, generally with white markings on the spire; interior bluish white, iridescent.

Dead specimens only. The dentition is unknown.

Genus. MARGARITA. Leach.

I put the following three species into this genus with great hesitation. Perhaps they belong to *Gibbula*, but the umbilicus is narrow.

MARGARITA ANTIPODA. Hombron and Jacquinot, Voy. Pole Sud., Zool. V., p. 58, pl. 14, figs. 26-28 (1854).

Habitat.—Auckland Islands.

Shell small, iridescent, with transverse bands of greenish on the upper part; umbilicus almost covered.

I have not seen this species. The dentition and operculum are unknown.

MARGARITA ROSEA. Hutton, Cat. Marine Moll. of New Zealand, p. 36 (1873).

Habitat.—Stewart's Island; Campbell Island.

Whorls faintly spirally striated; very narrowly umbilicated. Pinkish white with three or four narrow pink spiral bands and some purplish spots on the body whorl.

The dentition and operculum are unknown.

MARFARITA FULMINATA. Hutton, Cat. Marine Moll. of New Zealand, p. 36, (1873).

Habitat.—Auckland to Wellington, Chatham Islands.

Shell smooth, without spiral striæ except on the base; umbilicus small. Pink, purplish, or olivaceous, usually with markings especially at the suture.

Dead shells only. The dentition and operculum are unknown.

Genus. GIBBULA. Risso.

GIBBULA OPPRESSA. Hutton, Jour. de Conch., 1878, p. 34.

Habitat.—Auckland.

Whorls flattened in the middle and more or less keeled; closely spirally ribbed. Dark purplish black not shining. Operculum many whorled.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 14, fig. M.

GIBBULA NITIDA. Adams and Angas, Proc. Zool. Soc. of London, 1864, p. 36. *G. inconspicua,* Hutton, Cat. Marine Moll. of New Zealand, p. 36, (1873).

Habitat.—Hokianga, Auckland to Wellington.

Shell polished, finely spirally striated. Greenish yellow with longitudinal undulating purplish brown streaks. Operculum many whorled.

The dentition is figured in Trans. N.Z. Institute XV., pl. 14, fig. N.

Genus. BANKIVIA. Beck.

BANKIVIA VARIANS, Beck, in Krauss' Sudafric Moll. (1848).

Habitat.—Cook's Straits. Found also in Tasmania and Australia.

Variable in colour, white, purple, pink, or black, plain or banded, sometimes with longitudinal undulating lines.

The animal is unknown as also is the dentition and operculum.

Genus. MONILEA. Swainson.

MONILEA EGENA. Gould (*Solarium*) Proc. Bost. Soc. Nat. Hist. III., p. 84, (1868), U. S. Expl. Expd. XII., p. 116, Atlas, fig. 228. *Monilea zealandica*, Hutton, Cat. Marine Moll. of New Zealand, (1873). *Margarita zealandica*, Sowb. in Reeve's Conch., Icon., fig. 17.

Habitat.—Bay of Islands.

Some of the spiral ribs are subgranular. Brownish white with longitudinal flexuous bands of brownish purple.

The dentition and operculum are unknown.

Genus. MONODONTA. Lamarck.

Trochocochlea Klein.

Sub-genus. *Diloma.* Philippi.

MONODONTA ÆTHIOPS. Gmelin, after Chemnitz, Conch. Cab. V. figs. 1820-1821 (1781). *M. reticularis*, Gray in Woods Ind. Test., Suppl, (1828), and in Diffenbach's New Zealand, II., p. 238. *Trochus zealandicus*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 257, pl. 64, figs. 10-11 (1834); Gray, Figs. Moll. Anim. I., pl. 40, fig. 9. *Labio concolor*, Adams, Proc. Zool. Soc. of London, 1851, p. 180.

Habitat.—Throughout New Zealand, Chatham Islands, Auckland Islands.

Shell rough; whorls distantly spirally grooved and obliquely striated with growth lines; four or five grooves on the body whorl above the periphery. Colour brownish purple, when rubbed purple, spirally tessellated with white; mouth purplish black.

The dentition is figured by Troches in Das Gebiss den Schnecken, II., taf. 23, fig. 3; and in the Trans. N.Z. Institute, XV., pl. 15, fig. A.

MONODONTA NIGERRIMA. Chemnitz, Conch. Cab. V., pl. 185, fig. 1848 (1780); *Turbo quoyi*, Keiner.

Habitat.—Banks' Peninsula to Dunedin, Chatham Islands, Auckland Islands.

Shell smooth, polished; whorls rather closely spirally grooved; eight or nine grooves on the body whorl above the periphery. Purplish black, interior highly iridescent, mouth black; columellar lip greenish at the base.

This species is apparently the same as *Trochus araucanus*, D'Orbigny, from South America. The dentition is figured in Trans. N.Z. Inst. XV., pl, fig. B.

MONODONTA MELALOMA. Menke, Molluscorum Novæ Hollandiæ, No. 50, p. 14, (1843). *Labio carrosa*, Adams, Proc. Zool. Soc. of London, 1851, p. 180; *Diloma hectori*, Hutton, Cat. Marine Moll. of New Zealand, p. 37, (1873); *T. chloropoda*, Tate.

Habitat—Banks' Peninsula to Dunedin. Found also in South and West Australia.

Shell smooth, or with low spiral ribs, never polished. Purplish, body whorl often yellow; mouth yellowish with a thin purple ring inside.

Our shells appear to be thinner, and the interior less grooved than Australian specimens, but there is no other difference. A shell in the Canterbury Museum named *Chlorostoma atra*, Lesson, from Chili appears also to be the same species. The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. D.

Variety. UNDULOSA. Adams, Proc. Zool. Soc. of London, 1851, p. 182; Voy. Erebus and Terror, Moll. pl. 1, fig. 15. *Trochus attritus*, Hombron and Jacquinot, Voy. Pole Sud. Zool. V., p. 57, pl. 14, figs. 19-20, (1854).

Habitat.—Banks' Peninsula to Dunedin.

Yellowish with longitudinal undulating lines of dark purple, or altogether purple. Mouth yellow, articulated with purplish black.

T. bruniensis, Petterd, from Tasmania is closely allied.

Variety. PLUMBEA. Hutton, (1883).

Habitat.—Banks' Peninsula to Dunedin, Campbell Island.

Dark purple, mouth black.

The dentition is figured in the Trans. N.Z. Institute, XV., pl. 15, fig. E.

Variety. GUTTATA. Hutton (1884).

Habitat.—Nelson.

Dark purple, usually spotted with white; mouth black; columellar lip greenish at the base; interior highly iridescent, markedly grooved.

This variety looks like a hybrid between *M. nigerrima* and *M. melanoloma*.

MONODONTA SUBROSTRATA. Gray in Yates' New Zealand, (1835), and in Dieffenbach's New Zealand, II., p. 238 (1843); Voy. Erebus and Terror, Moll. pl. 1, fig. 14.

Habitat.—Auckland to Tauranga. On *Zostera marina.*

Shell with sub-nodulose spiral ribs, which are distant on the upper surface and closer on the base. Yellowish with undulating longitudinal purple lines; mouth yellow, more or less marked with purple.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. G.

MONODONTA SULCATA. Wood. *Trochus cingulatus*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 259, pl. 64, figs. 16-20 (1834) [not of Brocchi]; Gray Figs. Moll. Anim. I., pl. 40, fig. 10; *Trochus gaimardi*, Philippi in his new edition of Chemnitz.

Habitat.—Cook's Straits to Dunedin.

Shell with three nodulose spiral ribs and raised lines between on the upper surface of the body whorl; about four closer ribs on the base. Smooth ; brownish black with minute yellow spots ; mouth brownish black.

Quoys figure is bad, but it must be intended to represent this species. The dentition is unknown.

MONODONTA EXCAVATA. Adams, and Angas, Proc. Zool. Soc. of London, 1864, p. 37.

Habitat.—Manukau Heads, Auckland.

Shell small smooth, shining ; not spirally marked, except on the base. Brown, mottled with yellowish white, but variable in colour.

Referred with some doubt to this species as Adams' description does not apply very well. The shell is depressed, the base concave, and the periphery sharply angled. The dentition is figured in Trans. N. Z. Institute, XV., p. 15, fig. F.

Sub-genus. *Latona.* Hutton.

Shell as in *Diloma* but perforated.

MONODONTA MIMETICA. Hutton, Jour. de Conch., 1878, p. 32.

Habitat.—Auckland.

Shell purple with oblique slightly waved lines or spots of white ; columella more or less stained with green.

The dentition is unknown.

Diloma australis, Tenison-Woods, (Pro. Roy. Soc. Tas. 1876, p. 145), appears to be closely allied.

Family. PLEUROTOMARIIDÆ.

Genus. SCISSURELLA. D'Orbigny.

SCISSURELLA MANTELLI. Woodward, Proc. Zool. Soc. of London, 1859, p. 202, pl. 46.

Habitat.—North Island.

I have not seen this species.

Family. STOMATELLIDÆ.

Genus. MINOS. Hutton.

Shell ear-shaped, regular, umbilicated; the spire small; aperture very large and oblique, not nacreous, the lips thin. Operculum horny multispiral. Dentition resembling that of *Cantharidus*.

Founded on *Fossarina petterdi*, (Brazier), from Tasmania.

MINOS RIMATA. Hutton; (1884). *Adeorbis petterdi*, Hutton, Trans. N.Z. Inst. XIV., p. 132, [not of Brazier].

Habitat.—Waiwera, near Auckland.

Shell small, yellowish white, with oblique brown spots; the umbilicus very narrow.

Differs from *M. petterdi* in its much narrower umbilicus. The operculum and dentition are not known.

Family. HALIOTIDÆ.*

Genus. HALIOTIS. Linné.

HALIOTIS IRIS. Martyn, Univ. Conch. pl. 61, (1784); Reeve, Conch. Icon., fig. 37.

Habitat.—Throughout New Zealand, Chatham Islands, Auckland Islands.

The outer lip is continuous and produced beyond the body whorl; the columella does not form a spiral.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. H.

HALIOTIS RUGOSO-PLICATA. Chemnitz, Conch. Cab. X., p. 311, fig. 1604 (1788); Reeve, Conch. Icon., fig. 7. *H. plicata*, Karsten, Museum Leskeanum, (1789). *H. australis*, Gmelin, in 13th edition of Linné's Syst. Nat. *H. cruenta*, Reeve, Pro. Zool. Soc. of London, 1846, p. 59.

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* The following species are omitted as not really inhabiting New Zealand :—

Haliotis nævosa, Martyn; inhabits Australia
Haliotis albicans, Quoy; inhabits Australia
Haliotis cunninghami, Reeve, inhabits Australia
Haliotis stomaticiformis, Reeve; inhabits Australia
Haliotis virginea, Chemnitz; inhabits Western Africa
Haliotis pulcherima, Deshayes; Habitat unknown
Haliotis novæ-zealandiæ, Reeve; Habitat unknown.

Habitat.—Throughout New Zealand, Chatham Islands, Auckland Islands. Found also in South Australia.

The posterior portion of the outer lip does not project beyond the body whorl; columella forming a spiral; exterior of shell obliquely plicated and crossed by rough striæ.

The dentition is not known.

HALIOITS GIBBA. Philippi, Abbild. und Besch. Conch. Haliotis, pl. IX., fig. 2, (1848); Reeve Conch. Icon. fig. 42; Voy. Erebus and Terror, Moll. pl. 1, fig. 16.

Habitat.—Throughout New Zealand, Chatham Islands.

Posterior portion of the outer lip not projecting beyond the body whorl; columella much curved but hardly spiral; exterior of shell longitudinally grooved and irregularly transversely plicated.

Variety HUTTONI. Filhol, Comtes Rendus, XCI., p. 1094. (1880)

Habitat.—Campbell Island.

Ribs stronger and slightly undulated; apex less anterior.

The dentition is not known.

Family FISSURELLIDÆ.

Genus. FISSURELLA. Lamarck.

FISSURELLA SQUAMOSA. Hutton, Cat. Marine Moll. of New Zealand, p. 42, (1873).

Habitat.—Foveaux Straits.

Oblong with strong radiating scaly ribs. Exterior brownish, the interior white.

The dentition is not known.

Sub-genus. *Lucapina.* Gray.

Apical opening surrounded by a callus.

FISSURELLA MONILIFERA. Hutton, Cat. Marine Moll. of New Zealand, p. 42. (1873).

Habitat.—Foveaux Straits.

With radiating moniliform ribs, and obscurely cancellated.

The dentition is not known.

Genus. EMARGINULA. Lamarck.

EMARGINULA STRIATULA. Quoy and Gaimard, Voy. Astrolabe. Zool. III., p. 332, pl. 68, fig. 21-22, (1834); Reeve Conch, Icon. fig. 47.

Habitat.—Cook's Straits to Foveaux Straits.

Shell longitudinally and transversely finely ribbed.

The dentition is not known.

EMARGINULA EMARGINATA. Blainville, Malacologie, *p.* 48, fig. 2. (1825); *E. australis*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 328, pl. 68, figs. 11-12, (1834); Reeve, Conch. Icon. fig. 19.

Habitat.—Lyttelton.

Found also in Australia and Tasmania.

Longitudinal ribs rough, alternately large and small.

The dentition is not known.

E. tenuicostata, Sowb. is said by Mr. Justice Gillies to occur in New Zealand. It is closely concellated, and pointed with green bands or brown rays.

Genus. PARMOPHORUS. Blainville.

PARMOPHORUS UNGUIS. Linné (Patella); Reeve, Conch. Icon. Scutus, fig. 5. *Patella ambigua*, Chemnitz, Conch. Cab. XI., fig. 1918.

Habitat.—Auckland to Dunedin.

The length of the shell is equal to twice the breadth.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. 1.

Sub-genus. *Tugalia*. Gray.

PARMOPHORUS INTERMEDIUS. Reeve, Proc. Zool. Soc. of London, 1842, p. 50. *T. elegans*, Gray in Dieffenbach's New Zealand, II., p. 240, (1843. *T. cinerea*, Sowb. Thes. Conch. III., p. 221, pl. 249, figs. 15-16; Reeve, Conch. Icon. fig. 5, [not of Gould]. *T. ossea*, Sowb. loc. sit. fig. 15.; Angas, Pro. Zool. Soc. of London, 1876, p. 219, [not of Gould]. *T. australis*, Tenison-Woods, Proc. Roy. Soc. of Tasmania, 1877, p. 21.

Habitat.—Throughout New Zealand, Chatham Islands. Found also in New South Wales, Victoria, and Tasmania.

The dentition is unknown.

Order. DOCOGLOSSA.

Family. ACMÆIDÆ.*

Genus. ACMÆA. Eschscholtz.

Sub-genus. COLLISELLA. Dall.

A. Apex of the shell sub-central.

ACMÆA CORTICATA. Hutton, Man. N.Z. Mollusca, p. 89, (1880).

Habitat.— Wellington to Dunedin.

Shell solid and depressed; the interior margin usually brown, rayed with white at the ribs, which vary in number from eight to more than twenty. Radula with a pair of marginal teeth on each side.

This species appears to be allied to *A. rugosa*, Quoy and Gaimard, from Amboina. The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. L.

ACMÆA CINGULATA. Hutton, N.Z. Journal of Science, I,, p. 477 (1883).

Habitat.—Dunedin and Lyttelton.

Shell solid, white, with about 30 to 50 low radiating ribs; interior white, the margin light brownish pink banded with white Radula without marginal teeth, the three laterals arranged in an oblique line.

The dentition is figured in Trans. N.Z. Institute, XVI., pl. X., fig. 5.

ACMÆA RUBIGINOSA. Hutton, Cat. Marine Moll. of New Zealand, p. 42, (1873).

Habitat.—Chatham Islands.

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* The following species is omitted as not inhabiting New Zealand:—
Patella cantharous, Reeve; inhabits Tasmania.

Shell rather thin, with 12 to 20 primary ribs, and shorter secundary ribs between them ; interior pinkish, rayed throughout with white under the ribs.

Dr. von Martens thinks that this may be *Patella lacunosa*, Reeve. The animal and dentition are unknown.

Perhaps *Patella campbelli*, Filhol, (Comptes Rendus, XCI., p. 1095, 1880), may be this species but the diagnosis is not sufficient for identification.

ACMÆA CONOIDEA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 355, pl. 71, figs. 5-7,, (1834) ; Gray Figs. Moll. Anim. pl. 114, fig. 2.

Habitat.—Banks' Peninsula.

Shell smooth, thin, small, conical, high, the apex rounded. Brown, sometimes with white radiating bands.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. K.

B. Apex of shell anterior.

ACMÆA PILEOPSIS. Quoy and Gaimard, Voy. Astrolabe, Zool III., p. 359, pl. 71, figs. 25-27, (1834). *Patelloides antarctica*, Hombron and Jacquinot, Ann, des Sci. Nat. Sec. 2, vol., 16, p. 190, (1841).

Habitat.—Bay of Islands to Banks' Peninsula, Auckland Islands.

Shell solid, smooth, with radiating striæ, convex, the apex recurved. Blackish, mottled with white, the interior bluish with a black margin.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. M.

ACMÆA FLAMMEA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 354, pl. 71, figs. 15-24, (1834); Gray, Figs. Moll. Anim. pl. 114, fig. 5.

Habitat.—Auckland to Dunedin. Found also in Tasmania.

Shell thin, pellucid, depressed, small, radiately striated. Yellow, marked with brown.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 15, fig. N.

ACMÆA FRAGILIS. Chemnitz, Conch. Cab. XI., fig. 1921, (1790); Quoy and Gaimard, Voy. Astrolabe, Zool. III. p. 351, pl. 71, figs. 28-30 (1834); Gray, Figs. Moll. Anim. pl. 114, fig. 7. *Patella unguis-almæ*, Lesson, Voy. Coquille, Zool. II., p. 420, (1830). *Patella solandri*, Colenso, Tasmanian Journal of Science, 1844.

Habitat.—Auckland to Dunedin.

Shell thin, depressed, the apex marginal. Green with concentric brown bands.

The dentition is not known.

Family. PATELLIDÆ*

Genus. PATINELLA. Dall.

Shell solid, the apex sub-central or anterior. Branchial wing interrupted in front.

Radula with a central plate, two laterals and one or two rows of rudimentary marginals on each side. Mouth entire below; margin of the mantle fringed.

I have altered the characters of this genus (which is founded on *P. magellanica*) so as to include all our Patellas, as they are evidently closely related.

PATINELLA STRIGILIS. Hombron and Jacquinot, Ann. des Sci. Nat. Zool. Series 2, vol. 16, p. 190, (1841). *P. magellanica*, Manual of N.Z. Mollusca, (1880).

Habitat.—Banks' Peninsula to Shag Point, Otago. Auckland Islands, Campbell Island.

Shell large, solid, obliquely conical, high, with about 20-30 low radiating ribs; the apex sub-central or rather anterior. Brown, obscurely marked with yellowish; interior greenish or yellowish-brown above the muscular impression, bluish-white and iridescent below it, the margin brown.

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* The following species are omitted as not really inhabiting New Zealand:—
Patella granularis, Linn.; inhabits South Africa
Patella cochlear, Born.; inhabits South Africa
Patella stella, Lesson; Habitat not known.

This is probably a variety of *P. ænea* (Martyn), or of *P. magellanica* (Martyn). *P. fuegensis* (Reeve), and *P. Kerguelensis* (Smith), are scarcely different.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 16, fig. A.

PATINELLA REDIMICULUM. Reeve, Conch. Icon. fig. 50, (1854); Voy. Erebus and Terror, Moll. pl. 1, fig. 24. *P. radians*, Reeve, Conch. Icon. fig. 25, [not of Gmelin]. *P pottsi*, Hutton, Cat. Marine Moll. of New Zealand, 44, (1873).

Habitat.—The southern portions of New Zealand and the Auckland Islands. Found also in Fuegia.

Shell large, depressed, with about 20 or 25 rounded ribs; the apex anterior; the interstices between the ribs bluish white.

Probably a variety of the last species. The dentition is not known.

PATINELLA DENTICULATA. Martyn, Univ. Conch. pl. 65, (1784). *P. margaritacea*, Chemnitz, Conch. Cab. XI., fig. 1914, (1790); Voy. Erebus and Terror, Moll. pl. 1, fig. 26. *P. ornata*, Dillyyn, Catal. Shell, p. 1029; Deshayes, Anim. sans Vert. 2nd edition, VII., p. 542. *P. nodosa*, Hombron and Jacquinot, Ann. des Sci. Nat. Zool. Series 2, vol. 16, p. 191, (184).

Habitat.—Throughout New Zealand.

Shell more or less depressed, with the apex anterior, generally about one fourth of the length from the anterior end. With eleven reddish yellow ribs, alternating with smaller and dark coloured ribs, which are spotted with white.

The dentition is figured in the Trans. N.Z. Institute, XV., pl. 16, fig. B.

PATINELLA INCONSPICUA. Gray in Dieffenbach's New Zealand, II., p. 244, (1843). *P. luctuosa*, Gould, Pro. Bost. Soc. Nat. Hist. II., p. 150, (1846) [not of Hombron and Jacquinot, (1841)].

Habitat.—Wellington to Dunedin.

Shell conical, high, the height often more than half the length; apex sub-central. Interior brown, with about twelve radiating white stripes.

This species passes into the last, and should perhaps be considered a variety of it.

PATINELLA REEVEI. Hutton, Man. of New Zealand Mollusca, p. 108, (1880). *P. imbricata*, Reeve, Conch. Icon. fig. 92, (1854), [not of Linné].

Habitat.—Wellington to Dunedin.

Apex anterior; ribs numerous, with imbricating scales. Colour dark blue black, or brownish.

The animal and dentition are unknown.

PATINELLA ILLUMINATA. Gould, Otia Conchologica, p. 7, (1846).

Habitat.—Auckland Islands, Campbell Island, Macquarie Island.

Like the last species but browner, and more or less marked with yellowish. Apex one fourth of the length from the anterior end. Ribs 30 to 40.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 16, fig. c. Perhaps *Patella terroris*, Filhol, (C. R. XCI., 1880) may be this species, but the diagnosis is not sufficient for identification.

PATINELLA EARLII. Reeve, Conch. Icon. fig. 71, (1854). *P. flexuosa*, Hutton, Cat. Marine Moll. of New Zealand, p. 45, (1873), [not of Quoy and Gaimard].

Habitat.—Stronghurst, Canterbury.

Ribs few and small, or none. Pale yellowish with deeply waved concentric brown lines.

Animal and dentition unknown.

PATINELLA RADIANS. Gmelin in 13th ed. of Syst. Nat. p. 3720, *P. radiata Novæ Zealandiæ*, Chemnitz, Conch. Cab. X. fig. 1618, (1788). *P. argyropsis*, Lesson, Voy. Coquille, Zool., II., p. 419, (1830). *P. argentea*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 345, pl. 70, figs. 16-17, (1834), [not of Linné]. *P. radiatilis*, Hombron and Jacquinot, Ann. des Sci. Nat. Series 2, vol. 16, p. 191, (1841. *P. decora*, Philippi, Zeitschrift Malak. 1848, p 162; Reeve, Conch Icon. fig. 33.

Habitat.—Throughout New Zealand. Its occurrence in Australia is doubtful.

Depressed, with about 20 ribs larger than the rest; apex one fourth of the length from the anterior end. Olive brown, blotched with paler.

The dentition is figured in Trans. N.Z. Institute, XV., pl. 16. fig. E.

Variety OLIVACEA. Hutton, Trans. N.Z. Inst. XV., p. 133, (1883).

Habitat.—Dunedin to the Bluff.

Ribs fine and uniform; apex one third to one fourth of the length from the anterior end. Uniform olive brown, with a black band round the margin.

The dentition is figured in the Trans. N.Z. Institute, XV., pl. 16, fig. D.

Variety PHOLIDOTA. Lesson, Voy. Coquille, Zool. II., p. 420, (1830). *P. sturnus*, Hombron and Jacquinot, Ann. des Sci. Nat. Series 2, vol., 16, p. 191, (1841). *P. floccata*, Reeve, Conch. Icon. fig. 106, (1854).

Habitat.—Throughout New Zealand.

Ribs small and uniform; apex very anterior, about one seventh of the length from the anterior end. Olive brown, largely blotched with white; or white with brown radiating bands.

PATINELLA TRAMOSERICA. Martyn, Univ. Conch. pl. 16, (1784); Reeve, Conch. Icon. fig. 27. *P. antipodum*, Smith, Voy. Erebus and Terror, Moll. p. 4, pl. 1, fig. 25, (1874.)

Habitat.—Wellington. Found also in New South Wales.

Depressed, finely radiately ribbed. Orange yellow with narrow black rays.

The animal and dentition are not known.

PATINELLA FLAVA. Hutton, Cat. Marine Moll. of New Zealand, p. 44, (1873).

Habitat.—Poverty Bay, to Stronghurst, Canterbury.

Conical, high, radiately ribbed. Pale yellow or orange without marks.

The animal and dentition are unknown.

PATINELLA STELLIFERA. Chemnitz, Conch. Cab. X., fig. 1617, (1788). *P. stellularia*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 347, pl. 70, figs. 18-20, (1834). Reeve, Conch. Icon. fig. 96.

Habitat.—Cook's Straits to Banks' Peninsula. Found also at the Friendly Islands.

Depressed, finely radiately ribbed. Reddish brown with radiating white stripes.

The animal and dentition are unknown.

As the Patellas are variable and not easy to make out I add a key to the species.

Colour brown.

Interior with 11 or 12 rays.
- Exterior with dark white spotted ribs .. *denticulata.*
- Exterior without dark ribs .. .. .. *inconspicua.*

Interior not rayed.
- Large and solid.
  - Exterior all brown .. .. .. *strigilis.*
  - Exterior bluish white between the ribs *redimiculum.*
- Medium and thinnish.
  - Smooth, usually with whith marks .. *radians.*
  - Rough and scaly .. .. .. *reevei*

Colour red or yellow.

With numerous waved concentric brown lines *earlii*
With radiating black stripes .. .. .. *tramoserica.*
With radiating white stripes .. .. .. *stellifera.*
Without markings .. .. *flava.*

NOTES ON HYBRIDISM IN THE GENUS BRACHYCHITON.

By Baron Ferd. von Mueller, K.C.M.G., M. & Ph. D., F.R.S., &c.

Cases of Hybridisation among Australian Plants are as yet but few on record. Instances therefore of natural cross-fertilization, when they come under our notice here, are of particular interest. Through the circumspect kindness of Dr. J. C. Cox, lately, a Hybrid between *Brachychiton populneum* and *B. acerifolium* was brought under my cognizance. It arose in Dr. Cox's brothers garden, where both the parent plants are up-grown; but it may have been obtained as a seedling from another place, both the indicated *Brachychiton*, which are beautiful shade trees of ready growth, being much reared in New South Wales. The Bastard-tree attained already a height of 40 feet and a stem diameter of one foot. The leaves differ in a marked manner from those of the parental species being of a more or less ovate shape or verging somewhat into a lanceolar form; but so far as seen by me they are quite lobeless, nor are they conspicuously acuminated. The leaf stalks are considerably elongated and not very slender. The panicle is ample, much like that of *B. acerifolium*, bearing numerous flowers; the articulation of the stalklets is at some distance from the calyx also as in *B. acerifolium*, not generally close to the calyx as in *B. populneum*. The color of the calyces holds the middle between that of the respective organ of the parent plants; it is pale yellowish outside much as in *B. populneum*. but inside crimson and not sprinkled as in *B. acerifolium*, according to a painted drawing furnished by Mrs. Ford. Fruits, so rarely developed by hybrids, have not been produced. For distinctive appellation in accordance with generally recognised rules the name *Brachychiton populneo-acerifolium* might be chosen for this highly interesting cross-production, the preponderance of resemblance being rather with*B. acerifolium* than with *B. populneum.*

It is worthy of remark, that from the whole extensive order of *Sterculiaceæ* only one instance of spontaneous hybridisation is on record, Mr. O. Tepper having discovered a cross between *Lasiopetalum Baueri* and *L. discolor* in South Australia. In the recent special work by Dr. W. O. Foske (Die Pflanzen Mischlinge, 1881) mention is however made of artificial crosses among the South African *Mahernias*, and doubtless in that genus as well as in *Hermannia* natural bastards could be found also.

This seems an apt apportunity to state that *Brachychiton acerifolium* has been traced recently by Mr. W. Bäuerlen as far south as Shoalhaven, where this assiduous collector gathered also the following plants, which were not proviously noticed so far south : *Philotheca australis*, *Sida rhombifolia*, *Poranthera ericifolia*, *Elatostemma reticulatum*, *Pennantia Cunninghami*, *Vitis clematidea*, *Pultenaea elliptica*, *Hovea linearis*, *Zornia diphylla*, *Ceratophyllum gummiferum*, *C. apetalum*, *Melaleuca styphelioides*, *Kunzea capitata*, *Eugenia myrtifolia*, *Trachymene linearis*, *Actinotus minor*, *Conospermum tennifolium*, *Cassinita quinqueforia*, *Goodenia heterophylla*, *Candollea laricifolia*, *Chloanthus Stoechadis*, *Clerodendron tomentosum*, *Tricoryne simplex*, *Aneilema acuminatum*, *Gymnostachys anceps*, *Paspalum scrobiculatum*.

NOTE ON THE CLASPERS OF HEPTANCHUS.

By W. A. Haswell, M.A., B. Sc.

Plate X.

In most *Elasmobranchii* there is found at the base of the clasper a cavity lined either completely (Sharks), or in a special position (Rays), with gland-cells secreting a sort of sebaceous material.* This cavity is excavated in the substance of the posterior lobe of the pelvic fin, and, opening from it, is a groove which runs along the clasper to its apex. In *Heptanchus indicus*, however, of which I have recently had the opportunity of examining fresh specimens, these organs present an arrangement which is in some respects entirely unlike that observed in other Elasmobranchs. The clasper itself has the form usual in Sharks. But the longitudinal groove which runs along its dorsal border is pushed in, as it were, in its proximal portion to form a deep, loose, vascular pouch of skin. Proximally the gland ends blindly. Enclosing the pouch and the claspers themselves is the posterior portion of the pelvic fin, which has the form of a wide sheath open internally and supported by the posterior fin-rays. When the two sheaths of opposite sides are drawn a little in towards one another they form a complete covering for the organs, only the tips being exposed. The inside of this sheath is lined with soft, highly vascular skin, devoid of scales and apparently glandular.

What purpose is served by this unusual arrangement it would be difficult to determine in the absence of any exact information as to the functions of the various parts in other forms; but the conjecture may be hazarded that the pouch serves as a reservoir

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* See K. R. Petri, Die Copulationsorgome der Plagiostomen, Zeitschr. f, wiss. Zool. xxx., 2 pp. 258—335, pl. xvi.—xviii.

for the secretion of the gland, and that the produced and sheath-like posterior lobe of the pelvic fin serves to enclose and protect the pouch and the claspers.

Explanation of Plate X.

Fig. 1. The clasper of *Heptanchus indicus* seen from the right side, the apex of the right pelvic fin drawn forward and the right clasper drawn backwards. Drawn from a photograph, reduced to one-third.

Fig. 2. The left clasper from the front, the posterior lobe of the pelvic fin drawn to one side.

a—entrance to glandular pouch. *b*—outer surface of pouch. *b'*—apex of clasper. *c*—apex of posterior lobe of pelvic fin. *d*—vascular inner surface of the posterior lobe of the pelvic fin forming sheath for clasper. *e*—pelvic fins. *f*—anal fin. *g*—dorsal fin. *h*—opening of cloaca. *k*—urogenital papilla. *l*—abdominal pores, a rod passed into the left.

NOTES AND EXHIBITS.

Mr. W. A. Haswell read the following note:—

In part 7, of the Transactions of the Linnean Society (September, 1883), is a paper by Mr. A. G. Bourne "On certain Points in the Anatomy of the Polynoina, and on *Polynoë (Lepidonotus, Leach) clava* of Montagu," in which occurs the following foot-note:—

"Since this was written Mr. W. A. Haswell, M.A., B.Sc., in "A Monograph of the Australian Aphroditea," (Proc. Linn. Soc., New South Wales, vol. vii.) has described the segmental organ in *P. (Antinoe) praeclara*, and *P. (Antinoe) Wahlsi* allied to *P. pellucida*, Ehlers. That author has also arrived at the conclusion that Ehlers has not seen the true segmental organs, but only intestinal caeca, he describes the former as opening at the ventral tubercles, but does not give any figures."

Now my paper on the above subject, which contained among other matter an account of the nephridia or segmental organs of *Polynoë*, was published, not after Mr. Bourne's, as might be inferred from the sentence quoted above, but several months before the latter was even read.

My paper was read in June, 1882, and published in August of the same year. Mr. Bourne's was read on January 18th, 1883, and published in September of that year. I therefore had priority in publication by a year. Moreover, I published a paper on the Segmental Organs of *Polynoë*, in the Zoologischer Anzeiger, of September, 1882, five months before Mr. Bourne's communication to the Linnean Society was read. Whatever credit, therefore, is due to priority of discovery, rests unmistakeably with me, and not with Mr. Bourne, and his note on the subject is calculated to convey an erroneous impression.*

My Macleay read the following extracts from a letter of the Rev. J. E. Tenison-Woods, Vice-President of the Society, which he had just received from Perak, Straits Settlement :—

"I am sending you now a brief account of my movements which if you think of sufficient interest I would thank you to communicate to the Linnean Society. I was laid up during the whole of January with jungle fever, but early in February I started on a boat expedition into the interior. I left Kuala Kansa with a party of nine Malays and one European, descending the stream to near the mouth, a distance of 120 miles. I then returned in a smaller boat to the junction of the Kinta and ascended that stream nearly as far as navigable, about 50 miles, then by means of elephants we made several day's journey across the country to visit the tin mines in the valleys of Possin, Pappau, Lahat and Goping. All these mines are in the granite which forms the main central range of the Malayan Peninsula.

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* I have already pointed out in the Proceedings of this Society. (Vol. VII., p. 611), that the position of the external apertures of the segmental organs of *Hermadion* was known to Claparède as early as 1870.

They are deposits of stream tin only. I saw no tin veins of any kind and believe that the rich formations have all been derived from the slow weathering of granite in which fine crystals of tin have been disseminated. The river Kiuta has its sources in the central granitic axis which here rises in magnificent mountains 8,000 or 9,000 feet high. The most of this part of the range is fronted by a lower range of crystalline limestone weathered into fantastic shapes and generally in some parts precipitous. These latter portions form cliffs of blue, green, red and yellow, which are very picturesque, especially as the rest of the hills like the mountains hereabouts are densely clothed with jungle forests. The tin deposits are very rich and will supply large mining resources for ages to come. The slow weathering of the granite has spread the alluvial to a wide distance from the mountains. As yet only the heads of the valleys have been worked and this only to a small extent.

"After leaving Goping I returned down the River Kiuta as far as the Kampar River which I ascended as far as it is navigable for a shallow boat. I stayed at the mouth of a small stream named the Diepang and made a short elephant journey to the Limestone Mountains. Here I found Chinese and Malays working tin drift out of Limestone Caves. These Caves are many hundred feet above the present level of the plains. The alluvial is somewhat different from most of the mines but I do not doubt that it has been derived from the granite. Since its deposition the plains of limestone have been worn away by weathering hundreds of feet. The limestone is crystalline and as far as examined quite destitute of fossils. It is stratified in places, yet even then when cut into thin plates it fails to show any organisms under the microscope. It lies upon a ferruginous paleozoic rock (Cambrian ?)—which is much contorted and occasionally metamorphosed into gneiss. The limestone crops out in the beds of most of the rivers. At Possin the sections in the plains show sharp pinnacles of marble, amid which granite detritus and tin sand are preserved in the depressions.

"From Kuala Diepang I returned to Telok Anson on the Perak, where the Government sent a small steamer to assist me in some dredging operations, and the examination of the Coral Reefs at the Islands called the Dindings. I was only badly provided with dredging instruments, having in fact nothing but a few small nets and some tangles, but even with these I managed to get a good harvest of crustacea, star-fishes, sea-urchins, mollusca, comatulæ, corals, and hydrozoa. The urchins, crabs and simple corals were very interesting, having many points of resemblance with the fauna of the Barrier Reef of N. E. Australia. The Coral Reefs are small but rich. I never saw such extraordinary numbers of sea-urchins. *Diadema setosum* was literally in thousands on the rock at the waters edge. The Molluscan fauna is different from that of tropical Australia. *Patella* and *Acmæa*, are seldom seen, and only occasionally a small *Siphonaria*; but judge my surprise in finding the rocks clustered with small specimens of our well known Port Jackson *Littorina tectaria*. The vegetation on all these Islands is that of all the Indian Archipelago and North Australia, and I believe the same extends to the Indian Peninsula. I refer to such species as *Calophyllum inophyllum*, *Terminalia catappa*, *Scævola Koenigii*, *Ipomæa pes-capræa*, *Morinda citrifolia*, *Thespizia populnea*, *Tournefortia sericea*, *Guilandina bonduc*, *Gmelina asiatica*, *&c.* Of course there is a little of the indigenous vegetation as well.

"In the course of my journeys I have not seen many wild animals. Once when riding alone I started a black panther to the great alarm of my pony. But the country swarms with wild elephants, tigers, and several large serpents. Crocodiles in the rivers I seldom saw, but scarcely a day passed on which some live animal was not offered for sale at the Malay villages we passed.

"The mines are for the most part worked by Chinese. A few Malays mine for tin, but in a most inefficient manner, for though the Chinese methods are bad enough, yet the Malays are far inferior to them as miners. At the head of the Kinta I came into the country of the Sakeis, an aboriginal mountain people who are only a small degree above our own Australian natives. In this part of the country they are quite peaceful, though never liking to remain long away from the wild mountains. Some of the tribes use bows and arrows but here their only weapon is the sumpitan or blow tube. Their arrows are poisoned with Upas or Ypo (Antiaris toxicaria and other plants) and a wound from them is very fatal.

"I am starting to morrow for the Krian River and I dare say may be able to communicate something new in my next letter."

Mr. Henry Deane, M.A., exhibited a large and curiously formed gall found on a gum tree (*Eucalyptus resinifera ?*). It was the production of one of the gall making Coccidæ, and resembled closely the gall of the female of *Brachyscelis duplex*. described and figured by H. L. Schrader in the first volume of the Transactions of the Entomological Society of New South Wales.

The Chairman said that he wished to call the special attention of the Society to the magnificent addition to the library just received from Belgium. About 600 books and pamphlets on scientific subjects arrived by the "Cuzco" last week, sent by the Royal Malacological Society of Belgium. For many of them the Society was indebted to the several Societies whose publications they are, and to these thanks have been duly sent, and in most cases it is to be hoped that a constant interchange of publications will be kept up; but the action of M. Lefèvre in the matter calls for especial notice. That gentleman immediately on receiving the circular announcing the Society's loss in the disastrous fire at the Garden Palace, wrote on behalf of his Society, not only expressing the kindest sympathy, but also announcing that he would collect for this Society all the Scientific Belgian publications which he could get. He thought the Society should mark in some special way its gratitude and approval.

It was resolved that the thanks of the meeting should be conveyed to M. Lefèvre by the President of the Society.

WEDNESDAY, 28TH MAY, 1884.

Professor W. J. Stephens, M.A., F.G.S., in the chair.

The Rev. T. Wyat Gill of the London Missionary Society, P. E. Henderson, Esq., C.E., and Percy Williams, Esq., were introduced as visitors.

MEMBERS ELECTED.

G. G. Edelfelt, Esq., of Townsville, Queensland, and Dr. Maurice J. O'Connor, of Sydney, were duly elected members of the Society.

DONATIONS.

"Fauna und Flora des Golfes von Neapel." Monographs I. to VIII., 1880 to 1882. 4to. From E. P. Ramsay, Esq., F.L.S., F.G.S.

"Nova Acta Regiæ Societatis Scientiarum Upsaliensis." Serici III., Tom. XI., Fasc. 2. 4to, 1883. From the Society.

"Annales de la Société Entomologique de Belgique." Tome XXVII. 8vo, 1883. From the Society.

"Journal of Conchology." Vol. IV., No. 5. January, 1884. From the Conchological Society of Great Britain.

"Science." Vol. III., Nos. 58 to 61, March 14th to April 4th, 1884. From the Editor.

"Bulletin of the California Academy of Sciences." No. 1, February, 1884. From the Academy.

"Proceedings of the Academy of Natural Sciences of Philadelphia." Part III., for 1883. From the Academy.

"Report of the Trustees of the Sydney Free Public Library for 1883-4. From the Trustees.

"Eucalyptographia." By Baron F. von Mueller, K.C.M.G., M.D., &c. Decade IX. 4to, 1883. "Systematic Census of Australian Plants." By Baron F. von Mueller, K.C.M.G., &c. First Annual Supplement. 4to, 1884. From the Author.

"Report of the Auckland Institute and Museum for 1883-84." From the Trustees.

"Report of the Royal Society of Tasmania for 1883." From the Society.

"Feuille des Jeunes Naturalistes." No. 162, 1 April, 1884. From the Editor.

"Midland Medical Miscellany." Vol. III., No. 28, April, 1884. From the publishers.

"Bulletin de la Société Impériale des Naturalistes de Moscou." Tome LVIII., Année 1883, No. 3. From the Society.

"Victorian Naturalist." Vol. I., No. 4, April, 1884. From the Field Naturalist's Club of Victoria.

"Catalogue of Books added to the Radcliffe Library during the year 1883. 1 Vol., 4to, 1884. From the Radcliffe Librarian.

"Twentieth Annual Report of the Zoological and Acclimatisation Society of Victoria, for 1883." From the Society.

"Catalogue of the Birds in the British Museum." Vol. IX., 1884. 8vo. From the Trustees.

"Bulletin de la Société Royale de Géographie d'Anvers." Tome VIII. 5e Fasc. 1884. From the Society.

NEW AUSTRALIAN-FISHES IN THE QUEENSLAND MUSEUM.

By Charles W. D. Vis, M.A.

Serranus subfasciatus.

D. 11/15. A. 3/8. Lat. 105. Tr. 14/24.

The height of the body is $\frac{5}{16}$ to $\frac{5}{19}$ of the total length. The length of the head $\frac{3}{10}$ of the same. The orbit is $\frac{1}{5}$; snout, $\frac{1}{4}$; interorbit $\frac{1}{8}$ of the length of the head.

Profile of body and head above regularly convex, slightly indented over the centre of the orbit; caudal rounded. Soft dorsal and anal higher than the spinous dorsal, obtusely pointed. Muzzle obtuse. Three opercular spines, the middle one the largest. Pre-opercular serrations gradually increasing in size from the top of the hinder limb and suddenly expanding at the angle. The upper maxillary reaches beyond the level of the hinder edge of the orbit. Second anal spine much stronger than the third. Pectoral rather longer than the ventral, distant from the anal. Scales enlarging gradually posteriorly. Colour purplish brown, with indications of darker transverse stripes on the post-abdomen and caudal peduncle. A series of short dark bars descending forwards from the base of the dorsal, no spots nor black edge on the caudal.

Length, 8 inches. Locality, Cardwell.

This species has no near alliance with any co-member of its section of the genus. It must however, be observed, that one of them, S. oceanicus, C. & V. is considered by Mr. Macleay to be identical with Bleeker's marginalis, which again is identified by

Dr. Bleeker with his Epinephelus fasciatus. It is therefore possible that sub-fasciatus may be yet another form of the one species, but its very small scales and its markings render it improbable.

SERRANUS MARS.

D. 9/15. A. 3/8,

The height of the body is $3\frac{1}{2}$ in the length of the body, s.c.; the length of the head $2\frac{3}{5}$ in the same length. The orbit is $4\frac{3}{4}$; inter-orbit, $3\frac{3}{5}$. and snout $3\frac{1}{2}$ in the length of the head. The second anal spine is $\frac{1}{3}$ of the length of the head.

Caudal rather emarginate. The upper maxillary reaches far beyond the level of the hinder edge of the orbit. The profile of the head is convex, very slightly indented in front of the upper edge of the orbit The muzzle is pointed. First dorsal lower than the second and the anal; both the latter obtusely pointed. Opercle with three spines, the middle one much the largest; pre-opercle minutely denticulated on the hinder limb towards and upon the angle. Canines $\frac{2}{2}$, the upper distant; the other teeth long, especially in the inner row below and the innermost of the maxillary groups. Pectoral long, reaching nearly to the base of the anal. Second anal spine longer and much stronger than the third. Scales deciduous.

Colour uniform dark brown. Caudal with an oblique white bar on each lobe converging backwards. Soft dorsal and anal with a pale intra-marginal band.

Closely allied to S. urodelus, Cuv., but without any traces of spots on the pale edged fins. Other distinctive characters are a longer head and eye, and a concave caudal.

Length, 7 inches. Locality, Cardwell.

SERRANUS MYSTICALIS.

D. 11/16. A. 3/8. Lat. 100. Tr. 12/30.

The height of the body is rather less than $\frac{1}{4}$ of the total length, the length of the head is $\frac{3}{4}$ of the total. The orbit is $\frac{1}{4}$, the inter-orbit $\frac{1}{8}$, and the snout $\frac{3}{7}$ of the length of the head.

Caudal rounded. The upper maxillary does not reach the level of the posterior margin of the orbit. The profile of the head is deeply indented in front of the eyes. The muzzle is rather obtuse. The fourth, fifth and sixth spines of the first dorsal the longest, $2\frac{1}{4}$ in the height of the body in front of the pectoral. Opercle with three spines, of which the middle one is much the strongest. Pre-opercle with sub-equal obtuse comblike denticulations, shortened above the angle, broader and more tooth-like at the angle. Soft dorsal and anal rounded at the tip, equal in height to the spinous dorsal. Second anal spine longer than the third. Pectoral much longer than the ventral, nearly reaching the anus.

Colour uniform pale brown, two broad bands along the dorsals, one at the base, the other in the middle, faintly indicated. Edge of the jaws and a line on the cheek bordering the upper edge of the maxillary black.

Length, 8 inches. Locality, Queensland Coast, habitat ?

The nearest ally of this fish is S. moara. Temm. and Schleg. of the Japanese Seas. It is differentiated by the absence of any marking on the body and the presence of black lines on the head.

Genyoroge notata, var. c. and v. sublineata.

D. 10/13. A. 3/8. Lat. 49. Tr. 8/13.

The ascending lines above the lateral line wanting. The upper stripe is along the lateral line, and passes through the black blotch. The one below it also passes within the edge of the spot.

Length, $7\frac{1}{2}$ inches. Locality, Cardwell.

Genyoroge nigricauda.

D. 10/15. A. 3/8. Lat. 48.

The height of the body equals the length of the head, both being $3\frac{1}{2}$ in the total length. The snout equals the orbit, both being $3\frac{1}{2}$ in the length of the head; interorbit $5\frac{1}{2}$ in the same. The preoperculum is finely serrated on both limbs, and has a moderate notch above the angle. Caudal strongly emarginate.

Colour yellowish grey. Caudal nearly black with a very narrow white edge. Soft dorsal and webs of spinous dorsal behind the first two broadly black edged, the extreme edging being pale.

Length, 4 inches. Locality, Queensland coast.

In structural characters approaching *G. Bengalensis.*

PRIACANTHUS JUNONIS.

D. 10/13. A. 3/14. Lat. 87. Tr. 42.

The height of the body is one-fourth of the total length. The length of the head, $3\frac{1}{3}$ in the same; orbit, $2\frac{1}{3}$; snout 3 in the length of the head; interorbit, $\frac{1}{2}$ of the orbit and $\frac{3}{11}$ of the length of the head. Lateral line indistinct on fore-part of the body only. The posterior nostril is more than twice as long as broad with its posterior side straight, its anterior convex. The operculum has one spine. The preoperculum is serrated on both limbs, and has a long flat serrated spine at the angle. Dorsal spines nearly equal, the second not much shorter than the last, roughly striated. The ventrals reach to the base of the anal, but are considerably shorter than the head. The maxillary reaches the anterior fourth of the orbit. Colour uniform yellowish grey, (dry) without spots or edgings.

Length, 5 inches. Locality, Queensland coast.

HEROPS. Nov. gen.

Teeth on vomer and palatine bones; in jaws viliform, without canines. Eye very large. Operculum spiniferous. Preoperculum serrated, without spines. One dorsal deeply notched; dorsal and anal sheathed. Lateral line continuous; gape very oblique. Habit elevated, compressed. Branchiostegals six. Upper surface of head naked.

H. MUNDA.

D. 10/11-12. A. 3/11. Lat. 51. Tr. 5/11.

The height of the body is $3\frac{1}{4}$ to $3\frac{1}{2}$; the length of the head 4 in the total length. The orbit nearly $\frac{1}{2}$, the snout and interorbit each $\frac{1}{4}$ of the length of the head.

Lower profile more convex than the upper. The upper edge of the orbit rises above the interorbital surface. Operculum with two spines subequal or the lower one elongated. Preoperculum finely serrated on both limbs. Caudal forked; 5th and 6th dorsal spines the longest, one half the height of the body. 2nd anal spine equal in length but stronger than the 3rd.

Colour uniform silvery, on the dorsum with a bluish steel tint. Caudal broadly dark edged all round.

Length, 5 inches. Locality, Cardwell.

The naked head, associated with comparatively large scales, and a preoperculum entirely without spines have led to the proposal to form a genus for this Priacanthine fish.

Pseudambassis nigripinnis.

D. 7, 1/8. A. 3/9. Lat. 29. Tr. 11.

The height of the body is 2/5, the length of the head $\frac{1}{3}$ of the length, s.c. The orbit $2\frac{3}{4}$, the snout and interorbital each $3\frac{1}{4}$ in the length of the head. The 2nd dorsal spine is half the height of the body. Preorbital serrations feeble. Lower limb of preoperculum very feebly serrated, but with two or three strong teeth at the angle. Profile equally convex above and below, slightly concave over the orbit. Head and foreparts thick.

Colour fleshbrown, with a silvery mesial line. The scales of the back edged with black spots; soft dorsal and anal, more or less, largely black tipped; web between 2 and 3 dorsal spines densely black dotted.

Length, 1-$1\frac{3}{4}$ inches. Locality, Brisbane.

Besides the black edged scales and black tipped fins this little fish has a larger head and broader interorbit that P. Ramsayi, with which it is associated in fewer numbers in the Brisbane River.

Pseudambassis pallidus.

D. 7, 1/8. A. 3/8. Lat 25. Tr. 9.

The height of the body is $2\frac{1}{3}$; the length of the head $2\frac{3}{4}$ in the length, s.c.; orbit $\frac{1}{3}$, snout and interorbit each $\frac{1}{4}$ of the length of the head. Second dorsal spine more than $\frac{2}{3}$ of the height of the body. Preorbital strongly serrated, lower limb of preoperculum strongly serrated. Dorsal profile elevated, angular, highest at the insertion of the dorsal. Head rather large and compressed.

Colour uniform pale brown; spotless.

Length, $1\frac{3}{4}$ inches. Locality, Queensland.

Allied to P. Macleayi, but with lower fins and smaller eye; its form is also less elevated.

PSEUDAMBASSIS CONVEXUS.

D. 7,1/6. A. 3/8. Lat. about 22. Tr. about 11.

The height of the body is $2\frac{1}{5}$; the length of the head 3 in the length, s.c.; orbit 3; snout and interorbit each $3\frac{1}{2}$ in the length of the head. Second dorsal spine $\frac{2}{3}$ of the height of the body; 2nd dorsal longer than 3rd and 2nd anal longer than 3rd. Form, sub-pyriform compressed, rather deep. Lower profile more convex than the upper.

Colour bright flesh pink, spotless; cheek pearly.

Length, 1 inch. Locality, Queensland.

In many characters similar to P. nigripinnis, but longer dorsal and anal spines and without markings.

APOGON SIMPLEX.

D. 7, 1/9. A. 2/8. Lat. 25. Tr. 9.

The height of the body and the length of the head each $3\frac{1}{2}$ in total length; the orbit $2\frac{1}{4}$; interorbit $3\frac{1}{2}$; and snout 5 in the length of the head. The 3rd and longest dorsal spine $2\frac{1}{2}$ in the height of the body, and equal to the length of the 2nd anal. The preoperculum is minutely serrated, the maxillary reaches the hinder fourth of the orbit. The first dorsal is low, the 2nd dorsal and the anal elevated. Caudal peduncle long and tapering.

Colour uniform vinaceous grey, operculum pearly.

Length, $2\frac{1}{2}$ inches. Locality, Cooktown.

APOGON RUDIS.

D. 7, 1/9. A. 2/8. Lat. 24. Tr. 2/6.

The height of the body and length of the head are each $3\frac{1}{5}$ of the total length; the orbit is $2\frac{2}{3}$, interorbit $4\frac{1}{2}$, and snout 5, of the length of the head. The hind limb and half of the lower limb of the preopercle denticulated; the maxillary reaches the hinder third of the orbit. The first dorsal is nearly as high as the second.

Colour uniform yellowish brown. A broad black band at the base of the second dorsal; the first dorsal faint dusky.

Length, 5 inches. Locality, Cardwell.

APOGONICTHYS LONGICAUDA.

D. 6, 1/9. A. 2/9. Lat. 38. Tr. 3/13.

Height of the body, $3\frac{2}{3}$, and length of the head $3\frac{1}{4}$ in the total length, or $2\frac{3}{4}$ and $2\frac{2}{5}$ respectively in the length, s.c. Orbit 4, snout $3\frac{1}{2}$, inter-orbit 5, in the length of the head. The length of the caudal peduncle equals the height of the 2nd dorsal spine, and is one-half greater than its own height. The 1st dorsal spine is more than half the height of the body. The upper maxillary reaches nearly to the vertical from the hinder edge of the orbit, 2nd dorsal spine shorter than the 1st. Uniform brownish (dry.) Cheeks and opercle finely brown-sprinkled; edge of the first dorsal, second dorsal and anal finely black dotted. A few brown dots on the body and fins.

Length, 4 inches. Locality, Queensland.

HOMODEMUS. NOV. gen.

Six Branchiostegals, one dorsal with eleven spines, anal with three. No canines. Teeth on vomer, palatines and jaws. Outer row of jaw teeth larger, all villiform. No teeth on the tongue. Operculum with an obtuse point, entire. Pre-operculum entire. Scales small. Lower jaw the longer.

HOMODEMUS CAVIFRONS.

D. 11/16. A. 3/13.

The height of the body and length of the head are each $2\frac{2}{3}$ in the length of the body, s.c. Orbit $7\frac{1}{2}$, inter-orbit $4\frac{1}{2}$, and snout 4, in the length of the head ; 5th dorsal spine about $\frac{1}{4}$ of the height of the body.

Profile gibbous at the insertion of the dorsal, concave over the head. Head broad behind, muzzle depressed. The maxillary reaches beyond the hinder edge of the orbit. Dorsal deeply notched, the spinous portion rather lower than the soft and the anal. Caudal rounded. Fifth dorsal spine the longest. Second anal equal in length to the third but much stronger. Scales rounded, obscurely ctenoid.

Colour brown, without markings.

Length, 14 inches. Locality, Tully River.

DULES HUMILIS.

D. 10/11. A. 3/11. Lat. 50. Tr. 5/10.

Height of the body one-third, and length of the head $\frac{1}{4}$ of the total length. Orbit 3, inter-orbit and snout each $3\frac{3}{4}$ in the length of the head.

The dorsal is deeply notched, its 4th and 5th spines longest, and equal to more than one-half the height of the body. Habit high, compressed with the upper profile rather gibbous at the origin of the first dorsal, and slightly concave over the head. Caudal deeply emarginate. Second anal spine as long as and stronger than the third. Operculum with two small points. Pre-opercle finely serrated. Eye large. The maxillary reaches the anterior fourth of the orbit.

Colour silvery, immaculate, darker on the back. Caudal broadly dark-edged all round.

Length, 4 inches. Locality, Queensland.

Helotes profundior.

D. 12/10. A. 3/9. Lat. 90. Tr. 17/36.

The height of the body is nearly 4, the length of the head $5\frac{1}{2}$ in the total length of the body. Orbit 4, snout 3, in the length of the head. Teeth distinctly lobed. Mandibles with a line of open pores continuous round the symphysis. Operculum with two flat points, the upper one small, the lower (on one side) elongate. Upper limb and angle of pre-opercle serrated, coracoid denticulated. The maxillary reaches the vertical from the posterior nostril. Spinous dorsal arched, the 5th spine the longest. Anal spines short and weak. Caudal emarginate. Snout obtuse, tumid over the nasal region.

Colour pinky brown with golden reflexions especially on the head. Four dark brown longitudinal lines on the head and body.

Length, 6 inches. Locality, S. Australia.

The comparative depth of this fish and the narrowness of its scales are characters sufficiently distinctive. The longitudinal lines are indistinct in the spirit specimen, in the recent fish there may be more than four visible.

Therapon spinosior.

D. 14/8. A. 3/8. Lat. 56. Tr. 4/12.

Height of the body, $\frac{3}{10}$ and the length of the head $\frac{1}{4}$ of the total length. Orbit and snout each $3\frac{1}{3}$ in the length of the head.

Habit oblong. Upper profile regularly convex from tail to tip of snout. Dorsal and caudal moderately emarginate. The upper maxillary reaches the level of the interval between the nostrils. Angle of the pre-operculum rounded, its hinder limb obtusely serrated, more acutely at the angle. Operculur spine moderate with a deep notch above it.

Colour yellowish brown, with a brighter band along the middle of each scale. Fins uniform.

Length, 4 inches. Locality, Queensland.

THERAPON ACUTIROSTRIS.

D. 12/10. A. 3/8. Lat. 60. Tr. 8/18.

The height of the body is 3, and the length of the head $3\frac{3}{4}$ in the total length. The orbit and snout are each 3, the inter-orbit, $4\frac{1}{2}$ in the length of the head.

Dorsal moderately emarginate. Caudal slightly so. The upper profile angular, that of the head nearly straight from the dorsal. Muzzle sharp. Pre-orbital serrated. The serrations of the hinder limb of the pre-operculum gradually increasing in length downwards. Operculum with two spines. The 4th and 5th dorsal spines the longest; the 2nd anal longer and stronger than the third. Dorsal spines and 2nd anal very strong.

Colour light silvery blue with three longitudinal stripes on the body, the middle running from the snout over the eyebrow to the tail. Web of the dorsal edged with black. Fins otherwise uniform. In one example the back above the upper stripe is nearly as dark as it, rendering it indistinct.

Length, 4 inches. Locality, Queensland.

Allied to T. oxyrhynchus.

AUTISTHES. Nov. gen.

Persistent vomerine teeth; body oblong; jaws subequal; one dorsal deeply notched, with 12 strong spines. In each jaw an outer series of stout conical teeth. All the bones of the head armed, operculum with a strong spine. Scales small, three strong anal spines, eye large, no groove behind the chin nor pores on the mandibus.

AUTISTHES ARGENTEUS.

D. 12/10. A. 3/8. Lat. 85. Tr. 14/26.

The height of the body is less than one-fourth of the total length and equals the length of the head, including the opercular spines. Orbit $3\frac{2}{3}$, and snout (=interorbit) $3\frac{1}{3}$ in the length of the head; 4th dorsal spine (the longest) $\frac{2}{3}$ of the same.

Preorital and inter-operculum finely denticulated, preoperculum on both limbs strongly crenulo-dentated; operculum, with two points, the upper almost obsolete, the lower elongate, dagger shaped ; coracoid large, crenulo-dentated ; scapulary more faintly armed, but reaching nearly to the vertex ; superorbital radiately grooved ; scales thick, ctenoid ; caudal strongly emarginate ; 4th dorsal spine more than twice as long as the third, 8th longer than the 7th, spinous dorsal much higher than the soft or the anal ; pectoral short, 3rd anal spine the longest ; the upper maxillary reaches beyond the fore edge of the orbit.

Colour silvery. Upper two-thirds of webs of 4th and 7th spines of dorsal, tips of first three rays of soft dorsal, end of upper caudal lobe and a large spot on the tips of its submedial rays black.

Length, 12 inches. Locality, Queensland Coast.

HEPHÆSTUS. Nov. gen.

Form of body rather elevated ; eye rather small ; mouth horizontal, the lower jaw rather the shorter ; 1 dorsal with 12 spines, the anal with 3 ; caudal fin emarginate. No canine, palatal, nor vomerine teeth. Preoperculum denticulated, operculum with obtuse points ; scales moderate, ctenoid ; 6 branchiostegals ; pseudo branchiæ and air bladder. (?)

H. TULLIENSIS.

The height of the body is $2\frac{1}{2}$; the length of the head $3\frac{1}{2}$ in the total length ; the orbit $4\frac{1}{2}$, interorbit $3\frac{1}{2}$, snout 3 nearly, in the length of the head. The 5th dorsal spine $\frac{1}{4}$ nearly of the height of the body. Form very convex above, profile of the head concave ; 1st dorsal lower than the 2nd or the anal, both the latter rounded at the tip. Pectorals short, rounded : coracoid and scapulary finely denticulated. Preopercle entire on lower limb, angle rounded ; 4th and 6th dorsal spines the longest. The 2nd anal equals the 4th dorsal, and is a little longer and much stronger than the 3rd. Soft dorsal, anal and caudal scaly at the base. Outer row of teeth strong, incurved.

Colour uniform blackish, soft dorsal, anal and caudal black, narrowly edged with white.

Length, 9 to 12 inches. Locality Tully and Murray (Queensland) Rivers. Feeds on Zostera.

This genus, if warranted by the characters given, will come near Lobotes.

GERRES SPLENDENS.

Lat. about 48. Tr. about $3\frac{1}{2}/9$.

The height of the body is $2\frac{3}{4}$; the length of the head $3\frac{1}{3}$ in the length, s.c.; orbit $2\frac{3}{4}$, snout and interorbit each rather more than $\frac{1}{3}$ of the length of the head. The 3rd dorsal spine is more than $\frac{1}{2}$ of the height of the body; the 2nd anal more than $\frac{1}{2}$ of the 3rd dorsal and longer than the 3rd anal. Scales persistent, most of those on the back crenulated in the centre. Preorbital emarginate, first dorsal subfalciform, the upper profile is regularly convex, the lower straight, and the belly flattened between the ventrals. Hind limb of the preopercle nearly vertical, and its angle rounded Sheath of dorsal fin moderate.

Colour uniform silvery with blue and gold reflections. The edge of the dorsal black.

Length, $7\frac{1}{2}$ inches. Locality, Cardwell.

SCOLOPSIS PLEBÆIUS.

D. 10/9. A. 3/7.

The height of the body is $3\frac{1}{4}$, the length of the head $4\frac{1}{4}$ in the length, s.c.; orbit $2\frac{1}{2}$, interorbit 3, snout $3\frac{1}{3}$ in the length of the head. The height of the preorbital is $\frac{2}{5}$ of the orbit, on the edge of the orbit a single preorbital spine, with two feeble denticulations beneath it on one side, not on the other, hind limb of preoperculum vertical and strongly serrated, its produced angle bears 3 large flat denticulations. The 3rd anal spine is equal in length to the 2nd, but is much weaker. Upper profile gibbous over the nape.

Colour pale brown. A line of oval white spots at the base of the first dorsal and anterior half of second running out along the middle of the second. On the last five webs of the first and first of the second dorsal a black spot between the white one and the base of the spine.

Length, 6 inches. Locality, Queensland.

THE AUSTRALIAN HYDROMEDUSÆ.

By R. von Lendenfeld, Ph.D.

- Part III.

Plates VII. and VIII.

THE 1st SUBORDER HYDROPOLYPINÆ.

THE BLASTOPOLYPIDÆ.

5. FAMILY BLASTOPOLYPIDÆ. Von Lendenfeld, 1884.

Hydropolypinæ which form colonies of Zooids, which attain different shapes, adapting themselves to different parts of the work that has to be performed by the whole. There are always alimentary Zooids, Trophosomes and generative Zooids, Polypostyles in one colony. The alimentary Zooids never mature the genital products, this duty devolves exclusively on the Polypostyles.

I. SUB-FAMILY CORDYLOPHORINÆ. Von Lendenfeld, 1884.

Branched colonies bearing alimentary Zooids, with scattered filiform tentacles, and Polypostyles.

No representative of this group is known to occur in Australia.

II. SUB-FAMILY BIMERINÆ. Von Lendenfeld, 1884.

Branched colonies which bear alimentary and sexual Zooids. The former have a single verticil of filiform tentacles.

No Bimerinæ are known to occur in Australian waters.

III. SUB-FAMILY CAMPANULARINÆ. Von Lendenfeld, 1884

Blastopolypidæ with free alimentary Zooids on stalks, and invested by a chitinous cup. The Polypostyls are simple mouthless Zooids, in the gastral walls of which the generative elements are matured. They possess short stalks.

1. GENUS. CAMPANULARIA. Von Lendenfeld.

Companularinæ with alimentary Zooids which are destitute of an Operculum. All Zooids on simple unbranched Hydracauli, which spring from a creeping Hydrorhiza

The alimentary Zooids are very similar to some which belong to the Hydromedusinæ. The structure of representatives of this genus has been described by Jickeli (1) and Weismann (2.)

The Entoderm on the body is lower than on the arms, the muscular cells are epethelial and not sub-epithelial as in many other Hydromedusæ. The cells of the tentacular axis are sometimes filled with Protoplasm.

Jickeli describes extraordinary cells which occasionally fill the whole of the Ectoderm, and vary greatly in shape and size. They appear as amoeba fixed in different stages of locomotion and growth.

The Entoderm of the Proboscis consists of particularly high elements.

CAMPANULARIA URNIGERA. De Lamarck.

Lamouroux (3) describes this species from Australia under the name Clythia urnigera.

CAMPANULARIA MACROCYTTARIA. De Lamarck.

Quoy and Gaimard (4) describes this species from Zostera Antarctica, collected on the shore of Australia.

(1.) *C. Jickeli.* Der Bau der Hydroidpolypen. Morphologisches Jahrbuch. Band, VIII. Seite, 631.

(2.) *A. Weismann.* Die Entstehung der Geschlechtszellen bei den Hydromedusen. Seite, 144-146.

(3.) *Lamouroux.* Histoire des Polypes Coralligènes flexiles, p. 203.

(4.) *Quoy* and *Gaimard.* Voyage de l'Uranie, etc.

CAMPANULARIA COSTATA. Bale. (?)

Bale (1) described a Zoophyte without Gonaphor, from Port Darwin, under this name.

CAMPANULARIA TINCTA. Hincks.

Hincks (2) described a Hydroid from Port Phillip under this name ; a variety is found at Portland. (3)

2. GENUS. LAOMEDEA. Von Lendenfeld.

The alimentary Zooids are destitute of an Operculum, and the colonies are tree-like, inasmuch as the Hydrocauli are not inserted directly in the creeping Hydrorhiza, but appear as branches of a more or less erect stem, which may be climbing.

LAOMEDEA ANTIPATHES. Lamouroux.

Lamouroux (4) describes this species from "Australasia."

LAOMEDEA TORRESII. Busk.

Busk (5) describes this species form Torres' Straits, and Bale (6), from Fitzroy Island.

LAOMEDEA REPTANS. Lamouroux.

Lamouroux (7) found this species on the Thallomes of Ruppia Antarctica from Lewin's Land.

LAOMEDEA LAIRII. Lamouroux.

Lamouroux (8) obtained this Hydroid from Australian waters.

(1.) *W. Bale.* Catalogue of Australian Hydroid Zoophites, p. 56.
(2.) *T. Hincks.* Annales and Magazine of Natural History, series 3. Vol. VII, p. 280.
(3.) *Bale.* Catalogue of Australian Hydroid Zoophytes, p. 57.
(4.) *Lamouroux.* Histoire des Polypes Coralligenes flexiles, p. 206.
(5.) *Busk.* Voyage of the Rattlesnake, Vol. I., p 402.
(6.) *Bale.* Catalogue of Australian Hydroid Zoophites, p. 52.
(7.) *Lamouroux.* Exposition Methodique des genres de l'oure des Polypiers, Paris 1821, p. 14.
(8.) *Lamouroux.* Histoire des Polypes Coralligenes flexiles, p. 207.

LAOMEDEA MARGINATA. Von Lendenfeld.

Bale (1) described this Hydroid from Queenscliff and Portland, without knowledge of the Polypostyles, as Campanularia marginata.

LAOMEDEA RUFA. Von Lendenfeld.

Bale (2) described this Hydroid, the Polypostyle of which is unknown, from Holborn Island.

LAOMEDEA UNDULATA. Von Lendenfeld.

Quoy et Gaimard (3) describe this species from Algæ of Port Jackson under the name of Clytia undulata.

3. GENUS. LAFŒA. Lamouroux.

The trophosomes on very short stalks, tubular without operculum, and regularly disposed on the Hydrophyton.

The Histological structure of a representative of this genus was studied by Jickeli. (4).

The Perisarc consists of three layers, only two of which are visible in the Hydrotheca. The threads which connect the inner surface of the perisarc with the Cœnosarc are exceptionally thin and long. Cindoblasts are found exclusively on the tentacles, and the nettle-capsules are all of one kind.

LAFŒA FRUTICOSA. Sars.

This species is cosmopolitan. Bale (2) describes one specimen from Busk's collection obtained in Bass Straits as belonging to this species.

4. GENUS. HALECIUM. Oken.

Trophosomes biserial on the erect stems, subsessile; jointed to a short lateral process of the stem. There is a sexual difference externally visible in the Polypostyles.

(1.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 54.
(2.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 54.
(3.) *Quoy et Gaimard*. Voyage de l'Uranie ite.
(4.) *C. Jickeli*. Der Bau der Hydroidpolypen. Morphologisches Jahrbuch, Band VIII., Seite 629.
(5.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 64.

Weismann (1) studied two representatives of this genus.

Hamann (2) published a short note on the embryology of this genus. The ciliated embryo, with an Entoderm and an Ectoderm, was observed. The Entoderm is produced by a kind of invagination, but not by delamination as in other cases, and the process is somewhat similar to that described by Ciamician (3) from Tubularia.

HALECIUM TENELLUM. Hincks.

Bale (4) has found a specimen very similar to this European species, and I am also inclined to refer some specimens which I obtained in Port Phillip to this species.

IV. SUB-FAMILY SERTULARINÆ. Von Lendenfeld, 1884.

Alimentary zooids sessile their thecæ inserted in the free and erect or creeping stem.

1. GENUS. LINEOLARIA. Hincks.

This Genus is intermediate between this and the former Sub-Family. The Hydrophyton is closely attached to foreign bodies. The Hydrothecæ are sessile.

LINEOLARIA SPINULOSA. Hincks.

This Hydroid is common on Cymodocea Antarctica in Port Phillip and Portland.

LINEOLARIA FLEXUOSA. Bale ?

Bale (5) describes a Lineolaria the Gonophores of which are unknown, from Williamstown under this name.

(1.) *A. Weismann.* Die Entstehung der Geschlechstszellen bei den Hydromedusen. Seite 160-165.

(2.) *Hamann.* Der Organismus der Hydroidpolypen. Jenaische Zeitschrift. Band XV., Seite 528.

(3.) *Ciamician.* Ueber den inneren Bau und die Entwickelung von Tubularia, Zeitschrift fur wiss. Zool. Band XXXII.

(4.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 65.

(5.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 62.

2. GENUS. SERTULARIA. Hincks.

Stems arising from a creeping stolon. Trophosomes placed biserially on the stem and inserted in it, without Operculum.

Weismann (1) describes the structure of one species. Of the histology not much is known. The morphology of the Gonosome is described by Allman (2.)

SERTULARIA FERTILIS. Nov. sp.

Plate VII., fig. 4, 5.

The stems of the pinnate colonies attains a height of 8 cm. The Pinnæ are inserted alternately. They are from 10-14 mm. long. The Trophosomes are alternate, and the stem of the Pinna has a zig-zag shape, making room as it were for the Hydrothecæ to situate themselves in a straight line. The Hydrothecæ stand close together, and are somewhat wedge-shaped, with semi-circular opening from the exterior margin of which teeth protude. The opening is directed forward. The Hydrothecæ can be considered as semi-immersed.

The Gonophores are transformed Polyps of stem and Pinnæ. At the proximal end of each Pinna, one Polyp becomes a Polypostyle, and there are also Gonophores between the Pinnæ on the stem, one in each internode.

I found this Sertularia at Timaru, East coast of New Zealand, it bears Gonophores in April.

SERTULARIA IRREGULARIS. Nov. sp.

Plate VIII., fig. 6.

I have named a Sertularia, related to Kirchenpauer's Dynema Grosse-dentata, S. irregularis, from the great individual irregularities which I have met with in this species.

(1.) *A. Weismann.* Die Entstehung der Geschlechts zellen bei den Hydromedusen. Seite, 169.

(2.) *J. Allman,* A Monograph of the tubularian, etc., Hydroids. Vol. I, p. 50.

This Sertularia grows in dense bushy tufts, which reach a height of 4 cm. The stems bear few and irregularly disposed branches. The Hydrothecæ are alternate, or opposite. Most of them appear to be opposite, but sometimes one is found on one side without a corresponding one on the other (compare the figure.)

The Gonothecæ are very large, and only met with in the proximal portions of the colony.

The Hydrothecæ bear a larger external and smaller forward tooth, the back margin is perfectly smooth, the opening lies forward. The Hydrothecæ are adnate their whole length.

The Gonophor is flat pear-shaped and possesses a large circular terminal opening.

I found this Hydroid on the roots of Macrocystis in Port Phillip. It bears Gonophores in September.

SERTULARIA OPERCULATA. Linné.

This cosmopolitan species has been found at several places on the coasts of Australia and New Zealand. (1.) It was first described from Australasia by Kirchenpauer under the name Dynema fasciculata (2), and is one of the most common Hydroids of our coast.

SERTULARIA BISPINOSA, Coughtrey.

This species has been described from South Australia and New Zealand by Gray (3) and Coughtrey (4). The Sertularia operculata of Thompson (5), is, according to Bale (6), probably the same species. I have found this Sertularia on Bryozoa, and also on the roots of Algæ in Western Port and Port Phillip.

(1.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 68.

(2.) *Kirchenpauer.* Neue Sertulariden. Verhandlungen der K.L.C.D. Akademie. Band XXXI., Seite 12, 1864.

(3.) *Gray.* Dieffenbach: Travels in New Zealand, Vol. II.

(4.) *Coughtrey.* New Zealand Hydroids. Trans. N. Z. Institute, Vol. VII.

(5.) *W. Thompson.* Annals and Magazine of Natural History, February 1879, p. 107.

(6.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 68.

SERTULARIA TRISPINOSA. Coughtrey.

This species has been discovered in New Zealand by Coughtrey (1), Bale (2), believes to be able to refer a Victorian Hydroid to S. trispinosa.

The Sertularia operculata cf W. Thompson is probably the same. (3)

STERTULARIA MAPLESTONEI. Bale.

This species found in Portland has been described by Bale (4.)

SERTULARIA BIDENS. Bale.

This species found in Queenscliff and Williamstown has been described by Bale (5.)

SERTULARIA PULCHELLA. W. Thompson.

This species found in George Town and in South Australia has been described by Thompson (6), who thinks that the Sertularia bicuspidata of Lamarck is the same. It is however, according to Bale (7), different from the species described under that name by Heller.

SERTULARIA AUSTRALIS. Thompson.

This species was first described by Kirchenpauer (8) under the name of Dynamena australis, and afterwards by Thompson (9). It is found in Victoria and New Zealand.

(1.) *Coughtrey.* Trans. New Zealand Inst., Vol. VII.
(2.) *Bale.* Catalogue of the Australian Hydroid Zoophytes. p. 70.
(3.) *W. Thompson.* Annals and Magazine of Natural History, February, 1879, p. 107.
(4.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 70.
(5.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 70.
(6.) *W. Thompson.* Annals and Magazine of Natural History, February, 1879, p. 108,
(7.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 72.
(8.) *Kirchenpauer.* Dynema Verhandlungen Akademie der Naturforscher, 1864. Seite, 11.
(9) *Thompson.* Annals and Magazine of Natural History, February, 1879, p. 105,

SERTULARIA PENNA. Bale.

This species from Bass' Straits, was first described by Kirchenpauer (1), under the name of Dynamena penna.

SERTULARIA ELONGATA. Lamouroux.

This species found in Victoria, South Australia and New Zealand, has been described by Lamouroux (2), W. Thompson (3), and Blainville (4), under this name by Lamarck (5), under the name of Sertularia lycopodium, by Gray (6) as Dynamena abietinoides, and by Coughtrey (7), as Sertularia abietinoides.

SERTULARIA UNGUICULATA. Busk.

This species found in Victoria, New South Wales and New Zealand, has been first described by Busk (8), and under the name of Thinaria ambigua by Thompson (9.)

SERTULARIA GEMINATA. Bale.

This species was found in Victoria, and described by Bale (10).

SERTULARIA FLEXILIS. Thompson.

Is found in Victoria and has been described by Thompson (11).

SERTULARIA TRIDENTATA. Busk.

This species is found in Bass' Straits, and has been described by Busk (12.)

(1.) *Kirchenpauer.* Dynema Verhandlungen Akademie der Naturforscher. Seite. 11, 1864.

(2.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, p. 189.

(3.) *W. Thompson.* Annals and Magazine of Natural History, 1879, February, p. 107,

(4.) *Blainville.* Manual d'Actinologie,

(5.) *De Lamarck.* Histoire Naturelle des Animaux sans Vertébres.

(6) *Gray.* Dieffenbach. Travels in New Zealand. Vol II.

(7.) *Coughtrey.* Transactions of the New Zealand Institute. Vol. VII.

(8.) *Busk.* Voyage of H. M. S. Rattlesnake. Vol. 1, p. 394.

(9.) *Thompson.* Annals and Magazine of Natural History, 1879. February, p. 111,

(10.) *Bale.* Catalogue of the Australian Hydroid Zoophytes. p. 78.

(11) *Thompson.* Annals and Magazine of Natural History, 1879, February, p. 103.

(12.) *Busk.* Voyage of H.M.S. Rattlesnake, Vol. I., p. 394.

SERTULARIA RECTA. Bale.

This species is found in South Australia, and was described by Bale (1.)

SERTULARIA MACROCARPA. Bale.

This species is found in Victoria, and was described by Bale (2.)

SERTULARIA DIVERGENS. Lamarck.

This species was found in the South of Australia, and described by Lamarck (3), and by Lamouroux (4) under the name of Dynamena divergens; by Thompson (5) as Sertularia flosculus.

SERTULARIA TENUIS. Bale.

This species was found in Victoria, and described by Bale (6). It is considered by him to be the same as Dynamena distans of Lamouroux.

SERTULARIA BICORNIS. Bale.

Was found in Victoria and described by Bale (7).

SERTULARIA TRIGONOSTOMA. Busk.

This species was first described by Busk (8) from Torres Straits, and afterwards by Bale (9), from Albany passage.

SERTULARIA ACANTHOSTOMA. Bale.

This species was found in South Australia and has been described by Bale (10.)

SERTULARIA INSIGNIS. Thompson.

This species was found in George Town, and has been described by Thompson (11.)

(1.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p 79.
(2.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 80.
(3.) *Lamarck.* Histoire Naturella des Animaux sans Vertébres. Tom. II.
(4.) *Lamouroux,* Histoire des Polypiers Coralligénes flexibles, p. 180.
(5.) *Thompson.* Annals and Magazine of Natural History, 1879. February, p 104,
(6.) *W. Bale.* Catalogue of Australian Hydroid Zoophytes, p. 82.
(7.) *W. Bale.* On the Hydroida of South Eastern Australia. Journal of the Royal Microscopical Society of Victoria, Vol II., p. 22.
(8.) *J. Busk.* Voyage of H.M.S. Rattlesnake, Vol. I., p. 392.
(9.) *W. Bale.* Catalogue of the Australian Zoophytes, p. 84.
(10.) *Bale.* Catalogue of Australian Hydroid Zoophytes, p. 85.
(11) *Thompson.* Annals and Magazine of Natural History, 1879, February, p. 109.

SERTULARIA CRENATA. Bale.

This species is found in Port Phillip, and has been described by Bale (1.)

SERTULARIA TUBA. Bale.

This species is found at Queenscliff, and has been described by Bale (2.)

SERTULARIA PATULA. Busk.

This species is found in Bass' Straits and described by Busk (3). It also occurs in Williamstown and Queenscliffe, Victoria.

SERTULARIA ORTHOGONIA. Busk.

This species has been found in the Prince of Wales Channel, Torres Straits, parasitic on *Ser. pristis*, and described by Busk (4), who thinks it a variety of Ser. patula.

SERTULARIA MINIMA. Bale.

This very variable and wide-spread species was found by Bale (5), growing profusely on seaweed on the beach at Williamstown. and was by him identified with Coughtrey's (6) Synthecium gracilis and with Sertularia pumila. Bale (7) also considers his own Sertulia pumiloides as a variety of Sertularia minima. Thompson (8) has also described this Sertularia.

SERTULARIA MINUTA. Bale.

This species is found in Sorrento, Port Phillip, and has been described by Bale (9.)

(1.) *Bale*. Catalogue of Australian Hydroid Zoophytes, p 86.
(2.) *Bale*. Catalogue of Australian Hydroid Zoophytes, p. 87.
(3.) *Busk*. Voyage of H.M.S. Rattlesnake, Vol. I., p. 390. Appendix IV.
(4.) *Busk*. Voyage of H. M. S. Rattlesnake Vol. I., p. 390.
(5.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 89
(6.) *Coughtrey*. New Zealand Hydroideæ. Transactions of the New Zealand Institute Vols. VII. and VIII.
(7.) *Bale*. Journal of the Microscopical Society, Victoria, Catalogue of the Australian Hydroid Zoophytes, p. 90.
(8.) *Thompson*. Annals and Magazine of Natural History, 1870, p. 104
(9.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 390.

SERTULARIA LOCULOSA. Busk.

This species is found in Bass' Straits and Victoria. It has been described by Busk (1.)

SERTULARIA CONFERTA. Bale.

This species is found in Carpentaria Gulf, and was first described under the name of Dynamena conferta by Kirchenpauer (2), and afterwards as a Sertularia by Bale (3.)

SERTULARIA GROSSEDENTATA. Bale (4.)

This species was found in Australia and described by Kirchenpauer (5) under the name of Dynamena grosse dentata.

SERTULARIA ARBUSCULA. Lamouroux.

This species was found in Australian waters, and described by Lamouroux (6), Lamarck (7), and de Blainville (8.)

SERTULARIA TUBIFORMIS. Bale.

This species was found by Lamouroux (9), growing on Hydrophytes of Australasia, and described by him under the name of Dynamena tubiformis. Bale (10) follows Lamarck (11) in naming it Sertularia tubiformis.

(1.) *Busk.* Voyage of H. M. S. Rattlesnake. Vol I., p. 393.

(2.) *Kirchenpauer.* Neue Sertulariden etc. Verhandlungen der K.L C., d. Akademie Band XXXI., Seite 10, des Seperatabdruckes.

(3.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 93.

(4.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 94.

(5.) *Kirchenpauer.* Neu Sertulariden etc. Verhandlungen der K.L.C., d. Akademie Band XXXI., Seite 13, des Seperatabdruckes.

(6.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, p. 191.

(7.) *Lamarck.* Histoire Naturelle des Animaux sans Vertébres, Vol. II.

(8.) *Blainville.* Manual d' Actinologie.

(9.) *Lamouroux.* Exposition Methodique des genres de l' ordre des Polypiers, p. 12

(10.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 95.

(11.) *Lamarck.* Histoire Naturelle des Animaux sans Vertébres, Vol. II.

SERTULARIA TURBINATA. Bale.

This species was found by Lamouroux (1) growing on the Fuci of Australia and described and named by him Dynamena turbinata. Bale (2) follows, Lamarck (3), and names it Sertularia. It has also been mentioned by de Blainville (4.)

SERTULARIA OBLIQUA. De Lamarck.

This species was found by Lamouroux (5) also on the Fuci of Australasia, and described, and named by him Dynamena obliqua ; Lamarck (6) named it Sertularia obliqua.

SERTULARIA BARBATA. Bale.

This species was found on the Fuci of Australasia, and described by Lamouroux (7), as Dynamena barbata. Cited also by Blainville (8) ; Lamarck (9) mentions it as Sertularia ciliata, Bale (10), calls it Sertularia berbata.

SERTULARIA TYPICA. Von Lendenfeld.

Sertularia Sertularioides. Bale.

This species was found on seaweed and Zoophytes of Australia, and described by Lamouroux (11), as Dynamena sertularioides ; and has been named by Bale (12) Sertularia sertulariodes, a rather extraordinary name, which I think ought to be changed to the name S. typica.

(1.) *Lamouroux*. Exposition'Methodique des genres de l'ordre des Polypiers
(2.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 96,
(3.) *Lamarck*. Histoire Naturelle des animaux sans Vertébres.
(4.) *Blainville*. Manual d' Actinologie.
(5.) *Lamouroux*. Histoire des Polypiers Coralligénes flexibles, p. 179.
(6.) *Lamarck* Histoire Naturelle des Animaux sans Vertébres.
(7.) *Lamouroux*. Histoire des Polypiers Coralligènes flexibles, p. 178.
(8.) *Blainville*. Manual d'Actinologie.
(9.) *Lamarck*. Histoire Naturelle des Animaux sans Vertébres.
(10.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 96.
(11.) *Lamouroux*. Histoire des Polypiers Coralligènes flexibles, p. 178.
(12.) *Bale*. Catalogue of the Australian Hydroid Zoophytes, p. 96.

SERTULARIA RIGIDA. Lamouroux.

This species has been found in Australasia and described by Lamouroux (1). It has been also mentioned by Blainville (2) ; Lamarck (3), speaks of it as Sertularia divaricata.

SERTULARIA DISTANS. Lamouroux.

This species was found by Lamouroux (4) in Australasia and described by him. It has also been mentioned by Lamarck (5.)

SERTULARIA TRIDENTATA. Lamouroux.

This species was found in Australasia by Lamouroux (6), and mentioned by Lamarck (7.)

SERTULARIA SCANDENS. Lamouroux.

This species found in Australasia has been described by Lamouroux (8), and also mentioned by Blainville (9.) De Lamarck (10) speaks of it under the name of Sertularia millefolium.

3. GENUS. DIPHASIA. A. Agassiz.

Branching colony, trophosoms opposite a pair on each Internode or alternate. They possess an internal operculum. Polypostyles different in the two sexes.

DIPHASIA SYMMETRICA. Nov. sp.

Plate VIII., Fig. 7.

Shoots rather irregularly pinnate. Stems tapering towards the centrifugal end. Hydrothecæ opposite, standing at an angle of

(1) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, p. 190.
(2.) *Blainville.* Manual d'Actinologie
(3.) *Lamarck.* Histoire Naturelle des aminaux sans Vertébres.
(4.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, p. 191.
(5.) *Lamarck.* Histoire Naturelle des animaux sans Vértebres.
(6.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, 187.
(7.) *Lamarck.* Histoire Naturelle des animaux sans Vertèbres.
(8.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles, p. 189.
(9.) *Blainvillle.* Manual d'Actinologie.
(10.) *Lamarck.* Histoire Naturelle des aminaux sans Vertébres.

about 40°, and not adnate to the branch, tubular, the outer margin crowned by two teeth, which are of equal size and rounded at the top.

Female Gonothecæ with two long opposite spines, which cause the symmetrical appearance.

I found the skeletons of this Hydroid very plentiful in the drift thrown up at Timaru on the East Coast of New Zealand. The specimens were collected in February, and found to be full of Gonothecæ.

DIPHASIA PINNATA. Agassiz.

This species probably very rare in Australia, has been found in Sydney, and described by Agassiz (1), Hincks (2), and also by Pallas (3), under the name of Sertularia pinnata. Pallas gives a separate name to the female, Sertularia Nigra, and Lamouroux (4) Sertularia fuscescens, Oken (5), Nigellustrum pinnatum.

DIPHASIA ATTENUATA. Hincks.

Hincks (6) describes this species found in Adelaide, in the first place as Sertularia attenutata, Hincks (7), Ellis (8), speaks of it under the name of Sertularia rosacea, Johnstone (9) under the name of Sertularia pinnaster.

DIPHASIA DIGITALIS. Bale,

This species found by Busk (10) in the Prince of Wales Channel and Torres Straits, and named by him Sertularia digitalis, has been placed by Bale (11) in the genus Diphasia.

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(1) *Agassiz.* Contributions to the Natural History of the United States Acalephæ. Vols. III,, IV., 1860-62.
(2.) *Hincks.* History of the British Hydroid Zoophytes, p. 255.
(3.) *Pallas.* Elenchus Zoophytorum.
(4.) *Lamouroux.* Histoire des Polypiers Coralligénes flexibles, p. 195.
(5.) *Oken.* Jahrbuch der Natur Geschichte.
(6.) *Hincks.* History of British Hydroid Zoophytes, p. 247.
(7.) *Hincks.* Annals and Magazine of Natural History, April 1861.
(8.) *Ellis* Essay towards a Natural History of the Corallines found on the Coast of Great Britain and Ireland.
(9.) *Johnstone.* History of the British Zoophytes.
(10.) *Busk.* Voyage of H. M. S. Rattlesnake, p. 393
(11.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 101

DIPHASIA MUTULATA. Bale.

This species found in Prince of Wales Channel and described by Busk (1) has also been placed among the Diphasia by Bale (2.)

DIPHASIA SUB-CARINATA. Bale.

This species found in Bass' Straits and in many parts of Australia, and described by Busk (3), has been placed among the Diphasia by Bale (4.)

4. GENUS. SERTULARELLA. Gray.

Branching colonies. Trophosomes biserial and alternate, with an Operculum composed of several pieces of chitin. The Gonothecæ are usually ringed transversely.

The structure of Sertularella Polyzonios has been investigated by Weismann.

SERTULARELLA MICROGONA. Nov. sp.

Plate VII., fig. 1-3.

From a creeping Hydrorhiza, stems about 1 cm. in height arise, which bear the distant Trophosomes, and the exceedingly small Gonosomes. The Trophosomes are wide at the base and narrower at the mouth which has a toothed circumference because there are 4 bites in it, as it where which leave four protruding teeth between them. The Gonangium is oval and compressed. It has no evident rings on its surface, the Polypostyl is a cylindrical body, thickest in the middle which appears connected with the inner surface of the Gontheca by many cellular strings.

I found this Hydroid in Port Phillip (Victoria) on stones in the Laminarian Zone.

(1.) *Busk.* Voyage of H. M. S. Rattlesnake, p. 391.
(2.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 101.
(3.) *Busk..* Voyage of H. M. S. Rattlesnake, p. 390.
(4.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 102.

SERTULARELLA POLYZONIAS. Gray.

This cosmopolitan species has been found in Victoria and New Zealand, and has been described from these places by Hutton (1) and Coughtrey (2), who have named it Sertularia simplex. Bale (3) gives it the same name as Gray.

SERTULARELLA INDIVISA. Bale.

This species has been found in Victoria and South Australia. It has been described by Bale (4.)

SERTULARELLA SOLIDULA. Bale.

This species has been found in Victoria and described by Bale (5.)

SERTULARELLA MACROTHECA. Bale.

This species is found at Griffith's Point (Victoria), and has been described by Bale (6.)

SERTULARELLA LÆVIS. Bale.

This species is found at Williamstown (Victoria), and has been described by Bale (7.)

SERTULARELLA PYGMAEA. Bale.

This species is found in Victoria, South Australia and New Zealand. It has been described by Bale (8.)

(1.) *Hutton.* Transactions of the New Zealand Institute. Vol. V.
(2.) *Coughtrey.* Transactions of the New Zealand Institute. Vol. VII.
(3.) *Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 104.
(4.) *Bale.* Journal of the Microscopical Society of Victoria. Vol. II., p. 24.
(5.) *Bale.* Journal of the Microscopical Society of Victoria. Vol. II., p. 24.
(6.) *Bale.* Journal of the Microscopical Society of Victoria. Vol. II., p. 25.
(7.) *Bale.* Journal of the Microscopical Society of Victoria. Vol. II., p. 24.
(8.) *Bale.* Journal of the Microscopical Society of Victoria. Vol. II., p. 25.

SERTULARELLA JOHNSTONI. Gray.

This species is found in Victoria, New Zealand, Tasmania and South Australia. It has been described by Gray (1), Hutton (2), Coughtrey (3). Allman (4) and Thompson (5).

SERTULARELLA DIVARICATA. Busk.

This species is found in Port Stephens and Bass' Straits, and has been described by Busk (6.)

SERTULARELLA NEGLECTA. Thompson.

This species is found in Victoria and South Australia, and has been described by Thompson (7.)

SERTULARELLA RAMOSA. Thompson.

It is doubtful if this species really belongs to Australia, as Thompson (8) found only a fragment in Bass' Straits, where he thinks it may have got accidentally. I do not exactly know how.

4. GENUS. PASYTHEA. Lamouroux.

The stems arising from the Hydrorhiza are simple or branched dichotomously. The Trophosomes are opposite, in pairs, arranged in sets at some distance apart.

(1.) *Gray and Dieffenbach.* Travels in New Zealand.

(2.) *Hutton.* Transactions of the New Zealand Institute. Vol. V.

(3.) *Coughtrey.* Transactions of the New Zealand Institute. Vol. VII.

(4.) *Allman.* Journal of the Linnean Society. Zoology. Vol. VII.

(5.) *W. Thompson.* Annals and Magazine of Natural History, Feb. 1879, p. 101.

(6.) *Busk.* Voyage in H. M. S. Rattlesnake. Vol. 1., p. 388.

(7.) *W. Thompson.* Annals and Magazine of Natural History, Feb. 1879, p. 100.

(8.) *W. Thompson.* Annals and Magazine of Natural History, Feb. 1879, p. 102.

PASYTHEA QUADRIDENTATA. Lamouroux.

This species is found at Fitzroy Island and Port Stephens. It has been described by Lamouroux 1), Ellis and Solander (2), and Lamarck (3) under the name of Sertularia quadridentata, and by De Blainville(4) under the nameof Tuliparia quadridentata.

PASYTHEA HEXODON. Busk.

This species was found by Busk (5) at Cumberland Island and described by him.

6. GENUS. IDIA. Lamouroux.

Colonies pinnately branched. The Trophosomes form two continuous series in contact with each other along the front of the stem. Gonotheca on the front of the stem.

IDIA PRISTIS. Lamouroux.

This species is found in many parts of New Zealand Coast, and has been described by Lamouroux (6) and Busk (7).

7. GENUS. THUIARIA. Fleming.

Colonies with branching stems. Trophosoms biserial not in pairs, usually more or less immersed. Gonothecæ similar to those of Sertularia.

(1.) *Lamouroux.* Histoire des Polypiers Coralligénes flexibles, p. 156.
(2.) *Ellis and Solander.* The Natural History of many curious and uncommon Zoophytes, p. 57.
(3.) *Lamarck.* Histoire Naturelle des Animaux sans Vertebres. Tom II., p. 121.
(4,) *Blainville.* Manual d'Actinologie.
(5.) *Busk.* Voyage in H. M. S. Rattlesnake. Vol. I., p. 395.
(6.) *Lamouroux.* Histoire des Polypiers coralligènes flexibles.
(7.) *Busk.* Voyage in H.M.S. Rattlesnake, Vol. I., p. 390.

THUIARIA FENESTRATA. Bale.

This species described and named by Bale (1) is found off Cumberland Island, Albany Passage, and Port Curtis. It is also described by Busk (2) under the name of Sertularia crisioides and by Lamouroux (3) under that of Salacia tetracythara.

THUIARIA QUADRIDENS. Bale.

This species is found in Port Curtis and off Holborn Island. It has been described by Bale (5).

THUIARIA LATA. Bale.

This species is found in Victoria and has been described by Bale (6.)

(1.) *Bale.* Catalogue of Australian Hydroid Zoophytes, p. 116.
(2.) *Busk.* Voyage of H.M.S. Rattlesnake, Vol. I., p. 389.
(3.) *Lamouroux* Histoire des Polypiers coralligènes flexibles, p. 214.
(5.) *Bale.* Catalogue of Australian Hydroid Zoophytes, p. 119.
(6.) *Bale.* Journal of the Microscopic Society of Victoria, Vol. II., p. 26.

THE GEOGRAPHICAL DISTRIBUTION OF THE AUSTRALIAN SCYPHOMEDUSÆ.

By R. von Lendenfeld, Ph.D.

There is extremely little known of the physical conditions of the Australian Seas, but this little will suffice to explain the peculiar geographical distribution of the Rhizostomæ in these waters.

Of all the different kinds of Medusæ the Rhizostomæ can be preserved most easily. They are also more easily noticed by travellers than the more delicate and smaller forms of the other groups. I have myself seen Rhizostomous Medusæ from the deck of a large steamer so clearly, that with a little imagination I could have given a description of them, so striking are these creatures on the open sea !

There are therefore from the more inaccessible parts of the surface of the earth relatively more Rhizostomous Medusæ known than others, and for the same reason the Rhizostoma considered alone gives a better idea of the geographical distribution of the Medusæ than could be obtained by considering the whole class, as in the latter case those in the more accessible places would be, in proportion, too numerous.

I shall therefore confine my remarks to Rhizostomæ.

The chemical constitution of the sea, the quantity of common salt contained in it, and the proportion in which other salts are found, are all at present unknown. (1) The knowledge of the currents which are most important for our enquiry is in a far higher state of development.

(1.) The result of the observations taken during the Voyage of the Challenger, have not yet been published.

We will first of all consider the more considerable of the warm and cold Equatorial, and Polar currents, which tend to equalize the warmth of the Equatorial and the cold of the Polar water.

THE COLD CURRENTS.

Two mighty currents of cold water flow from the Antarctic regions in a north-easterly direction towards the zone of the Tropics. The one approaches Tasmania and the other Cape Nuyts, the south-west point of Australia. Each current divides at the spot where it nears the coast. As well from Tasmania as from Cape Nuyts extend sub-marine elevations of the ground of the ocean towards the south-west, which, like a ploughshare, divide the currents in two equal parts before they reach the coast.

The eastern branch of the western current, and the western branch of the eastern, bend round in a half circle and are lost in the Great Australian Bight. The eastern branch of the western Polar current bends round to the east and south-east, but remains at a distance from the coast; the branch coming from the eastern Polar current on the contrary bends towards the north-west and west, and flows along the coast of this part of Australia, namely, Victoria.

The western branch of the western Polar current alters its course from a northern to a western direction. During its course northwards it washes the west coast of Australia.

The eastern branch of the eastern current flows due north-east from Tasmania to Cape Van Diemen, the north-west point of New Zealand.

In its middle course, as we shall see further on, it passes beneath a warm current coming from the equator, and on the north-eastern side of this current it appears again. These cold currents are surface currents, but still appear to extend to a great depth. Only here and there in deep water we find other currents than on the surface.

The warm equatorial currents which flow westwards from the 20th degree latitude north, send out many branches towards the south. Whilst a part of the chief current only just touches Point Albany, the north point of Australia, two of the branches flowing south follow the coast line.

A mighty stream flows down in a south-westerly direction, east of New Zealand, and washes the eastern coast of the New Zealand islands. A second warm equatorial current branches off from the principle stream flowing west, north-east of the New Hebrides, passes New Caledonia and forming towards the west a convex course, bends towards the south and later on to east-south-east. This current joins the one mentioned above near the Macquarie Island. It washes the east coast of Australia for many hundred kilometers, and only leaves it at Port Jarvis, 130 kilometers south of Sydney.

This is the current which crosses the cold one flowing from Tasmania towards New Zealand. As mentioned before it flows above the cold current and divides it in this way into two streams, an eastern and a western.

LOCAL CURRENTS.

Besides the currents, often very strong (1), caused by the winds, which change irregularly with the time of the year, there are also constant currents of a local kind which it is best to consider as branches of the equatorial and polar chief currents. The direction and strength of such currents depend on the configuration of the floor of the ocean and the line of coast.

One branch of the equatorial stream that washes the east coast of Australia leaves its convex side in the latitude of Bass' Straits

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(1.) Once on a voyage from Cape Van Diemen, the most northern point of New Zealand, to Sydney, I remarked how strong such currents might become, for as the steamer approached the east coast of Australia it was driven 35 kilometers southwards, by a current which is usually not there.

and flows through these Straits in a westerly direction. This current, in the shallow parts of the Straits, is so strong that even in the calmest weather the sea is very much disturbed. On the surface of the water, between New Zealand, Australia, and New Caledonia, slight whirlpools are found.

A current in the Torres Straits, similar to the one in Bass' Straits, flows in a westerly direction in the pass between Australia and New Guinea. Again, a stream coming from the south-west is found on the north-west coast which flows along the coast of De Wittsland: another more important current coming from south-east passes Cape Leuwin.

A current, not discoverable on the surface, to the south of the great Australian Bight, flows in an easterly direction along the bottom of the sea.

The sources from which I have collected these assumptions contradict each other in so many and such important points that it has been very difficult to make a clear representation of the facts; and although from these grounds there must be numerous deficiencies in my description still in the more important point it will be found near the truth.

The depths of the sea, in that part under our survey, varies from 4000 to 5000 meters. The ground of the sea rises everywhere pretty gradually to the level of 200 meters from the surface at an average distance from the coast of 20 kilometers.

The level of 3,650 meters (2,000 fathoms), does not surround Australia on all sides; there are shallows, which on one side unite Australia with Asia across the Islands towards Cochin China, and on the other across New Zealand with South America. (1) In these shallows the sea does not reach the depths of 3,650 meters. The south-east of Australia is the steepest in descent. The Geographic Distribution of the Rhizostomæ within this district depends, as I will attempt to show in the following pages, on these currents on the one hand, and the configuration of the coast on the other.

(1.) *F. Hutton.* On the origin of the Fauna and Flora of New Zealand. New Zealand Journal of Science, Jan. 1884.

Haeckel (1) mentions a number of Medusæ from Australia. In his sense, the Australian district extends over all the neighbouring islands, and especially New Guinea. I intend to limit myself to those species found near Australia and New Zealand.

Haeckel describes twelve Rhizostomæ from the coasts of the Australian Islands. One of these comes from a part not exactly particularized, and therefore does not throw any light on the Geographical Distribution. I have myself found four Rhizostomæ on the Australian coasts, but only three of these were preserved sufficiently to admit of description.

One of these Medusæ is the Crambessa mosaica (2) of Haeckel, the two others were first discovered by me (3). We have therefore to consider the following fourteen species :—

RHIZOSTOMÆ.

TOREUMIDÆ.

Archirhiza primordialis. Haeckel.

Haeckel (4) describes this Medusa found in Bass' Straits.

Archirhiza aurosa. Haeckel.

This New Zealand Rhizostome was sent to Haeckel (5) without any exact account of where it was found, but as we only find any lively intercourse of vessels on the East Coast of these Islands, and at any rate as far as the Southern Island is concerned,

(1.) *E. Haeckel.* Das System der Medusen. Seite XIII., 645
(2.) *R. von Lendenfeld.* Cœlenteraten der Südsee, III., über Wehrthiere und Nesselzellen. Zeitschrift für wissenschaftliche Zoologie. Band, XXXVIII. Seite, 364.
(3.) *R von Lendenfeld.* Ueber eine neue Uebergangsform zwischen Sæmostomæ und Rhizostomæ. Zoologischer Anzeiger. Band V. Seite 380. Zur Metamorphose der Rhizostomen. Zoologischer Anzeiger. Band VII. The Scyphomedusæ of the Southern Hemisphere. Proceedings of the Linnean Society of New South Wales, 1884.
(4.) *E. Haeckel.* Das System der Medusen. Seite, 565.
(5.) *E. Haeckel.* Das System der Medusen. Seite, 645.

civilisation is pretty much limited to the eastern coast, we may take it for granted that this Medusa, as well as the following New Zealand species, were found on the East Coast.

Toreuma theophila. Haeckel.

This Medusa, first described by Péron and Lesueur (1), and named Cassiopea Dieuphila, was sent to these authors from de Witt's Land north-west coast of Australia. It has been catalogued by Haeckel (2) in his system under the above name. Toreuma theophila.

Cassiopea Ornata. Haeckel.

Haeckel (3) describes under this name a Rhizostome evidently extensively distributed in the north of our district. Specimens from New Guinea, the Pelew Islands and North Australia were at his disposal.

Cephea Fusca. Péron et Lesueur.

This Medusa, like the last mentioned, is extensively distributed in the north of our district. It was first described by Péron et Lesueur (4), and under the same name catalogued by Haeckel (5). It was found on the coast of De Witts Land as well as on the Malabar coast.

The family of the Pilemidæ appears to be wanting on the coasts of Australia, and is not even to be found in the larger district which Haeckel reckons as the Australasiatic.

CHAUNOSTOMIDÆ.

Pseudorhiza aurosa. Von Lendenfeld.

This Medusa was found by me (6) in Port Phillip, the harbour of Melbourne, and described as a species of the new family of

(1.) *Péron et Lesueur.* Tableaux des Meduses, p. 356.
(2.) *E. Haeckel.* Das System der Medusen. Seite, 566.
(3.) *E. Haeckel.* Das System der Medusen. Seite 570.
(4.) *Péron et Lesueur.* Tableaux des Meduses, p. 361.
(5.) *E. Haeckel.* Das System der Medusen. Seite 575.
(6.) *R von Lendenfeld.* Ueber eine neue Uebergangsform zwischen Semostomen und Rhizostomen, Zoologischer Anzeiger. Band V., Seite 380.

the Chaunostomidæ. It is not found in great swarms but singly. I have seen altogether about thirty specimens. Haacke has found the same Medusa in Glenelg, the harbour of Adelaide.

VERSURIDÆ.

Haplorhiza simplex. Haeckel.

This Medusa found in Bass' Straits has been described by Haeckel (1).

Haplorhiza punctata. Haeckel.

This species (2) comes from the northern part of our district, and was found on the coast of Arnheim's Land.

Cannorhiza connexa. Haeckel

This Rhizostoma was caught in the open sea, near New Zealand (3.)

Phyllorhiza punctata. Von Lendenfeld

Phyllorhiza punctata (4) has been found hitherto only in Port Jackson, the harbour of Sydney, not so frequently as other Medusæ. It is never to be found in close swarms but more isolated.

CRAMBESSIDÆ.

Crambessa palmipis. Haeckel.

According to Haeckel (5) this Medusa appears to be common in the north of the Australian waters on the coast of northern Australia. Haeckel received it from two different sources.

(1.) *E. Haeckel.* Das System der Medusen. Seite 604.
(2.) *E. Haeckel.* Das System der Medusen. Seite 604.
(3.) *E. Haeckel.* Das System der Medusen Seite 605.
(4.) *R. von Lendenfeld.* Zur Metomorphose der Rhizostomen. Zoologischer Anzeiger Band VIII. The Scyphomedusæ of the Southern Hemisphere and The Development of the Versuridæ. Proceedings of the Linnean Society of New South Wales, 1884.
(5.) *E. Haeckel.* Das System der Medusen. Seite 620.

Crambessa mosaica. Haeckel (1.)

This Medusa is, without doubt, the most common in those parts of Australia and its waters that have been visited by me. It has also been mentioned by a long list of authors. It has been described by Quoy et Gaimard (2) under the name of Cephea mosaica from Port Jackson, and since by Huxley (3) as Rhizostoma mosaica from the same place. I have found it myself (4) in Port Phillip, Melbourne, and in Port Jackson, Sydney. The Melbourne specimens are blue and more delicate, those from Sydney brown and coarse.

It is found in immense swarms, and is more common in Melbourne than in Sydney. After a storm in Port Phillip at high water mark one often finds these Medusæ on the beach in a row, from 2 to 4 meters wide, lying one over the other in a thick mass further than the eye can reach.

Thysanostoma thysanura. Haeckel.

This Medusa was sent to Haeckel (5) from the Godefroy Museum, without any more exact mention of the place where it was found than New Zealand.

Leonura leptura. Haeckel.

This Rhizostome found in New Zealand has been described by Haeckel (6.)

When we compare these Rhizostomæ with those from other waters we are first struck by the fact, that although a few species extend from North Australia towards India, still by far the greater number are only met with on the Australian coast, and again that we only know very few species which have been found in more places than one. The following table shows the peculiarity of these circumstances:—

(1.) *E. Haeckel.* Das System der Medusen. Seite 625.
(2.) *E. Haeckel.* Das System der Medusen. Seite 622.
(3.) *Quoy et Gaimard.* Voyage de l'Uraine Zoologie, p. 569.
(4.) *Huxley.* Philosophical Transactions, 1849, p. 422-432.
(5.) *R. von Lendenfeld.* Scyphomedusæ of the Southern Hemisphere. Proceedings of the Linnean Society of New South Wales, 1884.
(6.) *E. Haeckel.* Das System der Medusen. Seite 631.

A TABLE OF THE AUSTRALIAN RHIZOSTOMÆ ARRANGED ACCORDING TO THEIR LOCALITY.

Kind.	Locality.						
	South Adelaide.	South-east Bass' Straits.	East Sydney.	New Zealand.	North Arnheim's Land.	East Indian Islands.	North-west De Witt's Land.
Archirhiza primordialis ...	...	S.	...	...	...	...	...
Archirhiza aurosa	...	...	...	W.	...	...	...
Toreuma theophila	...	...	...	...	..	...	P.
Cassiopea ornata	...	...	...	...	G.	K. W.	...
Cephea fusca	...	...	...	...	...	D.	P.
Pseudorhiza aurosa... ...	H.	L.	...	...	...	...	...
Haplorhiza simplex... ...	...	G.	...	...	...	...	...
Haplorhiza punctata ...	...	...	...	...	E.	...	...
Cannorhiza connexa ...	...	...	..	S.	...	...	...
Phyllorhiza punctata ...	...	...	L.	...	...	...	...
Crambessa palmipes ...	...	...	...	...	G.	...	.
Crambessa mosaica... ...	...	L.	Q. H. Dr. L.	...	...	...	...
Thysanostama thysanura...	...	...	...	...	...	...	...
Leonura leptura	...	...	...	W.	...	...	...

The letters to the right of the table signify the names of those who found the Medusæ, at the places mentioned above them.

D.—Dussimier. Dr.—Drayton.
E.—Elsey. G.—Godefroy.
H.—Haacke. K.—Koch.
L.—Lendenfeld. P.—Përon et Lesueur.
Q.—Quoy et Gaimard. S.—Smith.
W.—Weber.

Of those fourteen species there are four known as coming from more than one place. None of the Australian Medusæ are found beyond Malabar. Two are found in the East Indian Archipelago, and also on the Coast of North Australia. The northern kinds have in general a wider distribution than the southern. New Zealand species seem perfectly isolated, the three belonging to New Zealand not having been found in any other place.

Generally speaking we can say that the distribution districts are very limited, and that three districts, for the moment at least, perfectly independent of one another can be distinguished in the Australian waters. These are—New Zealand with its three species; South-east Australia with five, and North Australia with five.

The district of New Zealand is still very little known. Within the two others we find local as well as transgressing species, which, although they have at present only been found in two places, probably exist in the parts lying between these. Therefore we must accept as a fact that Pseudorhiza exists between Adelaide and Melbourne, and Cambressa mosaica between Melbourne and Sydney.

Although our knowledge of the Australian Medusa is very limited still I do not doubt that the three distribution-districts seen on the table do really represent the facts. The cause of the development of these three well defined distribution-districts is to be found in the currents.

The New Zealand Medusæ, which, from the grounds alluded to above, have surely come from the east coast, belong to the New Zealand equatorial current, and this current might possibly carry the Medusa to the southern polar sea but never to the Australian coast. A current flows from Tasmania towards New Zealand. But as till now, no Medusæ from Tasmania have been described, it is impossible to know what influence this current may have on the distribution of the New Zealand Medusæ. But any connection between the Fauna of Bass' Straits and that of New Zealand cannot take place as may be clearly seen from the map.

The Fauna of Bass' Straits is very different from that of the warmer streams passing the east coast of Australia. At the point, Jarvis Bay, where the warm current leaves the coast lies the boundary between the Fauna of the cold Polar and the warmer equatorial currents. The fish and shellfish at the north Jarvis Bay are mostly different from those to the south of it; but in the Rhizostoma a movement has taken place which must certainly be considered as the effect of the local current coming from the east and flowing through Bass' Straits. The connection through Bass' Straits of Port Phillip (Melbourne), and Glenelg (Adelaide) is formed by the Polar current which here bends towards the west and flows along the coast.

Lastly the northern district is entirely disconnected from the others, as a current coming from the Tropic Zone in the Pacific Ocean flows through it. Strong local currents are of course met with among the numerous islands, and these currents are the cause of the wider distribution of the northern Medusa. The current coming from south-east which flows along the coast of De Witts' Land prevents any extension of the Medusæ of this district towards the south-west. None of these currents are violent, and it may be taken for granted that living Medusæ may be carried downwards, but never extend upwards in these currents; and further that Medusæ which are well known to be very sensitive to any change in their surroundings are not likely to fight the battle of existence with success if they leave that kind of sea-water to which they are accustomed in which they live.

Numerous Medusæ, and especially the large Rhizostoma, swim far up into sheltered bays and the mouths of rivers to deposit their young, and are therefore confined by the formation of the coast, as well as by the currents, to certain limits.

Should any kind of Medusa get to a place where its scyphostomæ can flourish, for instance, in a sheltered harbour, and should the circumstances of its new abode enable it to live, then this harbour will remain a lasting dwelling place of such a Medusa.

If a current flows by the entrance of a harbour in which Rhizostomæ have found a home, then they can spread to a great distance even without breeding places, but only in the direction of the current. Harbours connected by a current often contain exactly the same species, although they are often very distant one from the other. On the contrary harbours not so connected mostly contain different species. From one harbour to another, even if they be very near one another, this distribution of the Medusæ cannot take place against the current. If we, therefore, find Rhizostomæ in several harbours, the centre of distribution is not in the middle, but at the extreme upper end of the down current.

If we now pass over the limits of our district and consider all the Rhizostomidæ, we shall discover some interesting facts on the distribution of this group of Medusæ, which will be easily seen in the table published in one of my former papers. (1)

The adult Medusæ will, for the most part emigrate from their birth place and seek the open sea, swimming about without particular aim, they must be carried on by the current. Whilst the Medusæ swim about in the open sea they cannot produce young in case their young consist of Scyphostomæ; as these only flourish in quiet and shallow water, but if they get into a harbour then they can propagate their species, as here the Scyphostomæ flourish and such a harbour will become a new centre of distribution.

It appears to be proved, as already mentioned, that Rhizostomæ propagate by means of a change of generation, and that their Scyphostomæ flourish best or perhaps solely in quiet and shallow water.

And, therefore, the above can be applied to Rhizostomæ and we must come to the conclusion that the Rhizostomæ can spread

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(1.) *R. von Lendenfeld.* Proceedings of the Linnean Society of New South Wales. Vol., IV., May 1884.

from a sheltered harbour, to a great distance, but that a boundary is set to any such spreading, if a harbour suitable for a breeding place is too far away.

Although the Rhizostomæ of the Northern Hemisphere are so much better known than those of the southern, the number of the species known here is far greater than there. We may, therefore, be allowed to maintain that the Rhizostomæ are incomparably more numerous in the Southern than in the Northern Hemisphere; which is doubtless in connexion with the greater expanse of water south of the Equator.

In comparing the whole of the Scyphomedusæ, we have to meet the difficulty, that in proportion but very few of the smaller and more delicate forms occurring in the Southern Hemisphere are known. Of the 210 Scyphomedusæ with which we are acquainted, 104 have been found in the Southern Hemisphere.

From the reasons referred to above the comparison of the Rhizostomæ alone gives a more exact idea of the distribution than the comparison of all the Scyphomedusæ would afford.

THE DIGESTION OF SPONGES EFFECTED BY ECTODERM OR ENTODERM?

By R. Von Lendenfeld, Ph.D.

In my paper on the Australian Aplysinidæ (1) I gave an account of the experiments which I had carried on for the purpose of obtaining some information concerning the digestion in Sponges. The main result of these experiments was that the Epithel of the ciliated chambers is not to be considered as an organ of digestion, that all cells of the Sponge freely take up Carmine when in contact with them, and that therefore the cells of the Epithelia of Sponges kept in water containing Carmine were soon found full of Carmine granules, but that the Epithel of the ciliated chambers soon ejects the Carmine again whilst the cells of the upper surface of the subdermal cavity give it off to the amœboid wandering cells of the Mesoderm, and that these transmit the Carmine granules after they have been partly digested, to the cells of the ciliated chambers for ejection. I concluded from this that the digestive function of the Sponges which I experimented on was centralized in the upper wall of the subdermal cavities, and that in Sponges which do not possess a highly developed cavity of this kind the digestion was effected by the Epithelia of the *introductory* canal system.

According to F. E. Schulze (2) the introductory canal system of the Sponges is produced by a complicated folding process of the

(1.) *R. von Lendenfeld.* Cœlenteraten der Südsee II, Neue Aplysinidæ Zeitschrift fur wiss. Zool. Band XXXVIII., Seite 252 ff

(2.) *F. E. Schulze.* Uber den Bau und die Entwickelung der Spongien. Die Plakiniden. Zeitschrift für wiss. Zool. Band XXXIV., Seite 439.

whole, and is derived directly from the Ectoderm. Marshall (1) studied the Embryology of Reniera filigrana and came to results very different from those of Schulze, and in fact from anything published previously. Although there may be a few doubtful statements in this extremely interesting paper, statements which I have criticised (2) elsewhere, there are certainly also so many proofs brought forward -to endorse them that it appears more than doubtful whether Schulze's statements hold good for Sponges similar to Reniera. According to Schulze (l.c.) the introductory canals are produced by the Ectoderm and are originally very short, they then break through the walls of the ciliated chambers and *afterwards* grow out to greater length. Granted that the centrifugal portion of the canal wall is really Ectodermal there is no proof that the same thing is the case in the inner and longer portion of the canal. It is apparently just as likely that the Epithel of the growing canal is produced from the lower end as that it is produced by a rapid multiplication of the cells at its exterior termination. In the case of Reniera, Marshall (l.c.) has proved that the introductory canal system is Ectodermal, and although, there is no doubt, that the centrifugal terminations of the introductory canals of Plakina are originally Ectodermal it is apparent from the above statements that the lower portion may also here be Entodermal.

At the time when I wrote my paper on the Aplysinidæ, I had not seen Marshall's paper, which was published at the same time, and I was accordingly not aware, that any one had made statements about the origin of the Epithelia of the introductory Canals different from those of Schulze (l.c.), which were at that time universally accepted. Accordingly, I concluded from the fact that the digestion in sponges took place in the introductory Canal system, and that this Canal system had an Ectodermal Epithel, that the *Sponges absorbed their nourishment by means of the Ectoderm.*

(1.) *W. Marshall.* Die Ontogenie non Beniera filigrana Zeitschrift fur wiss. Zool. Band. XXXVII., Seite 227 ff.

(2.) *R. von Lendenfeld.* Monograph of the Australian Sponges. Proceedings of the Lin. Soc. N.S.W., Vol. IX.

This conclusion was somewhat similar to one which Balfour (1) had arrived at by reasoning only and without any actual proof.

If the Epithel of the introductory Canals is Entodermal, this conclusion is wrong, because in that case one of the premises is wrong. And further investigations will be required to settle the question of the correctness of these premises.

I have made up my mind to publish this explanation, because some authors have considered my conclusions as important, and that part of the premises which is the result of my experiments as of lesser importance. Polejaeff (2) has pointed out this fact in his recent excellent publication on the Calcareous Spongea of the Challenger Expedition.

Metschnikoff (3) in his highly important paper on Intracellular Digestion, has cited my observations as examples of Ectodermal digestion, but it appears from his statements, as if I had said that the *outer surface* of the Sponge absorbed nourishment, which I did not say.

Polejaeff (l.c.), remarks with great acuteness, that I should not have considered the "Keimblätter" in my argument, as it is not certain to which embryonic layers that Epithel belongs, by which in the case of the Aplysillidæ the greater part of its nourishment appears to be observed.

Polejaeff says in another place (4), that nourishment is absorbed by all the Canal surfaces, that the Epithelia of the Canals conducting hither and thither, are physiologically as similar as they are morphologically. This opinion is based upon four arguments. Two of these do not apply to the Aplysillidæ. Polejaeff states that the amœboid

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(1.) *T. Balfour.* Handbuch der vergleichenden Embryologie, deutsch von Vetter. Band, I. Seite. 144.

(2.) *Polejaeff.* The Zoology of the Voyage of H. M. S. Challenger. Part XXIV., p. 14.

(3.) *E. Metschnikoff.* Untersuchungen über die intracellulüre Verdauung bei wirbellosen Thieren. Arbeiten aus den Zoolog. Inst. der Universitæt Wien. Band, V. Seite, 3. Translated into English. Quarterly Journal of mikr., Sc., Nr. 98.

(4.) *Polejaeff.* (l.c.), p. 15.

wandering cells are just as numerous below the Epithel of the Canals leading outwards, as underneath the Epithel of the Sub-dermal cavity. I do not doubt that this occurs in the Sponges which Polejaeff has examined. In the Aplysillidæ however, a centralisation towards the skin appears to have taken place together with the formations of a large Sub-dermal cavity, as only there a layer of thickly pressed wandering cells can be proved to exist.

Polejaeff says further (l.c.), there "is no room for the supposition that all nourishment is absorbed by the Sub-dermal cavity Epithel." Although I am quite willing to acknowledge that other portions of the Epithel are able to absorb nourishment, just as the outer skin of a man can absorb substances. I must conclude from my observations, that, in fact, by far the greater part of the nourishment in the case of the Aplysillidæ is absorbed in the Sub-dermal cavity. Following Marshall's example, I avoid any generalisation, and I do not doubt, that Polejaeff as well as myself are both right, but that we have arrived at different results in some trifling particulars, because we have examined different Sponges.

We can now discern concerning the digestion of Sponges what probably is correct, and which statements are doubtful. The views expressed in my paper on the Australian Aplysinidæ (l.c.) are very different from those expressed by Carter, who is of opinion, that the cells of the ciliated chambers are those to which digestive functions are to be ascribed.

This, as Polejaeff (l.c.) remarked from a mechanical point of view, is a very unlikely hypothesis and can be considered as discredited by my observations. And I think that my scientific colleagues universally agree to my statement that the nourishment is absorbed in the canals and not in the ciliated chambers. Whilst in the Aplysillidæ the introductory canals effect the absorption of nourishment in a higher degree than the drainage canals; in some other Sponges such a difference does not occur. (Polejaeff l.c.)

The introcellular digestion, discovered by Lieberkühn (1) and Metschinkoff (2) is probably effected by the amœhoid wandering cells, whilst only the epithelial cells have the function of *transmitting* the nourishing material to them.

Lieberkühn's, Metschinkoff's and my own experiments were made with Carmine and not with nearly nourishing material, so that these conclusions are open to a little doubt as Metschinkoff (3) remarks. His statements based on a series of most interesting experiments, however, make it probable that in the Sponges the nourishment is treated similarly to the Carmine granules.

The question whether the Sponges digest with the Ectoderm or with the Entoderm cannot yet be decided. But it does not appear improbable that both layers (Polejaeff l.c.) may have that function. The Keimblätter of other Cœlenterata are nearly analogous, so that we can conclude that the layers of the much less highly organised Sponges are still more so, and that we have in the Sponges *indifferent germinal layers before* us.

(1.) *Lieberkühn.* Beitrag zur Entwickelungsgeschichte der Spongillen. Müller's Archiv. Band 1836, Seite 385 ff.

(2.) *E. Metschinkoff.* Spongiologische Studien, Zeitschrift für wis. Zool. Band XXXII., Seite 371-374.

(3.) *E. Metschinkoff.* Ueber die Introcelluläre Verdauung bei wirbellosen Thieren. Arbheiten aus den Zool. Inst. d. Universität Wien, Band V., Seite 25, 26 u.o. O.

THE ERUPTION IN THE STRAITS' SETTLEMENTS AND THE EVENING GLOW.

By R. von Lendenfeld, Ph.D.

The result of the so extremely carefully collected data referring to the connection between the eruption of Karakatoa, and the spreading of the evening glow, for which we are indebted to Professor Smith, of our University, is expressed by this author in the following manner :—"We are driven therefore to conclude that the dust, if dust is really the agent in question, must have been meteoric, and had its origin outside our earth."

After this it would appear as if the data collected by Professor Smith, were not favourable to the hypothesis that the dust could be the volcanic dust of Karakatoa ; but the data collected, on the contrary prove convincingly, that Karakatoa was the centre of distribution of the evening glow, and that these set in two days after the eruption took place.

I do not intend in this paper to dwell in detail on the cause of the evening glow, and take it as granted, that the cause must be ascribed to fine particles floating in the air. There is a dispute whether these particles are ice-crystals or dust. If they were ice one must be able to discern those rings around the sun which always make their appearance when the sunlight is transmitted through clouds of ice-crystals. The radius of such rings which I have very often had occasion to observe during my Alpine experience is always 23°. Such rings have been observed of late in Europe, but not more frequently than in other years, and I think therefore, I am justified in considering dust as the cause of our glorious sunsets

The question now arises whence this dust came. Two sources only appear possible, and which have been mentioned above.

The dust was distributed from a centre in the neighbourhood of Karakatoa with extraordinary velocity, averaging, according to the data of the first appearance of the after glow, 2,000 miles per day. This great rapidity only lasted two days, later on the distribution was very slow in comparison, averaging only 100 miles per day. This great rapidity of the distribution at first seems to me to prove, that the dust must be of meteoric origin. If a cloud of meteoric dust struck the atmosphere of the earth, which rotating very rapidly in the tropics moves in a different direction from the dust cloud, falling towards the earth, it would of course disperse this dust cloud immediately, and in this manner the great rapidity of distribution at the beginning is explained. Later on, when the dust was once moving with the atmosphere, the distribution of course was very much slower. If the dust came from Karakatoa, such a difference in the rapidity of the distribution at the beginning, and afterwards could not be accounted for. Besides it seems extraordinary that in connection with smaller eruptions no traces of after glow, even in the nearest vicinity of the Volcano (Naples), has ever been observed. The long duration of the after glow, which can even now be observed proves that the dust must have been there originally in such quantities that a tellurie origin does not appear at all probable.

I therefore agree with Professor Smith that the dust is of cosmic origin. But a question now arises which Professor Smith has not dwelt on, namely, whether there is any connection between the great eruption in the Straits Settlements and the arrival of the cosmic dust cloud.

It is hardly likely that the centre of distribution of the after-glow that is of the dust in the air should coincide by chance with the great eruption in space, and the appearance of the dust with the eruption in time. If this coincidence did not occur by chance there are two possible ways of accounting for it: either the eruption was the cause of the appearance of dust or the appearance of dust was the cause of the eruption. I have given the reasons above why I believe the former not to have been the case, and we must now therefore consider the second alternative.

A dust cloud nearing the earth must necessarily influence the earth by its attraction. The general gravitation will attract the dust cloud to the earth, but also the latter towards the former. When the dust cloud comes near the earth this attraction will be local, near the place where it reaches the outer surface of the atmosphere very much stronger in the moment when it falls than anywhere else, the part of the globe nearest the falling dust cloud will be attracted in a great measure. If the globe were liquid the consequence of this local attraction would be, that on and near the surface from those parts around the place where the dust cloud was descending the mass would tend to flow towards that cloud. The firm crust of the earth cannot of course yield to such a local attraction from without, which can only disturb the equilibrium on the surface ; but the outer liquid coating, the sea, and the inner liquid or semi-liquid mass can obey, and in this case did obey the strain. The sea rose high and swept over the islands, and the liquid mass in the interior of the earth broke forth at a place of little resistance, where the pre-existing volcanoes prove the earth's crust to be weaker than elsewhere in the vicinity of that place, where the cosmic dust cloud struck the atmosphere.

I have ascertained an interesting fact, which goes far to prove the correctness of these statements, and in fact the conclusions drawn therefrom brought me to the explanation which I have presented above.

Tidal waves caused by volcanic eruptions are not rare. They are always caused by a centrifugal shock, and consequently consist of high waves much higher than those caused by the highest tide, which are separated from each other by steep rare valleys. In this case, I had occasion to observe the tidal waves at Lyttleton. Here the irregularity consisted in a *sinking* of the water, which during the whole day never reached even middle water-mark, and was at times fully six feet lower than spring ebb tide. Of course, if the tidal wave is caused by an attraction from without the neighbouring waters will be drawn from the places around towards the attracting object in this case the falling dust cloud, and this accounts for the great difference between this and other tidal waves, which was also expressed by the extremely long duration of two days in which period the water in Lyttelton was continually below the average height.

I have expressed these views in a similar manner in a paper published in Petermann's Geografische Mittheilungen, where further details are to be found, and to which essay I refer those of my readers who may be interested in the matter.

NOTES AND EXHIBITS.

Mr. Macleay said that by the last mail from San Francisco, he had received from the author, Professor Garman, of the Museum of Comparative Zoology, Cambridge, Mass., a pamphlet, containing a description and illustration of a shark of a very remarkable form. The fish was 5 feet long, with a diameter of less than 4 inches, the head was like that of a snake. the mouth large and terminal, the teeth resembling those of a snake, and it had only one dorsal fin placed opposite the anal. Mr. Garman proposes for this Sea Serpent looking Shark the name of *Chlamydoselachus anguineus*, and thus characterises the Family *Chlamydoselachidæ*. "Body much elongate, increasing in size very little anteriorly. Head depressed. broad. Eyes lateral, without nictitating membrane. Nasal cavity in skull separate from that of mouth. Mouth anterior. Snout broad, projecting very little. Cusps of teeth resembling teeth of serpents. Spiracles small, behind the head. One dorsal, without spine. Caudal without pit at its root. Opercular flap covering first branchial aperture, free across the isthmus. Intestine with spiral valve." The only specimen known, a female, was purchased from Professor H. A. Ward, and is said to have been brought from Japan.

Mr. Macleay said he wished to rectify as far as he was able at present some unaccountable omissions in the Supplement to the Catalogue of Australian Fishes, just published in Part 1, of Vol. IX, of the Proceedings of the Society. These were :—

Lophotes Guntheri. Johnston. Proc. Roy. Soc., Tasmania, 1882.

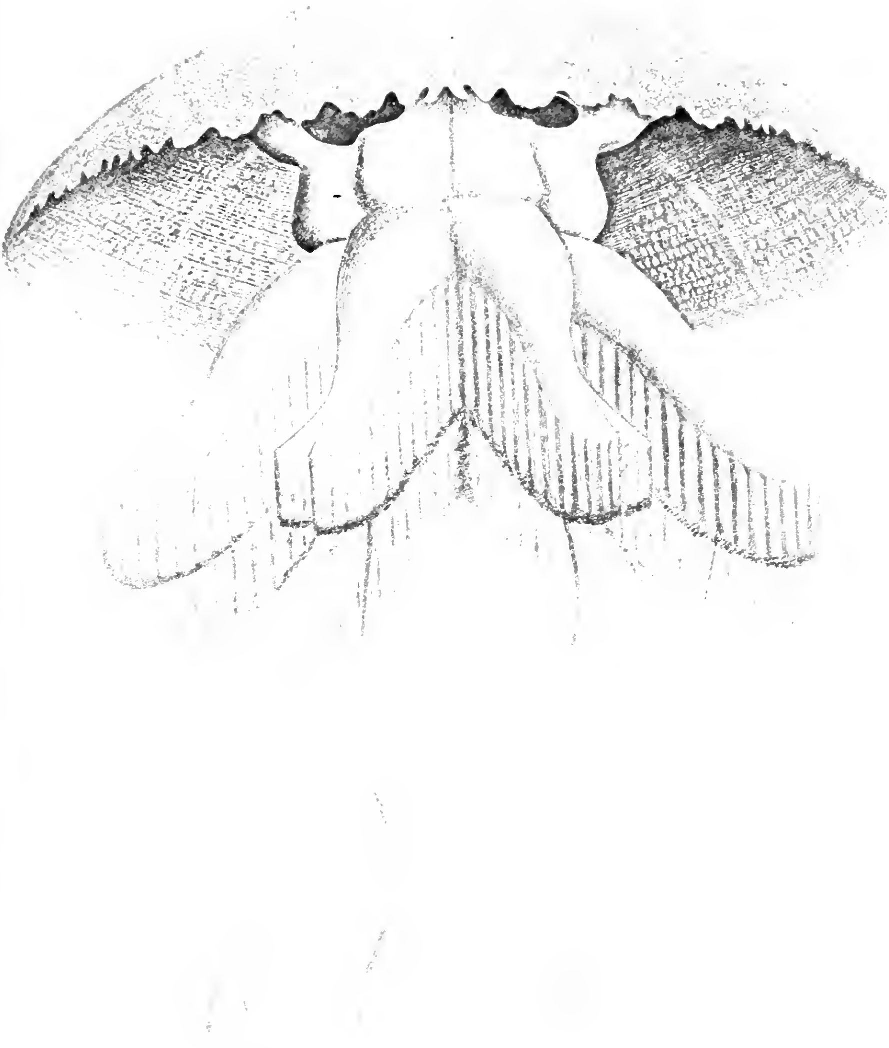
Atherina Tasmaniensis. Johnston. Proc. Roy. Soc., Tasmania, 1882.

Olistherops Brownii. Johnston. Proc. Roy. Soc., Tasmania, 1883.

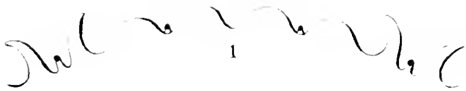
Mr. Macleay exhibited for the Rev. T. Wyat Gill a small beetle from New Guinea—the firefly of the country—found about 40 miles East of Port Moresby. It was of the same family as the fireflies of Southern Europe, the *Lampyridæ,* though probably a new species. Baron Maclay observed that he had noticed in New Guinea many other species of this family producing light in the same manner.

Mr. P. E. Henderson, C.E., exhibited, through Mr. Neill, a collection of minerals from Silverton, including a good specimen of Horn Silver: and a rich specimen of auriferous quartz from Cootamundra.

Mr. P. McMahon, J.P., exhibited a specimen of Rock Crystal (Amethyst) found on the surface near Twofold Bay.



V. Lendenfeld, del.



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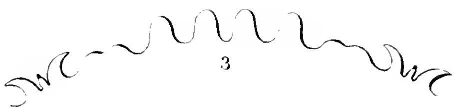

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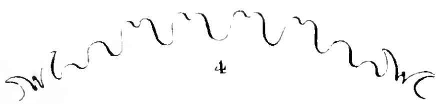

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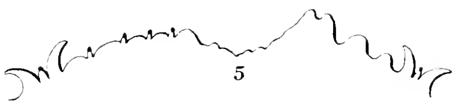

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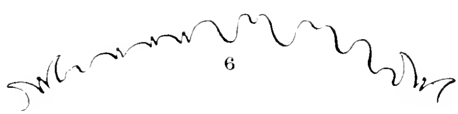

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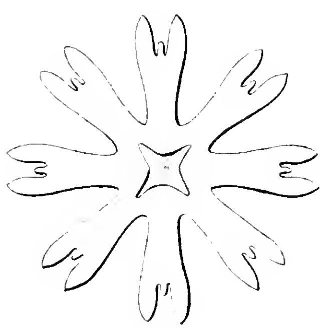

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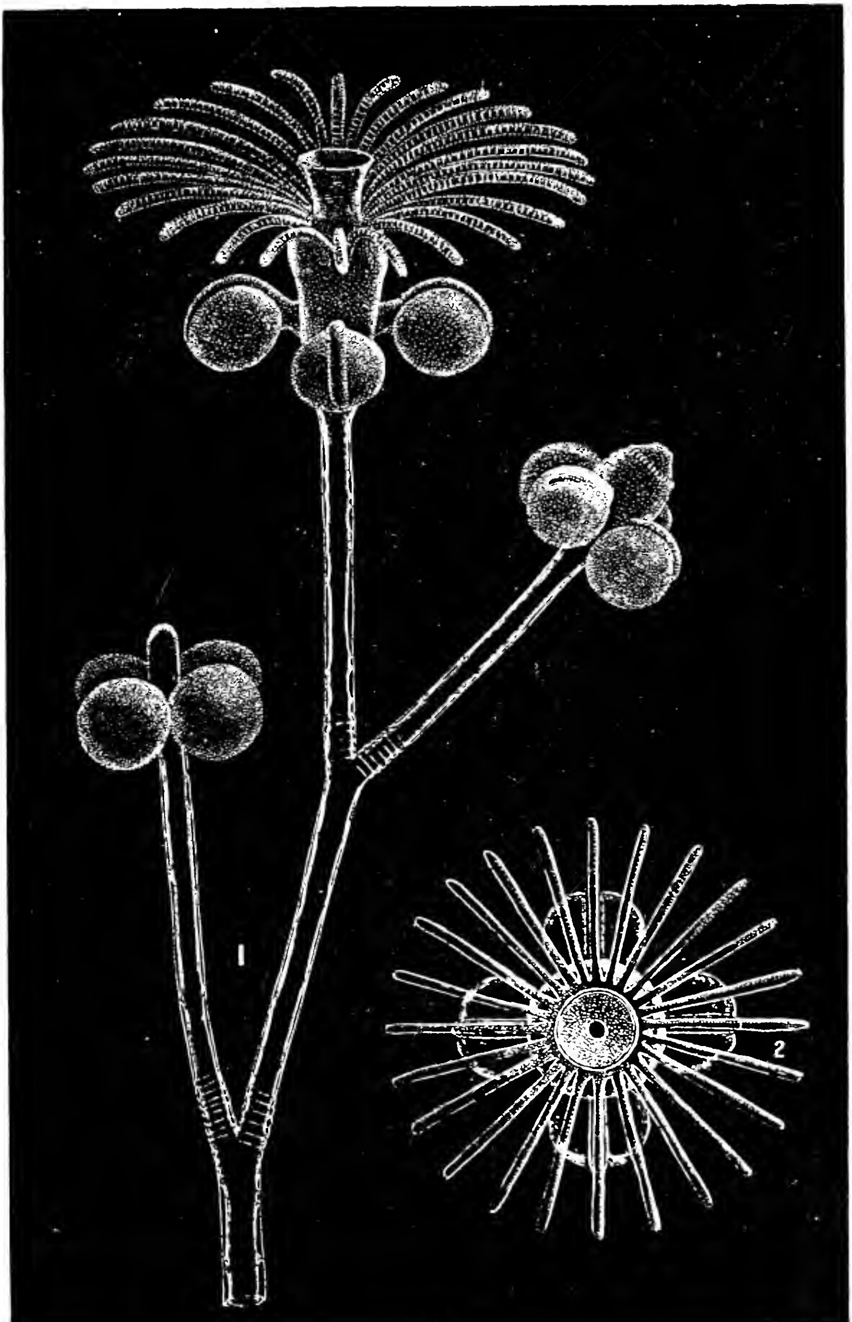

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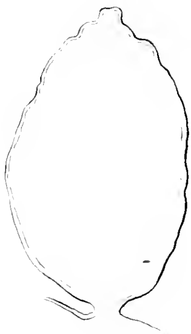

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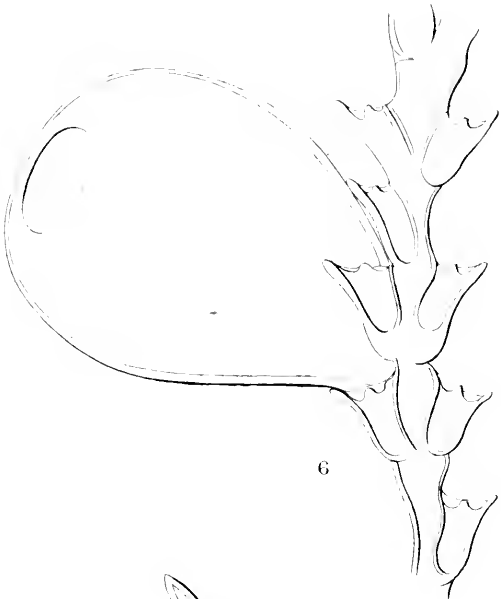

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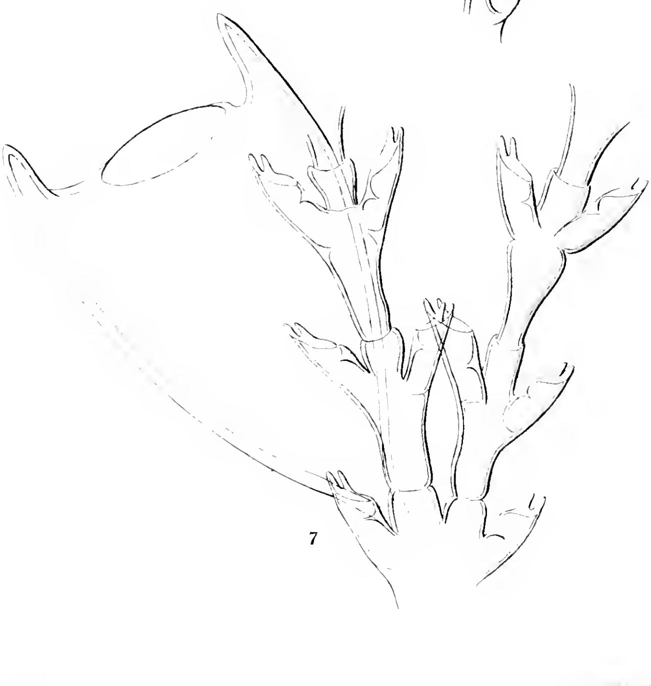

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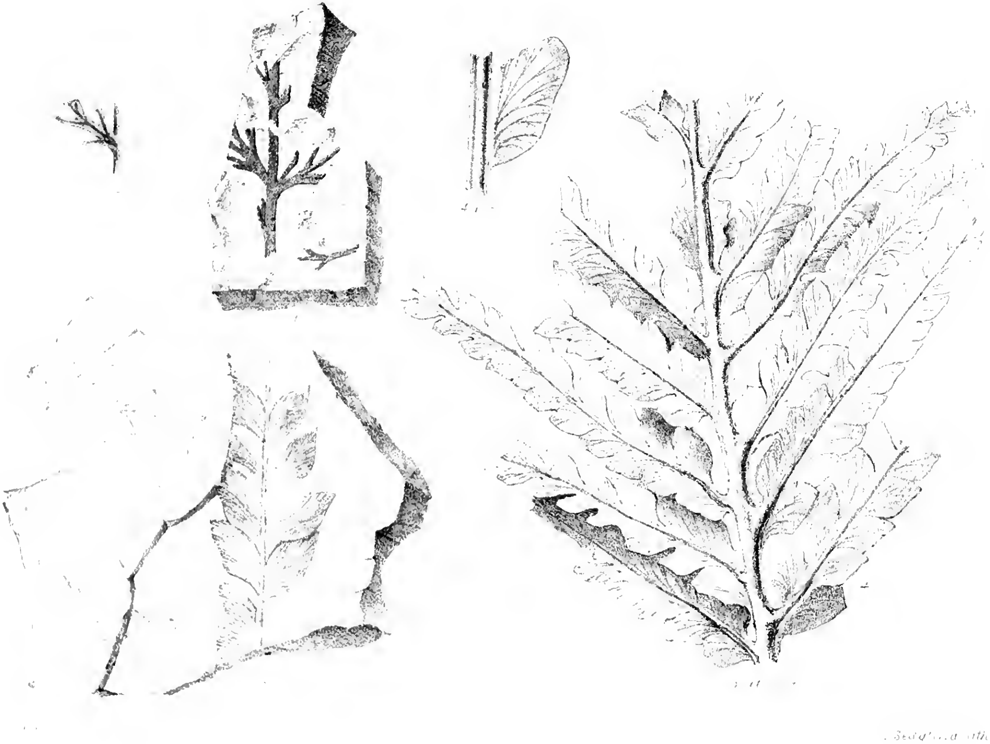

W. A. H. del.

CLASPERS of HEPTANCHUS

Stringfield lith.

WEDNESDAY, 25TH JUNE, 1884.

The Vice-President, Dr. James C. Cox, F.L.S., &c , in the chair.

Charles E. Tucker, Esq., and Dr. Hankins were introduced as visitors.

MEMBERS ELECTED.

John Mitchell, Esq., Bowning ; George Masters, Esq. ; Frederick Stoltenhoff, Esq. ; L. C. Henderson, Esq.

The Chairman announced that G. F. Angas, Esq., F.L.S., &c., of London, had been elected a Corresponding Member by the Council.

DONATIONS.

"Natuurkundig Tijdschrift voor Nederlandsch-Indie." Deel XLIII., 1884. From the Royal Natural History Society of Netherlands India.

"Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirkes Frankfurt." 1st Half Vol., 1884. From the Society.

"Phanerogamia of the Mitta Mitta Source Basin. Article 2. By James Stirling, F.L.S., 1884. From the author.

"Victorian Naturalist." Vol. I., No. 5. May, 1884. From the Field Naturalist's Club of Victoria.

"Proceedings of the Royal Society of Queensland." Vol. I., Part I., 1884.

"Science." Vol. III., Nos. 62 to 65. April 11th to May 2nd, 1884. Also, Vol. II., Nos. 38, 39 and 42; and Vol. III., No. 51. From the Editor.

"Bulletin of the American Museum of Natural History." Vol. I., No. 5, 1884. Also, "Fifteenth Annual Report for 1883." From the Museum.

"Medical Press and Circular." No. 2347. April 23rd, 1884.

"Vaccination Inquirer and Health Review." Vol. VI., No. 62. May, 1884. Also, three Pamphlets on the Vaccination Question. From the London Society for the Abolition of Compulsory Vaccination.

"Papers and Proceedings of the Royal Society of Tasmania," for 1883. From the Society.

"Report on the Progress and Condition of the Botanic Garden, Adelaide, South Australia, for 1883." From the Director.

"Feuille des Jeunes Naturalistes." No. 163. Mai, 1884. From the Editor.

"Journal of the Royal Microscopical Society." Ser. II., Vol. IV., Part 2. April, 1884.

"Fragmenta Phytographiæ Australiæ." By Baron F. von Mueller, K.C.M.G., &c. Decades VI. to XI. (1867-1881). "Eucalyptographia." By Baron von Mueller, K.C.M.G., &c. Decades I. to IX. (1879-1883). "Systematic Census of Australian Plants." Part I. By Baron von Mueller, K.C.M.G., &c. 1882.

"Natural History of Victoria, Prodromus of the Zoology." By Professor F. McCoy, F.R.S., &c. Decades I. to VIII. (1878-1883). "Victorian Government Prize Esssays": (1) "On the Agriculture of Victoria"; (2) "On the Origin and Distribution of Gold in Quartz Veins." From the Government of Victoria.

"Transactions and Proceedings of the New Zealand Institute." Vol. XVI., for 1883. From the Institute.

"On the Origination of Typhoid Fever." By A. K. Varley, Esq., Mount Gambier, S. A., 1884. From the Author.

"Report of the Trustees of the Australian Museum for 1883." From the Trustees.

"Natürliche Schöpfungsgeschichte, Von Dr. Ernst. Haeckel, 1873." "Kosmos." Von Alex. von Humboldt 4 vols., 8vo. 1845-58. "Recherches Helminthologiques en Danemark et en Islande." Par Dr. H. Krabbe. From Dr. Schuette

"Official Catalogue of the Wine, Fruit, and Grain at the Victorian Intercolonial Exhibition of 1884." "Melbourne Universal Exhibition, 1880. Notices of Public Works, &c., of France," From J. F. Bailey, of Victoria.

"Report on the Kimberley district, N. W. Australia." By the Hon. John Forrest, 1883. "Western Australia," History, &c., by W. H. Knight, Esq., 1870. "Melbourne International Exhibition, 1880. Catalogue for Western Australia." From the Government of Western Australia.

"Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft." Band XIII., Heft. 3. From the Secretary.

"Verslagen en Mededeelingen der Koninklijke Akademie Van Wetenschappen" Deel. XVIII., 1883. Also, "Jaarboekvoor, 1882." From the Academy.

"Archives Néerlandaises des Sciences exactes et Naturelles." Tome, XVII. Livr, 1, 2, 3, 4 and 5. Tome, XVIII. Livr. 1, 1882-83. From "La Société Hollandaise des Sciences à Harlem."

"Annual Report of the Smithsonian Institution for 1881." From the Director.

"Proceedings of the Academy of Natural Sciences, Philadelphia." Parts 1, 2 and 3 for 1882. From the Society.

"Journal of the Cincinnati Society of Natural History." Vol. VI. Nos. 1, 2, 3 and 4, 1883. From the Society.

"Proceedings of the Boston Society of Natural History." Vol. XXI. Part 4. Vol. XXII. Part 1, 1883.

"Mémoires de la Société Imperiale des Sciences de St. Petersbourg." Tome, XXX. Nos. 3 to 11, XXXI. Nos. 1 to 9, 1882-83. "Bulletin." Tome, XXVIII. Nos. 2 and 3. From the Society.

"Zoological Chart." By Dr. Usher. From Harrie Woods, Esq. Under Secretary for Mines, Sydney.

OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE NEIGHBOURHOOD OF SYDNEY.

No. 7.

By E. Haviland.

This paper treats of such species of the genus *Goodenia* as I have found in the immediate neighbourhood of Sydney. The genus belongs to the order *Goodeniaceæ,* so named after Dr. Goodenough, Bishop of Carlisle. Of the genus *Goodenia* we have the following species common about Sydney, *G. ovata, G. bellidifolia, G. stelligera, G. hederacea,* and a small road-side species, apparently a variety of *G. paniculata. G. paniculata* itself however, may be found, though it is not so common as the other species.

The flowers of this genus are very interesting. The unequally lobed corolla, the winged lobes, the position of the stamens and style, outside the corolla, the presence of an indusium, so unusual in flowering plants ; all rivet the attention of anyone engaged in the study of vegetable life ; and if my papers did not profess to speak only of plants belonging to the close neighbourhood of Sydney, I might refer to the elegance of some of the mountain species such as *G. decurrens* or *G. pendula:* but even those species I have named, as growing within the limit to which I confine myself, possess great beauty. I may refer especially to *G. ovata,* a fine showy plant of two to four feet high ; the purity of the colour of its flowers (almost golden yellow) contrasting with its dark green ovate leaves, gives it an exceedingly pleasing appearance. *G. stelligera* is a species found in or near marshes and swampy ground ; and varies exceedingly, even within the space of a few yards, accordingly as it is found in dry or wet soil. Growing on the dry ground round the swamp, it is an insignificant plant of four to six inches high, with few flowers; and all gradations from that to a fine robust plant of two feet, bearing a profusion of rich yellow flowers, may be found as the centre or very wet portions of the swamp are reached; marking, not only its character as a marsh plant, but its necessary treatment if brought under cultivation.

I have examined very carefully all the species to which I have referred; and as they all agree in their general form, and especiallly in those characters essential to this paper; it will save time if I speak more particularly of one species only; and I take for that purpose *Goodenia ovata.* The calyx is a linear tube with five linear lobes; the lobes as long as the tube. The corolla monopetalous, but divided into two principal lobes of unequal size; the upper and smaller one is again divided nearly to its base while the lower and larger lobe is divided into three sections, but not so deeply as the upper one; there are five stamens; the style simple, with an expanded crescent-like stigma, covered by an indusium. This indusium is an envelope rising from the style immediately below the stigma, passing on above it and completely covering it laterally; but having its mouth open or closed as may be. It expands towards its upper part, adapting itself to the crescent form of the stigma; its edges are densely ciliate. Speaking of it in one of his lectures, Dr. Woolls says,: "From the days of Robert Brown various opinions have been held respecting this indusium, some regarding it as an exaggeration of the rim which surrounds the stigmatic surface of Heathworts; some again considering it as a part of distinct origin though intimately cohering with the pistil; whilst others look upon it as necessary to the fructification of the flower. The parts have been observed to close on receiving the pollen. However that may be, the organ is one of deep interest."

If we take a flower of *Goodenia ovata* in the bud, before it has even began to open, and carefully dissect it, we shall find the five stamens as long as the pistil, the anthers just reaching to the top of the indusium; the filaments closely packed round the style; the mouth of the indusium wide open, exposing the stigma inside, as though it were at the bottom of an open bag; the whole wrapt up carefully and securely in the folds of the corolla. Great care is requisite in this dissection, as the anthers, even at this stage, are full of pollen, though not ripe; and being exceedingly delicate they are liable to be broken and the pollen lodged on the stigma, which would lead to a- wrong conclusion as to its mode of fertilization. Now, if we examine a flower a little more open, but yet not fully expanded, we shall find this state of things quite altered. The style will now be much longer than the stamens, the corolla (as I have already said) divided into two principal lobes, the upper and smaller one again divided almost to its base; the lower one thrice divided, though not so low down; the stamens, no longer occupying, (as is usual in most other flowers,) the inside of the corolla, but escaping through the open division of the upper lobe, close to its base; and generally growing out and away from it; often at a right angle to it. The style will also be found outside the corolla; but more erect and nearer to the back of the lobe; while the indusium is either quite closed, or nearly so; the deep ciliate fringe over its mouth, assisting to shelter the enclosed stigma. Taking now a mature and fully expanded flower we shall find the stamens still outside, and usually bent farther away from the corolla; the anthers all open, and the pollen either in abundance, or, in some cases, past that stage, all gone, and the anthers shrivelled. The style however has become very long in proportion to the stamens, and inclined still more to the corolla; until at last, the stigma covered by the indusium has re-entered it, through the same passage by which it had passed out, the division of the upper lobe. The re-entrance of the stigma into the corolla is the more readily effected, since at a short distance below it, the style is bent nearly at a right angle, just as though a tobacco pipe were held erect with its bowl upwards, then the stem would represent the style, and the bowl the indusium, enclosing the stigma.

The stigma is now, not only out of the reach of the anthers and pollen of its own flower by its relatively elevated position; but it is also prevented from contact with them, by the indusium completely covering it; and separated, too, from them, by the corolla. The mouth of the indusium now opens widely and the dense margin of cilia on its edges becomes more erect, forming a stiff brush, likely to sweep the pollen from any insect bearing it. It sometimes happens however, that although the mouth of the indusium is presented to the opening of the corolla, it may not have quite entered it when the stigma is ready to receive pollen; the slightest touch however of the corolla lobe, from the inside, opens the division, leaving the open indusium and stigma exposed from within, and in such a position, that an insect could not enter the corolla without coming into contact with them. The indusium will often be found in this position, (like that of a person standing in the open door-way of a room, but not actually in the room) open and full of pollen covering the stigma; and which could only have been placed on it from the inside of the corolla.

As to the fertilization of this plant; I think there can be little doubt, when we consider the construction of the flower, that it must be cross-fertilized. Either each flower must be fertilized by its own pollen while shut up in the bud; or by the pollen of some other flower, after the relative positions of the stigma and anthers are so changed, that contact between them is impossible. The first is unlikely, since neither pollen or stigma is mature; and in all the flowers I have examined in the bud, either quite closed or partly open, I have found the anthers unbroken and the open indusium free from pollen. Of course, it is quite possible, that an insect may alight on the anthers, load itself with pollen, and then go directly to the stigma of the same flower; and there is also a chance of its leaving pollen on one flower which it had gathered from another on the same plant; but there can be little doubt that the species to which I have referred (and perhaps the whole genus) are entirely dependent upon insects for their fertilization.

NEW AUSTRALIAN FISHES IN THE QUEENSLAND MUSEUM. PART II.

BY CHARLES W. DE VIS, M.A.

CHÆTODON AURORA.

D. 12/30 (about.) A. 3/20. Lat. 30.

The profile of the head is very concave, the snout produced and pointed, pre operculum slightly crenulated at the angle, dorsal and anal fins rounded posteriorly. The ocular band covers the posterior three-fourths of the orbit, and meets its fellow of the opposite side on the chest. Two broad but very faint bands on the body, the first from the fourth to sixth dorsal spines to the ventral, the second, forming on the anterior part of the soft dorsal a bright black triangle, goes to the anal. A black bar across the base of the caudal. Behind the black triangle the soft dorsal is bright buff, its posterior third brown. Anal, caudal peduncle and caudal yellow, the fins with a narrow intra-marginal black line, tip of caudal transparent.

Length, 3½ inches. Locality, Queensland Coast.

Closely related to C. Ulietensis, C & V.

CHÆTODON EPHIPPIUM. C. & V.

A half-grown specimen, in all probability from Cardwell.

CHÆTODON NIGRIPES.

D. 14/23. A. 3/18. Lat. 35.

The insertion of the dorsal is elevated, the profile of the head and nape descending from it in a nearly straight line. The snout produced, conical. The dorsal and anal fins pointed at the posterior end. The ocular band is narrower than the orbit, but widens on its lower edge. Body and fins uniform brownish grey, slate colour posteriorly. Anal with a broad black edge commencing in a point at the tip and dilating over the greater part of the spines.

Length, 4 inches. Locality, Queensland.

Chætodon germanus.

D. 13/24. A. 3/18. Lat. 42.

Nape rather gibbous in front of the dorsal. Snout short, equal in length to the diameter of the orbit. Dorsal and anal rounded No ocular band. An indistinct dark band across the forehead, and a black patch on the gibbosity of the nape. Body with about eight oblique bands descending forwards. One parallel to them on the base of the anal. Soft dorsal with a narrow black intra-marginal line. Caudal with a narrow black crescent in the middle and broad transparent tip. Anal with a within black edged buff intra-marginal concentric band, and brown margin.

Length, $2\frac{3}{4}$ inches. Locality, Queensland.

Chætodon townleyi.

D. 6/28. A. 3/20. Lat. 54.

Snout a little produced, longer than the diameter of the orbit. Ventral reaching the anal. Dorsal spines gradually increasing in length to the sixth.

Six brown to black vertical bands, the sixth narrow across the tail near the base. The first more or less distinctly double, from the nape through the eye, meeting its fellow of the opposite side on the chest. Second over the edge of the opercle. Third, fourth and fifth from the top of the dorsal to the bottom of the anal. The dorsal part of the fourth assuming more or less the form of a blotch, the fifth interrupted in the middle of its hinder edge by a large white edged black spot on the caudal peduncle.

Length, 1 to 3 inches. Locality, Moreton Bay.

A single example received its name from its collector, Captain Townley, of St. Helena, other specimens have been received subsequently.

SCATOPHAGUS QUADRANUS.

The fish representing on the Queensland Coast, the Indian Scatophagus argus Lin. appears to be incapable of identification with that species. It has no recumbent spine in either its adult or adolescent states. The spots on the body do not extend beyond the base of the soft dorsal. When they are present on the caudal they are limited to its lateral edges, and they scarcely pass on to the base of the anal. The fourth dorsal spine is $3\frac{1}{2}$ instead of $2\frac{1}{2}$ in the height of the body even in the full grown fish in which the trunk is relatively elongate. It may be added that no Australian specimen of S. argus is mentioned by Dr. Gunther. On these grounds, I venture to draw attention to our well-known fish under the specific name given above. The absence of the procumbent spine renders it strictly speaking a Chætodon, but in its general characters it is a Scatophagus, and I therefore, refer it to that genus. Its characters are

D. 11/15-16. A. 4/13-14. L. tr., about 80.

Interorbit half of the length of the head. Pre-orbital with lower posterior angle minutely serrated. Fourth dorsal spine $3\frac{1}{2}$ in the height of the adult body.

Colour, dark brown, chest, abdomen and caudal lighter. On the body black spots becoming smaller on the lower part, not extending to the nape nor forepart of the abdomen, ncr on the fins, except the lateral edges of the caudal. Webs of vertical fins conspicuously darker than the rays.

Length to 13 inches. Locality, Queensland Coasts.

Still commoner on our coasts than the preceding species is the representative of Scatophagus multifasciatus of Richardson. Its identification with that species is however, open to the same cardinal objection—in it also the pro-cumbent spine is entirely and invariably wanting. Moreover, were it possible to suppose that the absence of this generic character could have been overlooked by the describer of multifasciatus, the identify of our fish would still remain extremely questionable. Its fourth dorsal spine is the longest, and is 3 or nearly so in the height of the body against $2\frac{1}{3}$ in the multifasciatus. Its form and markings too are not sufficiently in accord with those of the subject of the figure given in the Zoology of the Erebus and Terror, to allow us to refer it to Dr. Richardson's species. Regarding it therefore as an undescribed species, I propose for it the name

SCATOPHAGUS ÆTATE-VARIANS.

D. 12/16. A. 4/15.

Height of the body 2 to $2\frac{1}{5}$, and length of the head 4 in the length of the body, s c. Interorbit, $2\frac{1}{2}$ in the length of the head.

Fourth dorsal spine the longest, $2\frac{2}{3}$ to 3 in the height of the body. Caudal fin $1\frac{1}{6}$ in the same. Length of the median rays of the caudal much greater than the depth of the caudal peduncle.

Colour, silvery white with markings varying with age. The young fish has on the upper part of the body five vertical bars, and on the post-abominal region large spots irregularly disposed. When about half mature it has two bars across the muzzle, the lower one continued around the lower lip. Between the orbits a curved band within a larger one, which curves backward from orbit to orbit, and is continued backwards on the nape to the first vertical bar on the body. The body has five bars terminating on the flanks and breaking up into dark spots on the abdomen, the anterior bar descending to the upper angle of the operculum, and sometimes faintly over the operculum. There is also a band from the end of the soft dorsal half-way to the anal, and another half across the root of the caudal fin. Between the vertical dorsal bands short alternate ones make their appearance. The dorsal spines aie silvery, the webs of the vertical fins dark. In the adult state the short alternate bars are lengthened to an equality with the others, either in continuity or as elongated spots. The irregular abdominal spots are arranged in two or three continuous longitudinal bands, and the markings on the head, except the interorbital band, become obsolete. The lips, a supraciliary stripe, and the caudal are dark and the web of the spinous dorsal black. The body is less deep, the vertex more concave and the muzzle rather longer.

Length to 12 inches. Locality, Queensland Coast.

The retention of the two preceding species is justified by the similar inconstancy in the *ăbsence* (to the eye) of the pro-cumbent spine in the allied genus Holacanthus. It is a character which in both genera should be stated with a reservation. The nakedness of the first dorsal in Scatophagus is its distinctive feature.

Two other species of Scatophagus are in the Queensland collection, one of them near Bougainvilli. C. & V., but both being quite young, I forbear to notice them further.

Holacanthus sphynx.

D. 14/16-17. A. 3/17. Lat. 45.

A procumbent dorsal spine. The pre-opercular spine is $\frac{1}{2}$ of the length of the head, and has a small one anterior to it. The vertical fins are rounded, not produced. The pre-orbital pre-opercle and lower limb of opercle denticulated. Profile equally convex above and below.

Colour, uniform light golden brown.

Length, $3\frac{1}{2}$ inches. Locality, Queensland Coast.

Holacanthus bicolor. Bl.

The procumbent dorsal spine exposed in the preceding species is, in bicolor, just covered by the skin.

Locality, Queensland Coast.

Holacanthus semi-circularis. C. & V.

In the Queensland specimen the alternating blue lines are barely distinguishable.

UPENEOIDES RUBRINIGER.

D. 8/8. A. 7. Lat. 27. Tr. 2/5.

The height rather less than a third of the length, s.c. The length of the head, one-third of the same. Orbit and interorbit, each $4\frac{1}{3}$, snout $2\frac{1}{5}$, in the length of the head. Second dorsal spine, $1\frac{2}{3}$ in the height of the body.

Physiognomy labroid. The profile of the head parabolic. Colour, dusky reddish brown. The scales narrowly edged, darker. Head and fins, except the pectoral, black. Pectoral, darker than the body.

MULLOIDES ARMATUS.

D $7\frac{1}{8}$. A. 1/6. Lat. 40. Tr. $2\frac{1}{2}$/7.

The height of the body is $5\frac{1}{2}$, and the length of the head, $4\frac{1}{4}$ in the total length. Orbit $3\frac{1}{2}$, snout more than $2\frac{1}{2}$, interorbit 4, dorsal and pectoral $1\frac{1}{4}$, in the length of the head. Scapula and operculum, each with a short point. The barbels hardly reach the angle of the pre-operculum. Profile of the snout, convex. Pre-orbital high, exceeding post-orbital part of the head. Tubules of anterior scales of lateral line numerous, becoming fewer and simpler posteriorly. Teeth of lower jaw minute in a broad band, of upper, small but distinct.

Colour, uniform ; fins, immaculate.

Length, 6 inches. Locality, Queensland.

LETHRINUS ORNATUS.

D. 10/8. A. 3/8. Lat. 47. Tr. 5/17.

The height of the body is $3\frac{1}{3}$, and the length of the head, 4 nearly, in the total length. Snout 2, orbit $4\frac{3}{4}$, interorbit $3\frac{1}{2}$, in the length of the head. The fifth (longest) dorsal spine is $3\frac{1}{4}$ in the height of the body, and $2\frac{1}{2}$ in the length of the head. The profile is tumid on the nape, rather concave between it and the snout. Anterior teeth short, not canines ; posterior teeth molars. Caudal strongly emarginate. The maxillary does not reach the anterior nostril, and is not covered by the pre-orbital. A bony protuberance in front of the orbit.

Colour, (dry) mottled grey: some of the scales white, some dark centred. Top of the head chesnut brown; soft dorsal with traces of pale spots. Pectoral, pale straw colour; axil, black, with the black extending on the upper edge of the base of the pectoral.

Colour, (recent) top of the head nearly greenish blue. Upper half of the rays of the soft dorsal, green; the webs reticulated with brown, outer rays of caudal red, passing into golden yellow near the tip of the upper lobe; tip white, medians rays tipped with black; on the body about twenty longitudinal golden streaks. Many scales of the middle of the trunk with pearly streaks. General tint bluish on the upper, yellowish on the lower parts. Sides of the head yellowish, with two blue streaks from the orbit to the rictus; rictus within vermilion. Base of pectoral rays yellow.

Length, 15 inches. Locality, Wide Bay.

Centropogon nitens.

D. 14/10. A. 3/5. Lat. ? Tr. $\frac{?}{43}$.

The height of the body is 4, and the length of the head to the tip of the opercular spine $3\frac{2}{3}$, in the total length. Orbit and interorbit 5, snout 4, in the length of the head. The third dorsal spine reaches from the tip of the snout to the hinder edge of the orbit. The dorsal notched, the last spine being two-thirds of the second ray which is longer than the second spine. The pectoral is narrow and does not reach to the end of the ventral. The ventral anal and dorsal webs deeply scalloped. Scales very distinct, each with three striæ converging from the base towards the margin. Armature of head normal. Colour seems to have been yellow on the body, the striæ of the scales giving them a bright glistening appearance. Middle of spinous dorsal blackish, top of soft dorsal and hinder half of caudal black; ventral marbled with black.

Length, $8\frac{1}{2}$ inches. Locality, Queensland Coast.

Tetraroge Bellona.

D. 15/8. A. 3/4.

Height of body and length of head, each $3\frac{1}{4}$ in the total length. Orbit and snout, each $3\frac{1}{2}$, interorbit 6, in the length of the head. Third to sixth dorsal spines (the longest) $2\frac{1}{2}$ in the same. Scales minute, but distinct. The dorsal rises on the nape, has no notch and is widely separated from the caudal. Third anal spine the longest. Pre-orbital with two strong denticulations, interorbit with two strong ridges diverging backward; nape, with a ridge-like spine, on each side.

Colour, light yellowish brown, blotched with darker brown, which extends as a patch on the spinous dorsal and forms a cross-band near the root of the caudal.

Length, 1·4 inch. Locality, Queensland Coast.

Tetraroge Hamiltoni.

D. 16/9. A. 3/5. Lat. 50.

The height of the body and the length of the head are each $3\frac{1}{2}$ in the total length. Orbit $3\frac{1}{4}$, interorbit 6, snout 4, in the length of the head. Third dorsal spine, 2/3 of the height of the body. Scales small and harsh, well defined, not extending on the anterior part of the dorsum. The third dorsal spine the longest, the 4th and 8th equal. The spinous dorsal higher than the soft or the anal; second anal spine longer and stronger than the third. Spine terminating the pre-opercular ridge long; the pre-orbital spine longer; no opercular ridge. Interorbital furrow shallow, traversed by two ridges diverging backwards.

Colour, pinky brown, deepening to a rufous brown broad band descending over the anterior part of the soft dorsal to and over the corresponding part of the anal; behind it on the soft dorsal a narrow fainter band. Spinous dorsal with two groups of brown specks. Caudal with two bands, one across the root, the other defining the posterior third. Muzzle and top of head dark brown. A dark band across the cheeks.

Length, $3\frac{1}{2}$ inches. Collected by Mr. J. Hamilton, Dunwich, Moreton Bay; received also from Mr. Steele, Tweed River.

In the young four cross bands are faintly indicated on the body, distinctly on the dorsal fin.

Aploactis lichen.

D. 3 + 11/10. A. 10. P. 13. V. 1/3.

The height of the body is 3, the length of the head $2\frac{3}{4}$ in the length, s c. The length of the face is $1\frac{3}{4}$ in that of the head. The first dorsal low, deeply notched. The second dorsal as high as the length of the caudal, and extending to the base of the latter. Head large, profile elevated over the operculum. Front straight, rising at a high angle. No teeth on the vomer nor palatines.

Colour, liver brown with dark blotches irregularly disposed, and forming cross-bands posteriorly. A large pinky-white lichen-like spot on the upper corner of the pectoral and similar pink spots on the opercle and orbit.

Length, 6 inches. Locality, Moreton Bay. Collected by Mr. G. Watkins, Dunwich.

On comparison with the figure of A. Milesii, Rich. the distinctive characters of this fish, its nuchal hump, long face, and high soft dorsal are sufficiently obvious.

Teuthis gibbosus.

A procumbent pre-dorsal spine.

The height of the body is $2\frac{3}{5}$, the length of the head $5\frac{1}{3}$, in the total length. Orbit and snout, each 3 in the length of the head. Lower profile regularly convex, upper increasing in convexity under the spinous portion of the dorsal. Last dorsal spine $\frac{2}{3}$ of the first ray.

Colour, rufous grey, redder on the back, nearly white on the abdomen, throat and cheeks. Dark brown spots sparsely scattered on the head and lower part of body. A few obscure pale spots on the lower part of the back.

Length, $6\frac{1}{2}$ inches. Locality, Queensland Court.

TEUTHIS TEUTHOPSIS.

A procumbent pre-dorsal spine.

The height of the body is nearly 2, the length of head $2\frac{2}{3}$ in the length, s.c. Orbit $3\frac{1}{2}$, snout and interorbit, each $2\frac{1}{2}$ in the length of the head. The upper lobe of the caudal the longer.

Lower part of the head, chest, and fore-part of the trunk with rather large pale dark-edged spots most conspicuous on the opercle where they are disposed in descending series.

Length, 8 inches. Locality, Queensland Coast.

The presence of a feature unique in the genus might be held sufficient to warrant the formation of a new generic term for the fish. This, however, I leave to others.

TEUTHIS FLAVA.

A procumbent predorsal spine.

The height of the body is $2\frac{3}{5}$, the length of the head, $4\frac{3}{4}$ in the total length. Orbit 3, snout $2\frac{2}{3}$, in the length of the head. Profile regularly and equally convex above and below. Caudal, strongly emarginate. Head, small.

Colour, uniform light purplish brown. The middle part of the body yellowish, especially near the head. Two dark bars from the orbit to the rictus. Pectorals yellow.

ON A MARINE SPECIES OF PHILOUGRIA.

PLATE XI.

By CHARLES CHILTON, M.A.

The Isopod described in this Paper was obtained at Coogee Bay near Sydney, on December 30th, 1883. I took it in considerable numbers creeping on the under surface of stones, which were completely covered by sea-water in rock-pools near high water mark.

The only *Oniscinæ* mentioned in Mr. Haswell's "Catalogue of the Australian Crustacea" are *Porcellio graniger* and *P. obtusifrons* so that my Isopod which belongs to the genus *Philougria*, is evidently new to the Australian fauna, and as it differs from the species of that genus which I can find descriptions of, I have ventured to think it is new to science. On account of its extraordinary habitat, I propose to call it *Philougria marina*. I have not been able to find any record of other marine species of the *Oniscinæ*, but it must be remembered, that the works of reference at my disposal are very few in number.

There can be little doubt that all the terrestrial Isopoda are descended from marine forms, hence the question naturally arises—is this *Philougria* a direct descendant of a form that has always kept to its marine habitat; or is it a terrestrial form that has found it convenient to return to the original habitat in the sea?

To this question I can give no satisfactory answer, but it resembles the terrestrial *Philougria* so closely that I am inclined to think it is a terrestrial form that has in the struggle for existence been forced to return to a life in the sea.

I append a detailed description :—

Philougria marina, sp. nov. Plate, XI., fig. 1 to 6. Length of body rather more than twice the greatest breadth ; lateral lobes of the cephalon projecting about as far as the central portion which is rather pointed ; eyes rather large and prominent, considerably raised above the lateral portions of the cephalon. External antennæ slightly longer than the cephalon and first three segments of the pereion, first three joints short, fourth as long as the two preceding, fifth slightly longer than the third and fourth together, narrow at base and slightly sinuous, flagellum a little longer than the fourth joint, composed of four joints, first three of about equal length, but narrowing distally, fourth slender, merging almost imperceptibly at the end into a pencil of very short setæ. Internal antennæ very small, of three joints, the first much larger than either of the others, as long as the second and third together, the second and third joints each bearing a small stout seta at their distal ends. Thoracic legs rather spinous, the largest spine, which splits up into three or four branches, being situated on the inferior margin of the carpus near its distal end. From the dactylos of each leg arises a seta longer than the dactylos, divided into two branches, the one remote from the dactylos being the longer and clubbed at the end, the other branch simple. Terminal segment of pleon triangular, sides concave, end rounded and supplied with two or three very small short setæ, not reaching quite as far as the end of the peduncle of the terminal pleopoda. Terminal pleopoda moderately long, basal joint large, as long as broad, inner ramus as long as the peduncle, articulated to its inner margin at some distance from its extremity, slender, ending in a few setæ, the longest of which is about three-fourths the length of the joint; outer ramus twice as long as the inner and much stouter, narrowing distally, ending in a few very short setæ. The whole body, the outer antennæ and the terminal pleopoda supplied with short stout scattered spines. Colour, light yellow, thickly covered with black or dark-brown stellated markings.

Length of largest specimen, 6 mm.

Habitat. In rock-pools at Coogee Bay, N. S. Wales.

The mandible is shewn in fig. 3 and 3*a*. I have been unable to find a molar tubercle in it. The cutting edge of the mandible itself consists of four teeth, three of about equal size, the fourth much smaller; the cutting edge of the accessory appendage ends in two large teeth and one or two smaller ones. In one specimen examined the teeth were much blunter than those drawn, probably it was an older specimen. Near the base of the accessory appendage is a thin membranous plate fringed with setæ, the two innermost ones being the largest and fringed on one side. Further along the inner edge of the mandible is another stout curved seta with one edge fringed, and beyond this again are four setæ arising from a common projection, the first is the shortest, the second and third increasing in length, all three having one side fringed, the fourth is much longer and is simple, Probably all these fringed setæ of the one mandible meet those of the other mandible in the median line and form a straining apparatus, or, since the setæ are somewhat stout, they may also be of some use in triturating the food of the animal and thus to a certain extent take the place of the molar tubercle.

I attach some importance to the peculiar seta arising from the dactylos of each thoracic leg, it appears to be very constant, and will, I think, aid in recognising the species; a seta similar, but quite distinct in form, is found in the species common in Canterbury, New Zealand, which I have identified with *Philougria rosea.*

The pleopoda, except the terminal pair, are very delicate; they consist of a basal portion much broader than long, which bears two broad plates, the inner one the smaller and without setæ, the outer one supplied with several rather long very delicately plumose setæ, and between these several very small delicate simple setæ.

Description of Plate XI.

Fig.—1. *Philougria marina*, x19.

Fig.—2. Outer antennæ of same, x45.

Fig.—3. Mandible of same, x180. *a.* End of same (compressed) x350.

Fig.—4. Thoracic leg of same, x83. *a*. dactylos of same more highly magnified.

Fig.—5. Pleopod of same, x72.

Fig.—6. Extremity of abdomen of same, x45.

THE AUSTRALIAN HYDROMEDUSÆ.

PART IV.—PLATES 12 to 17.

BY R. VON LENDENFELD, PH.D.

THE GRAPTOLITHIDÆ, PLUMULARIDÆ AND DICORYNIDÆ.

6. FAMILY. GRAPTOLITHIDÆ.

Possessing a chitinous Endo- and Exo-skeleton. The former rod-shaped. Colonies free swimming, probably extinct. From the Cambrian to the lower Devonian.

I. GROUP. GRAPTOLOIDEA. Lapworth.

Hydrosome developed from a Sicula, every canal containing Cœnosarc, bears only one row of cells. Axis (Virgula) on the dorsal side, in a furrow of the inner lamina.

A. MONOPRIONIDÆ,

Hydrothecæ in one row opposite the axis.

1. SUB-FAMILY MONOGRAPTINÆ.

MONOGRAPTIDÆ. Lapworth.

Developed one-sided; pointed ends of the Sicula pointing upwards, united with the dorsal margin of the proximal end of a single or composite Hydrosome.

No Australian representatives of this Sub-family are known.

2. SUB-FAMILY. LEPTOGRAPTINÆ.

LEPTOGRAPTIDÆ. Lapworth.

Hydrosome bilateral, with irregular branches. Cells apart, just touching. Sicula persistent in the axilar. The broad part forming the proximal end of the Hydrosome.

No Australian representatives of this Sub-family are known.

3. SUB-FAMILY. DICHOGRAPTINÆ.

DICHOGRAPTIDÆ. Lapworth.

Bilateral. Branches of regular cells, very dense, rectangular Sicula persistent, its point at the proximal end of the Hydrosome.

15. GENUS. DIDYMOGRAPSUS. McCoy.

Only two simple branches, without funiculus : Sicula axilar with the point turned upward; lower Silurian.

87. DIDYMOGRAPSUS FRUTICOSUS. Hall,

McCoy (1) describes this species from the lower Silurian slates (Llandeilo flags) of Bird Reef, Bendigo, and many other places in Victoria.

88. DIDYMOGRAPSUS QUADRIBRACHIATUS. Hall.

This species was described by McCoy. (2) It is found together with the former species in many places in Victoria.

89. DIDYMOGRAPSUS BRYONOIDES. Hall.

This species was described by McCoy (3) from many places in Victoria.

90. DIDYMOGRAPSUS OCTOBRACHIATUS. Hall.

This species occurs together with the former in several places in Victoria (4.)

(1.) *McCoy.* Prodromus of the Palæontology of Victoria. Decade 1, p. 13, pl. I.
(2.) *McCoy.* (l.c.), p. 15, pl. II.
(3.) *McCoy.* (l.c.), p. 16, pl. II.
(4.) *McCoy.* (l.c.), p. 17, pl. II.

91. DIDYMOGRAPSUS LOGANI. Hall.

This species together with an aberrant variety named by McCoy. D. L. Var. Australis is found in Castlemaine, Kangaroo Creek, and in other places in Victoria. (1.)

92. DIDYMOGRAPSUS EXTENSUS. Hall.

This species occurs in great abundance in the black Llandeilo flags (2.)

93. DIDYMOGRAPSUS CADUCENS. Salter.

This species occurs in Castlemaine and other places in Victoria (3).

94. DIDYMOGPAPSUS GRACILIS. Hall.

This species was obtained from the Bala Rock, north-west of Bulla (4.)

95. DIDYMOGRAPSUS THUREANI. McCoy.

This species was obtained from Llandeilo and Sandhurst (5.)

96. DIDYMOGRAPSUS HEADI. McCoy.

Rare in the Llandeilo flags, and in a few other places in (6) Victoria.

16. GENUS. CLADOGRAPSUS. McCoy, non. Geinitz!

Stem simple below with two rows of cells and mid-rib as in Diplograpsus; dividing above into branches with one row of cells only; cells excavated in the margin as in Climacograptus; without distinct tubes.

97. CLADOGRAPSUS RAMOSUS. Hall.

Not uncommon in the white Llandeilo flags, and in the black flags north-west of Bulla (7.)

(1.) *McCoy.* (l.c.), p. 18, pl. II.
(2.) *McCoy.* (l.c.), Decade II., p. 29, pl. XX.
(3.) *McCoy.* (l.c.), p. 30, pl. XX.
(4.) *McCoy.* (l.c.), p. 35, pl. XX.
(5.) *McCoy.* (l.c.), Decade V., p. 39, pl. L.
(6.) *McCoy.* (l.c.), p. 40, pl. L.
(7.) *McCoy.* (l.c.), Decade II., p. 33, pl. XX.

98. CLADOGRAPSUS FURCATUS. Hall.

In the reddish and whitish Llandeilo flag (1.)

4. SUB-FAMILY. DICRANOGRAPTINÆ.

DICRANOGRAPTIDÆ. Lapworth.

Hydrosome consists of two, originally dorsally united axis. Cells overlapping. Exterior part indented. Broad end of the Sicula on the proximal end of the Hydrosome.

There are no Australian representives of this Sub-family known.

B. DIPRIONIDÆ.

Cells in two rows, axis central.

5. SUB-FAMILY. DIPLOGRAPTINÆ.

DIPLOGRAPTIDÆ. Lapworth.

Hydrosome consists of two branches, dorsally joined. Sicula imbedded. The broad part forming the proximal end of the Hydrosome.

17. GENUS. DIPLOGRAPSUS. McCoy.

Stems simple, straight with a slender central axis; cells oblique in two rows alternating often with two spines near the exterior opening.

99. DIPLOGRAPSUS MUCRONATUS. Hall.

Very abundant in Llandeilo and Bulla (2.)

100, DIPLOGRAPSUS PRISTIS. Hisinger.

This species is found together with the former, and in other places in Victoria (3.)

101. DIPLOGRAPSUS RECTANGULARIS. McCoy.

This species is found in Llandeilo and Bulla (4.)

(1.) *McCoy*. (l.c.), p. 37, pl. XX.
(2) *McCoy*. (l.c.), Decade I., p. 20, pl. I.
(3) *McCoy*. (l.c.), Decade I., p. 11, pl. I.
(4) *McCoy*. (l.c.), Decade I., p. 11, pl. I.

102. DIPLOGRAPSUS PALMENS. Barrande.

Very abundant in the black Llandeilo flags (1.)

18. GENUS. CLIMACOGRAPTUS. Hall.

Cells vertical, free, in section suboval, divided from each other by deep cavities, without ornament or with a simple marginal spine. Hydrosome tapering, in section circular, or divided into two flaps. Axis prolonged beyond the distal end.

103. CLIMACOGRAPTUS BICORNIS. Hall.

This species has been found in Victoria (2.)

6. SUB-FAMILY. PHYLLOGRAPTINÆ

PHYLLOGRAPTIDÆ. Lapworth.

Hydrosome consists of four biserial axes, which coalesce with their dorsal sides. Sicula imbedded. The broader ends close to the proximal terminations of the Hydrosomes.

19. GENUS. PHYLLOGRAPTUS. Hall.

Leafshaped, cells rectangular, the lateral surfaces touching. Outer opening with two protruding spines.

104. PHYLLOGRAPTUS FOLIUM. Hisinger.

The variety P. F. var. Typus Hall of this species is very abundant in many places in Victoria (3.)

II. GROUP. RETIOLOIDÆ. Lapworth.

No Sicula. The Cœnosark of the common canal developes a double row of cells. Epidermis supported by chitinous fibres.

7. SUB-FAMILY. GLOSSOGRAPTINÆ.

GLOSSOGRAPTIDÆ. Lapworth.

Both axes united in the middle of the body.

No Australian representatives are known of this Sub-family.

(1.) *McCoy*. (l.c.), Decade II., p. 32, pl. XX.
(2.) *McCoy*. (l.c.), Decade I., p. 12, pl. I.
(3.) *McCoy*. (l.c.), Decade I., p. 7, pl. I.

8. SUB-FAMILY. GLADIOGRAPTINÆ.

GLADIOGRAPTIDÆ. Lapworth.

Both axes separate. Perfect exoskeleton of chitinous fibres.

20. GENUS. RETIOLITES. Barrande.

Hydrosome, simple tapering towards both ends. Axes straight or zig-zag shaped, often rudimentary. Cells rectangular. Both rows alternating. Inner Periderm layer a wide-meshed net.

105. RETIOLITES AUSTRALIS. McCoy.

This species occurs to the north-west of Keilor in Victoria (1.)

7. FAMILY. PLUMULARIDÆ. Hincks, 1868.

Hydropolypinæ forming colonies, consisting of generative Zooids, Polypostyls, alimentary Polyps and Machopolyps.

All these different kinds of Polyps are invested by chitinous cups, and appear regularly disposed along a stem, which in many cases is regularly branched, pinnate.

21. GENUS. PLUMULARIA. McCrady.

From a creeping and anastomosing Hydrorhiza plumous shoots arise, which bear Zooids. All the Zooids are invested by chitinous cups or cupsules. The Hydrothecæ cup-shaped; the Nematophores distributed along the stem and branches. Polypostyles different in the two sexes.

The structure of several species of this genus was investigated by Hamann (2), Jickeli (3), Weismann (4), and myself (5.)

(1.) *McCoy.* (l.c.), Decade II., p 36, pl. XX.
(2.) *O. Hamann.* Der Organismus der Hydroidpolypen Janaische Zeitschrift. Band XV., Seite 529.
(3.) *C. Jickeli.* Der Bau der Hydroidpolypen, II. Morphologisches Jahrbuch. Band VIII., Seite 636, ff.
(4.) *A. Weismann.* Ueber die Entstehung der Sexualzellen bei den Hydromedusen, Seite 172, ff.
(5.) *R. v. Lendenfeld.* Ueber Wehrthiere und Nesselzellen. Zeitschr. f. wiss. Zool. Band XXXVIII., Seite 354, translated into English Annales and Magazine of Natural History, 5th series. Nr. 71.

106. PLUMULARIA CAMPANULA. Busk.

This species was found in Bass' Straits and has been described by Busk (1.)

107. PLUMULARIA BUSKII. Bale.

This species was found at Griffith's Point and has been described by Bale (2).

108. PLUMULARIA AGLAOPHENIOIDES. Bale.

This species was found at Broughton Islands and has been described by Bale (3.)

109. PLUMULARIA OBCONICA. Kirchenpauer.

This species was found in the Gulf of St. Vincent and has been described by Kirchenpauer (4).

110. PLUMULARIA RADIA. Kirchenpauer.

This species was found in Brisbane and has been described by Kirchenpauer (5).

111. PLUMULARIA EFFUSA. Busk.

This species was found in Torres Straits and has been described by Busk (6), and Kirchenpauer (7).

112. PLUMULARIA RAMSAYI. Bale.

This species was found in Port Denison and other ports, and has been described by Bale (8).

(1.) *E. Busk.* Narrative of a Voyage in H.M.S. Rattlesnake.
(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 125.
(3.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 126.
(4.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band VI., Seite 46
(5.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band VI., Abtheilung 2, Seite 45.
(6.) *Busk.* Narrative of a voyage in H.M.S. Rattlesnake.
(7.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band VI., 2 Ab. Seite 46.
(8. *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 131.

113. PLUMULARIA CORNUTA. Bale.

This species was found in Port Denison and other harbours, and has been described by Bale (1.)

114. PLUMULARIA PRODUCTA. Bale

This species was found in Queenscliff and other places, and has been described by Bale (2.)

115. PLUMULARIA FILICAULIS. Pœppig.

This species described by Pœppig (3) and Kirchenpauer (4), from South America, has been found at Portland, Victoria, by Bale (5).

116. PLUMULARIA SETACEOIDES. Bale.

This species was found in Botany Bay and other Ports, and has been described by Bale (6). I have myself found it in Port Phillip.

117. PLUMULARIA DELICATULA. Bale.

This species was found in Griffith's Point and has been described by Bale (7.)

118. PLUMULARIA GOLDSTEINII. Bale.

This species was found in Queenscliff and has been described by Bale (8.)

119. PLUMULARIA OBLIQUA. Hincks.

This cosmopolitan species has been described by Saunders (9) and Johnstone (10), as Laomedea obliqua; by Lister (11) as

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(1.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 132.

(2.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 39.

(3.) *Pœppig.* Manuscript.

(4.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg

(5.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 134.

(6.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria. April, 1882, p. 40.

(7.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 40.

(8.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882. p. 41.

(9.) *Saunders.* Manuscript in litteris.

(10.) *Johnstone.* History of British Zoophytes.

(11.) *Lister.* Philosophical Transactions for 1834.

Campanularia, and more rightly by Hincks (1) as above. It has been described by Bale (2) from Portland and Tasmania, and found by myself in Port Phillip.

120. PLUMULARIA SPINULOSA. Bale.

This species I found on the drift in Timaru, New Zealand. It has been described by Bale (3), from Queenscliff, Victoria.

121. PLUMULARIA PULCHELLA. Bale.

This species was found at Queenscliff and has been described by Bale (4.)

122. PLUMULARIA HYALINA. Bale.

This species was found at Queenscliff and has been described by Bale (5.)

123. PLUMULARIA COMPRESSA. Bale.

This species was found at Portland and has been described by Bale (6.)

124. PLUMULARIA AUSTRALIS. Kirchenpauer.

This species was found in Portland and has been described by Kirchenpauer (7.)

125. PLUMULARIA FILAMENTOSA. Lamarck.

This species was found in the Southern Seas, and has been described by Lamarck (8), and Blainville (9.)

(1.) *Hincks.* Annals and Magazine of Natural History, April, 1861.
(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 138.
(3.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 42.
(4.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 42.
(5.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 41.
(6.) *W. Bale.* On the Hydroida of South-eastern Australia. Journal of the Microscopical Society of Victoria, April, 1882, p. 43.
(7.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band VI., Seite 49.
(8.) *Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.
(9.) *Blainville,* Manual d' Actinologie.

126. PLUMULARIA SULCATA. Lamarck.

This species was found in the Southern Seas and has been described by Lamarck (1), and Blainville (2.)

127. PLUMULARIA SCABRA. Lamarck.

This species from the Southern Sea has been described by Lamarck (3), and Blainville (4.)

128. PLUMULARIA LAXA. Allman.

This Hydroid was dredged by the Challenger in Station 163. Lat. 36° 56′ S. long. 150° 30′ E., in a depth of 120 fathoms, and has been described by Allman (5.)

129. PLUMULARIA GRACILIS. Nov. sp.

Plate XIV., fig. 17. Plate XVII., fig. 28, 29.

Shoots few in number rising from an anastomosing network of Hydrorhiza to a height of 10 cm. Regularly pinnately branched, each pinna bears secondary Pinnæ. Stem and branches black, ultimate Pinnæ transparent, light yellow. Pinnæ alternate, one on each Internode. Hydrothecæ cup-shaped with an entire margin, the superior part of which projects beyond the inferior, adnate to the Pinnæ. Slightly bithalamic. Nematophores, two lateral inferior ones in front of each Hydrotheca, and two medial ones behind and above Male Gonophores a double row along the main branches oval, with spinous projections on the top.

This species was dredged by the Hon. William Macleay in Torres Straits. Macleay Museum.

130. PLUMULARIA RUBRA. Nov. spec.

Plate XIII., figs. 11, 12, plate XIV., fig. 15.

From a creeping Hydrorhiza which invests Algæ of the Laminarian Zone, shoots rise up, which attain a height of 4 cm. The

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(1.) *Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.
(2.) *Blainville.* Manual d' Actinolegie.
(3.) *Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.
(4.) *Blainville.* Manual d' Actinologie.
(5.) *G. Allman.* Report on the Hydroida. The Zoology of the Voyage of the H.M.S. Challenger. Part XX., p. 19.

Pinnæ are distant and irregularly alternate, one to each Internode. The whole animal is bright brick red. The Hydrothecæ are cup-shaped and adnate throughout their entire length. The margin is entire, slightly undulating, the whole cup slightly quadrangular pyramidal. Every second Internode of the Pinna bears a Hydrotheca. Nemotophores small and wide mouthed, bithalamic. An inferior pair in front of each Hydrotheca and two medial ones behind each Hydrotheca. The anterior of these is similar to the paired Nemotophores with a terminal opening lying in a plain vertical to the axis of the Nematophore. The terminal opening of the posterior one is oblique and looks forward.

The Gonophores are borne along the stem on the Pinnæ and spring from the base of the Hydrotheca ; Male, oval, tapering below ; Female, slender, pear-shaped, with a jointed stalk bearing two Nematophores near the base.

I obtained this species from sea-weeds of the Laminarian Zone in Port Jackson.

131. PLUMULARIA TORRESIA. Nov. sp.

Plate XIII., figs. 13, 14, plate XIV., fig. 16

The Polyp colony consists of a thick branching stem (polysyphonic) on the branches of which slightly pinnate or irregular branchlets are found. The whole attains a height of 5 cm. The Hydrothecæ are cup-shaped, the margin is entire in its greater part, and has one tooth with a concave incision below. The cup is slightly elevated. The Nematophores are broad and stout, oval, bithalamic, one pair below each Hydrotheca ; two medial ones between the Hydrothecæ. Male Gonophores very slender, oval ; female, pear-shaped and stalked. This species was dredged by the Hon. W. Macleay in Torres Straits. (Macleay Museum.)

132. PLUMULARIA TRIPARTITA. Nov. sp.

Plate XII., figs. 8, 9, 10.

From a creeping Hydrorhiza pinnately branched, shoots arise which attain a height of 4 cm. The pinnæ are alternate, and there is one pinna to each internode. The Hydrothecæ are distant on every second internode of the pinna, adnate through half their length, tubular, with entire margin. The Hydranth is divided into three different parts by two strictures. Yellow gland-cells are scattered in the outer widest part, and are found in a dense mass in the central extension of the gastral cavity. Nematophores a pair of inferior on each Hydrotheca, one above and behind the Hydrotheca, and one to each intermediate inter. node. Gonophores unknown.

I obtained this species in Port Phillip, Victoria; and Timaru, New Zealand.

In the young shoots, cells were observed similar to those described by Jickeli, in Campanularia (1.) Plate XII., fig. 10.

22. GENUS. ANTENNULARIA. Lamarck.

Plumularidæ consisting of an anastomosing Hydrorhiza from which stems arise which possess verticillate branchlets. Alimentary Zooids in cup-shaped Hydrothecæ. Machopolypes in bithalamic Nematophores to each Alimentary Zooid: one inferior pair and two medial susperior ones between the Alimentary Zooids. Polypostyles in Gonothecæ which are axilliary and lateral.

The Histology of Antennularia antennina was investigated by Weismann (2), and this species, together with A. ramosa, served Hamann (3) as material for his investigations.

133. ANTENNULARIA CYLINDRICA. Bale.

This species was found in Port Curtis and has been described by Bale (4.)

134. ANTENNULARIA CYMODOCA. Busk.

This species was found in Australian waters and has been described by Busk (5.)

(1.) *C. F. Jickeli.* Ueber den Bau der Hydroidpolypen. Morphologisches Jahrbuch Band VIII. Seite 632.

(2) *A. Weismann.* Die Entstehung der Sexualzellen bei den Hydromedusen. Seite 188.

(3) *O. Hamann.* Der Organisums der Hydroidpolypen. Jenaische Zeitschrift. Band XV. Seite 529, 530.

(4.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 146.

(5.) *T. Busk.* Transactions of the British Association, 1850.

23. GENUS. SCIURELLA Allman.

Hydrocladia not disposed in pinnæ, but springing from many points round the circumference of chord-like stems. Gonangia situated in the axils of the hydrocladia, provided with symmetrically disposed horn-like processes, and enclosing a ramified blastostyle, the branches of which are in connection with moveable Nematophores distributed over the surface of the gonangium.

135. SCIURELLA INDIVISA. Allman.

This Hydroid was dredged by the Challenger, off Somerset Island, Cape York, Torres Strait, in a depth of 5-10 fathoms and has been described by Allman (1.)

24. GENUS. ACANTHELLA. Allman.

Hydrocladia pinnately disposed, bearing branches terminating in simple jointed prolongations in which the places of the hydrocladia are taken by spinelike appendages.

136. ACANTHELLA EFFUSA. Busk.

This Hydroid was dredged by the Rattlesnake, in Torres Straits off Cape York, and on reefs off Zamboanga, at a depth of 10 fathoms, by the Challenger (1.) It was described by Busk (2.)

25. GENUS. HETEROPLON. Allman.

Hydrocladia pinnate; Hydrothecal Internode with the lateral Nematophores moveable, and with a mesial fixed, spine-like Nematophore below the Hydrotheca.

(1.) *G Allman.* Report on the Hydroida. The Zoology of the voyage of H.M.S. Challenger, part XX., p. 26.

(2.) *G. Allman.* Report on the Hydroida. The Zoology of the voyage of H.M.S. Challenger, part XX., p. 27.

(3) *T. Busk.* A voyage in H.M S. Rattlesnake. Vol. I., p. 400.

137. HETEROPLON PLUMA. Allman.

This Hydroid was dredged at Station 162 of the Challenger, east off Moncoeur Island, Bass' Straits, in a depth of 40 fathoms, and has been described by Allman (1).

26. GENUS. AGLAOPHENIA. McCrady.

Shoots plumose, pinnate, often branched, rooted by a filiform stolon; alimentary Zooids with Hydrothecæ, which are generally toothed or lobed at the margin; a median superior and two inferior Machopolypes connected with each alimentary Zooid, no others along the polypiferous ramules; Polypostyles enclosed in corbulæ, or borne on specially modified pinnæ.

The structure of several species of Aglaophenia has been investigated by Weismann (2), and myself (3.)

138. AGLAOPHENIA. KIRCHENPAUERI. Nov. sp.

Plate XV., figs. 20, 21, 22, 23.

Stem smooth, divided by oblique joints into short internodes, each of which bears a Pinna. The Pinnæ are nearly opposite, long, approximate and point to one side. Hydrothecæ cup-shaped, margin slightly toothed, the lower part with two symmetrical shallow indentures and slightly projecting, not adnate. The inferior Nematophores barrel-shaped, the superior long and tubular with a terminal and lateral aperture. Half as long again as the Hydrotheca and adnate to it only in its lower half. Corbulæ oval with seven serrated ribs. Gonothecæ oval, stalked.

This species attains a height of 5 cm. It was obtained at Griffith's Point in Victoria. The specific name needs no explanation.

(1.) *G. Allmann.* Report on the Hydroida. The Zoology of the Voyage of H.M.S. Challenger. Part XX., p. 32.

(2.) *A. Weismann.* Die Entstehung der Sexualzellen bei den Hydromedusen. Seite 191.

(3.) *R. v. Lendenfeld.* Ueber Wehrthiere und Nesselzellen. Zeitschr. f. wiss. Zool. Band XXXVIII., Seite 355. Translated into English Annals and Magazine of Natural History, 5th Series. Nr. 71.

139. AGLAOPHENIA PLUMOSA. (Bale.)

This species was found in South Australia and Victoria, and has been described by Bale (1).

I have found it also at Griffiths Point and in Port Phillip, Victoria.

140. AGLAOPHENIA URENS. Kirehenpauer.

This species was found in Java Sea, Brisbane, Port Stephens, and Port Denison, East coast of Australia, and has been described by Kirchenpauer (2).

141. AGLAOPHENIA SQUARROSA. Kirchenpauer.

This species was found in Port Stephens, and has been described by Kirchenpauer (3).

142. AGLAOPHENIA RUBENS. Kirchenpauer.

This species was found in Port Denison and has been described by Kirchenpauer (4).

143. AGLAOPHENIA LONGICORNIS. Kirchenpauer.

This species found by Busk (5) in Prince of Wales Channel, and named by him Plumularia longicornsi has been described and placed under the Genus Aglaophenia by Kirchenpauer (6.)

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(1) *W. Bale.* Catalogue of Australian Hydroid Zoophytes, p. 153; and On the Hydroida of South East Australia, Journal of the Microscopical Society of Victoria, Vol. II., p. 37

(2) *G. Kirchenpauer.* Ueber die Hydroidenfamilie Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V., Abtheilung 3, Seite 46.

(3) *G. Kirchenpauer.* Ueber die Hydroidenfamilie Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V., Abtheilung 3. Seite 47.

(4) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg, Band V., Abtheilung 3 Seite 48

(5.) *T. Busk.* Narrative of a voyage in H.M.S. Rattlesnake, Vol. I.

(6.) *G. Kirchenpauer.* Uber die Hydroiden Familie, Plumularidæ, etc Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V., Abtheilung 3. Seite 47.

144. AGLAOPHENIA PHŒNICEA. Kirchenpauer.

This species found by Busk (1) in several parts of the Australian waters and named by him Plumularia phœnicea has been described by Kirchenpauer (2) as Aglaophenia phœnicea.

145. AGLAOPHENIA HUXLEYI. Bale.

This species was found by Busk (3) at Port Curtis and described by him as Plumularia Huxleyi. It is identical with Lamouraux's (4) Aglaophenia angulosa, and Plumularia angulosa Lamarck (5.) Bale names it as above (6).

146. AGLAOPHENIA DIVARICATA. Bale.

This species is frequent on many parts of the Australian coast. It has been described by Busk (7) as Plumaria divaricata, by Kirchenpauer (8) as Aglaophenia ramosa, and by Bale (9) as Aglaophenia M'Coyi. Recently Bale (10) has combined these Hydroids as A. divaricata.

147. AGLAOPHENIA RAMOSA. Bale.

This species was found at Swan Island in Bank's Straits. It has been described by Busk (11) as Plumularia ramosa, and named by Bale (12) as above.

(1.) *T. Busk.* Narrative of a voyage in H.M.S. Rattlesnake.

(2.) *G. Kirchenpauer.* Uber die Hydroiden Familie, Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V. Abtheilung 3. Seite 45.

(3.) *T. Busk.* Narrative of a voyage in H.M.S. Rattlesnake.

(4.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles.

(5.) *De Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.

(6.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 161.

(7.) *T. Busk.* Narrative of a voyage in H.M.S Rattlesnake

(8.) *G. Kirchenpauer.* Ueber die Hydroiden Familie, Plumularidæ, etc., Abhandlungen des Naturwissenchaftlichen Vereines in Hamburg. Band V., 3 Abtheilung. Seite 38.

(9.) *W. Bale.* On the Hydroida of South-east Australia, Journal of the Microscopical Society of Victoria, Vol. II., p. 46.

(10.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 162.

(11.) *T. Busk.* Narrative of a voyage in H.M S. Rattlesnake.

(12.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 164.

148. AGLAOPHENIA PARVULA. Bale.

This species was found in Queenscliff and Portland, and has been described by Bale (1).

149. AGLAOPHENIA PLUMA. Lamouroux.

This cosmopolitan species was described by Lamouroux (2), and mentioned by Ellis (3) as the Podded coralline; Linné (4), Pallas (5), Esper (6), and Lister (7) describe it as Sertularia pluma. Agassiz (8) and Hincks (9) adopt Lamouroux's name. Lamarck (10) and Johnstone (11) call it Plumularia cristata, and Ocken (12) Pennaria pluma. Kirchenpauer (13) describes it as Australian.

150. AGLAOPHENIA DELICATULA. Busk.

This species was found in Torres Straits and other tropic seas, and has been described by Busk (14.)

151. AGLAOPHENIA CRUCIALIS. Lamouroux.

This species was found in Australian waters and has been described by Lamouroux (15), Lamarck (16), and Blainville (17) mention it under the name of Plumularia brachiata.

(1.) *W. Bale.* On the Hydroida of South-east Australia, Journal of the Microscopic Society of Victoria, Vol. II., p. 46, April 1882.

(2.) *Lamouroux* Histoire des Polypiers Coralligènes flexibles, p. 170.

(3.) *Ellis.* The Natural History of many curious and uncommon Zoophytes.

(4.) *C. v. Linné.* Systema Naturæ, XII.Ed. Tom. 1, 1309.

(5.) *Pallas.* Elenchus Zoophytorum, p. 149.

(6.) *Esper.* Die Pflanzenthiere, Vol. VII., pp. 1, 2.

(7.) *Lister.* Philosophical Transactions for 1834, p. 369.

(8.) *Agassiz.* Catalogue of North American Acalephæ. Contributions to the Natural History of the U S.A. Vol. IV., p. 358.

(9.) *T. Hincks.* A History of the British Hydroid Zoophytes, p. 286.

(10.) *De Lamarck.* Histoire Naturelle des Animaux sans Vertèbres, Tom II., p. 161.

(11.) *Johnstone.* A history of the British Zoophytes, p. 92.

(12.) *Oken.* Lehrbuch der Natur. Seite 94.

(13.) *G. Kirchenpauer.* Ueber die Hydroiden Familie Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band VI., Abtheilung 2, Seite 23

(14.) *T. Busk.* Narrative of a voyage in H.M.S. Rattlesnake.

(15.) *Lamouroux.* Histoire des Polypiers Coralligènes flexibles.

(16.) *Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.

(17.) *De Blainville.* Manual de l'Actinologie.

152. AGLAOPHENIA FORMOSA. Kirchenpauer.

This species was found in South Africa, and has been described by Busk (1) as Plumularia formosa. Kirchenpauer (2) named it as above. According to Allman this species is also found in Australian waters (3.)

153. AGLAOPHENIA AURITA. Busk.

This species was found off Cumberland Island, and has been described by Busk (4).

154. AGLAOPHENIA BREVIROSTRIS. Busk.

This species was found off Cumberland Island, and has been described by Busk (5.)

155. AGLAOPHENIA MACGILLIVRAYI. Bale.

This species was found in the Louisade Archipelago and named by Busk (6) Plumularia Macgillivrayi; it has been renamed as above by Bale (7.)

156. AGLAOPHENIA RAMULOSA. Kirchenpauer.

This species was found in Port Lincoln, and has been described by Kirchenpauer (8.)

157. AGLAOPHENIA BREVICAULIS. Kirchenpauer.

This species was found in Ballina, and has been described by Kirchenpauer (9.)

(1.) *T. Busk* British Association Report, 1851.

(2.) *G. Kirchenpauer.* Ueber die Hydroidenfamilie, Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V. Abtheilung 3. Seite 26.

(3.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 109.

(4.) *T Busk.* Narrative of a Voyage in H.M.S. Rattlesnake.

(5.) *T. Busk.* Narrative of a Voyage in H.M S. Rattlesnake.

(6.) *T. Busk.* Narrative of a Voyage in H.M.S. Rattlesnake.

(7.) *W. Bale* Catalogue of the Australian Hydroid Zoophytes. Page 170.

(8.) *G. Kirchenpauer.* Ueber die Hydroiden Familie, Plumularidæ, etc. Abhandlungen des Naturwissenschaftlischen Vereines in Hamburg. Band V. Abt. 3. Seite 71.

(9.) *G. Kirchenpauer.* Ueber die Hydroidenfamilie, Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V. Abt. 3 Seite 41.

158. AGLAOPHENIA FLEXUOSA. Lamouroux.

This species, obtained in Australian waters, has been described by Lamouroux (1), Lamarck (2) speaks of it as Plumularia flexuosa.

159. AGLAOPHENIA FIMBRIATA. Bale.

This species was found in Australian waters, and has been described by Bale (3). Formerly it was described as Plumularia fimbriata by Lamarck (4), and Blainville (5.)

160. AGLAOPHENIA GLUTINOSA. Lamouroux.

This species was found in the Indian Seas, and has been described by Lamouroux (6), Lamarck (7) named it Plumularia glutinosa.

27. GENUS. DIPLOCHEILUS. Allman.

Hydrotheca with a duplicature of its walls forming an external calycine envelope which surrounds the Hydrotheca for some distance behind the orifice. Mesial Nematophore in the form of a shield-like process not aduate to the Hydrotheca; lateral nematophores absent.

161. DIPLOCHEILUS MIRABILIS. Allman.

This Hydroid was dredged by the Challenger in Station 162, April 2, 1874, off Moncour Island, Bass' Strait; depth, 38-40 fathoms; bottom, sandy. It was described by Allman (8.)

(1.) *Lamouroux.* Histoire des Polypiers Corallines flexibles.
(2.) *De Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.
(3.) *W. Bale.* Catalogue of Australian Hydroid Zoophytes. Page 172.
(4.) *De Lamarck.* Histoire Naturelle des Animaux sans Vertèbres.
(5.) *De Blainville.* Manual d'Actinologie.
(6.) *Lamouroux.* Histoire des Polypiers Corallines flexibles.
(7.) *De Lamarck.* Histoire Naturalle des Animaux sans Vertèbres.
(8.) *G. Allman.* Report on the Hydroida. The Zoology of the Voyage of H M.S. Challenger. Part XX.. p. 49.

28. GENUS HALICORNARIA. Bale.

Shoots plumose, pinnate, often branched, rooted by a filiform stolon; Hydrothecæ generally toothed or lobed, at the margin a median anterior and two lateral Nematophores connected with each Hydrotheca, no others along the Polypiferous ramules; Gonothecæ naked, on the main stem or the unaltered Pinnæ.

162. HALICORNARIA SUPERBA. Bale.

Bale obtained this species from Griffiths Point and Queenscliff, and has described it as Aglaophenia superba (1), it was afterwards (2) placed by him in the Genus Halicornaria.

163. HALICORNARIA ASCIDIOIDES. Bale.

This species was obtained from Queenscliff, and described by Bale as Aglaophenia ascidiodes (3.) Afterwards he placed it in the Genus Halicornaria (4.)

164. HALICORNARIA BAILEYI. Bale.

This species was found in Port Phillip and has been described by Bale (5.)

165. HALICORNARIA FURCATA. Bale.

This species was dredged at Broughton Islands near Port Stephens, and has been described by Bale (6.)

(1.) *W. Bale.* On the Hydroida of South East Australia. Journal of the Microscopical Society of Victoria. Vol. II. No. I, p. 31

(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes. P. 175.

(3.) *W. Bale.* On the Hydroida of South East Australia. Journal of the Microscopical Society of Victoria. Vol. II. No. I., p. 32.

(4.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 176.

(5.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 177.

(6.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 178.

166. HALICORNARIA HIANS. Bale.

This species was obtained by the Rattlesnake in Torres Straits, and has been described by Busk as Plumularia hians (1.) Bale places it in the Genus Halicornaria (2.)

167. HALICORNARIA HASWELLI. Bale.

This species was obtained at Port Curtis and has been described by Bale (3.)

168. HALICORNARIA LONGIROSTRIS. Bale.

This species was obtained in South Australia and Victoria, and has been described by Kirchenpauer (4) as Aglaophenia longirostris. Bale (5) considers his Aglaophenia Thompsoni to be identical with it, and combines the two in H. longirostris.

169. HALICORNARIA HUMILIS. Bale.

This species grows on other Hydroids of the same genus, and has therefore been described as parasitic by Bale (6), like the previous one. It is found in Port Phillip and Queenscliff.

170. HALICORNARIA PROLIFERA. Bale.

This species is found in Queenscliff. Bale (7) described it first as Aglaophenia prolifera, afterwards (8) he placed it in the Genus Halicornaria.

(1.) *J. Busk.* The Voyage of the Rattlesnake.

(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 179.

(3.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 180.

(4.) *G. Kirchenpauer.* Ueber die Hydroidenfamilie Plumularidæ, etc. Abhandlungen des Naturwissenschaftlichen Vereines in Hamburg. Band V. Abtheilung 3. Seite 42.

(5.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 181.

(6.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 182.

(7.) *W. Bale.* On the Hydroida of South East Australia. Journal of the Microscopical Society of Victoria, Vol. II., No. I., p. 34.

(8.) *W Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 183.

171. HALICORNARIA ILICISTOMA. Bale.

Originally described by Bale (1), as Aglaophenia ilicistoma, this species from South Australia and Queenscliff was afterwards placed in the Genus Halicornaria by him (2).

29. GENUS. HALICORNOPSIS. Bale.

Hydrocaulus pinnate; Hydrothecæ, with fixed anterior Nematophores. Lateral Nematophores absent.

172. HALICORNOPSIS AVICULARIS. Bale.

This species was described by Kirchenpauer as Aglaophenia avicularis (3) from Bass Straits. Bale (4) re-named it as above. It was found by him in several places on the south coast of Victoria.

30. GENUS. AZYGOPLON. Allman.

Hydrocladia pinnately disposed, mesial nematophore adnate to the walls of the hydrotheca; no lateral nematophores, Gonangia springing from the stem, and destitute of any special protective apparatus.

173. AZYGOPLON ROSTRATUM. Allman.

This Hydroid was dredged at Station 161 of the Challenger, on April 1, 1874, off the entrance to Port Phillip; depth, 38 fathoms; bottom, sandy. It was described by Allman (5.)

(1.) *W. Bale.* On the Hydroida of South East Australia. Journal of the Microscopical Society of Victoria, Vol. II , No. I., p. 33.

(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 184.

(3.) *G. Kirchenpauer.* Ueber die Hydroiden Familie der Plumularidæ, etc. Abhandlungen auf dem Gebiete der Naturwissenschaften, Hamburg. Band V., Abtheilung 3, Seite 33.

(4.) *W. Bale.* On the Hydroida of South Eastern Australia, etc. Journal of the Microscopical Society of Victoria, Vol. II., No. 1, p. 26.

(5.) *G. Allman.* Report on the Hydroida. The Zoology of the voyage of H.M.S. Challenger, Part XX., p. 54.

31. GENUS. PENTANDRA. v. Lendenfeld. Nov. gen.

Plumularidæ in which Machopolypes are as in Aglaophenia in connection with the alimentary Zooids, inasmuch as sets of them surround each Hydrotheca. The Polypo-styles are surrounded by a corbula as in Aglaophenia. Each alimentary Zooid is surrounded by five Machopolypes. There being instead of the single superior Machopolype of Aglaophenia three, a small one with adhesive cells only in the centre, and a pair of large Machopolypes at the side, which consist of two parts, one with adhesive, and one with thread-cells, and which are similar to the single superior Machopolype in Aglaophenia.

174. PENTANDRA PARVULA. Nov. sp.

Plate XIV., fig. 19, plate XVI., figs. 24, 25.

Stem recurved, smooth, dark brown, Pinnæ alternate, simple. one to each internode; Hydrothecæ cup-shaped with an octagonal margin, with slightly projecting pointed corners, corresponding to the corners of the octagon, centrifugal part of the cup slightly elevated not adnate. The inferior Nematophores pretty large, barrel-shaped, The superior paired and large Nematophores about twice the length of the Hydrotheca with a lateral and terminal opening, nearly straight, slightly thickened towards the end. The medial superior Nematophore free in its upper end, about as long as the Hydrotheca, with a single terminal opening looking obliquely forward. Corbula similar to that of Aglaophenia parvula Bale.

I obtained this species from several places on the Southern Coast of Victoria, and described its soft parts particularly the Machopolypes elsewhere (1.) In its appearance it is very similar to Aglaophenia parvula Bale, so much so, that I was inclined to

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(1.) *R. v. Lendenfeld.* Ueber Wehrpolypen und Nesselzellen. Zeitschrift für wissensch. Zoologie. Band XXXVIII. Seite 355. Translated into English Annals and Magazine of Natural History. Series V. Nr. 71.

consider it as identical with it at first. I have however, since then had occasion to study an Aglaophenia which possesses all the characters of Bale's Aglaophenia parvula, and it also appears quite impossible that so excellent an observer as Bale could have over looked the generic difference between our Pentandra and his Aglaophenia parvula. Pentandra parvula attains a height of from 2-3 cm.

175. PENTANDRA BALEI.

Plate XIV., fig. 18, plate XVI., figs. 26, 27.

Stem recurved, smooth, dark brown, Pinnæ alternate simple, one to each internode. Internodes very long. Hydrothecæ cup-shaped, margin dentate, teeth rounded, particularly large in the inferior part, anterior part of the margin free, slightly elevated not adnate. The inferior Nematophores pretty large barrel-shaped, the superior paired and large Nematophores about twice the length of the Hydrotheca with a lateral and terminal opening slightly incurved, centrifugally, and of the same thickness throughout. The medial superior Nematophore free in its upper end about as long as the Hydrotheca with a single terminal opening, looking obliquely forward. Corbula similar to that of the previous species.

This Pentandra was dredged by the Hon. W. Macleay in Torres Straits (Macleay Museum.) It attains a height from 3-7 cm.

8. FAMILY DICORYNIDÆ.

Generative Zooids free swimming Polypes with two tentacles and without a mouth, carrying two ova each.

These Zooids bud only on Polypostyles, and never on the alimentary Zooids which have one verticil of filiform tentacles.

32. GENUS. DICORYNE. Allman, 1872.

Hydrocaulus consisting of branched or simple stems, which arise at intervals from a creeping filiform Hydrorhiza. Alimentary Zooids fusiform, with a single verticil of filiform tentacles, surrounding the base of a conical Hypostom.

176. DICORYNE ANNULATA. Nov. sp.

Plate XVII., Fig. 30.

Hydrocaulus composed of slightly branched stems, which attain a height of about 1cm., arising from a reticulated Hydrorhyza. The Perisarc of the Hydrocaulus annulated throughout. Slight strictures also visible on the Hydrorhyza. Terminal cup-shaped extentions a little larger than in Dicoryne conferta. The generative Zooids are similar to those of the European species.

I found this Hydroid in Port Phillip.

EXPLANATION OF PLATES (1.)

Plate XII.

Fig. 8.—Plumularia tripartita, longitudinal section through an alimentary zooid, and an inferior Machopolyp drawn from sketches of optic and real sections made with DD., Oc. I.

Fig. 9.—Plumularia tripartita, skeleton of colony. AA., Oc. III.

Fig. 10.—Plumularia tripartita, a growing terminal end of a branch, optic longitudinal section. DD., Oc. II.

Plate XIII.

Fig. 11.—Section along the Symmetry-plane of the skeleton of a branch of Plumularia rubra. C., Oc. I.

Fig. 12.—Horizontal projection of the same.

Fig. 13.—Section along the Symmetry-plane of the skeleton of a branch of Plumularia Torresia. C., Oc. 1.

Fig. 14.—Horizontal projection of the same.

Plate XIV.

Hydromedusæ in natural size.

Fig. 15.—Plumularia rubra.

Fig, 16.—Plumularia Torresia.

Fig. 17.—Plumularia gracilis.

Fig. 18.—Pentandra Balei.

Fig. 19.—Pentandra parvula.

(1.) The letters and numbers indicate Zeiss's lenses.

Plate XV.

Aglaophenia. Kirchenpaueri.

Fig. 20.—The colony in natural size.

Fig. 21.—A Gonophor from below. A., Oc. III.

Fig. 22.—Section through a branch of the skeleton along the Symmetry-plane. C., Oc. I.

Fig. 23.—Horizontal projection of the same.

Plate XVI.

Fig. 24.—Pentandra parvula. Section through the skeleton of a branch along the Symmetry-plane. C., Oc. I.

Fig. 25.—Horizontal projection of the same.

Fig. 26.—Pentandra Balei. Section through the skeleton of a branch along the Symmetry-plane. C., Oc. I.

Fig. 27.—Horizontal projection of the same.

Plate XVII.

Fig. 28.—Plumularia gracilis. Section through the skeleton of a branch along the Symmetry-plane. DD., Oc. I.

Fig. 29.—Horizontal projection of the same.

Fig. 30.—Dicoryne annulata, the living Hydroid. C., Oc. I.

ON THE OCCURRENCE OF FLESH-SPICULES IN SPONGES.

By R. von Lendenfeld, Ph.D.

Siliceous spicules occur in Sponges either in the ground-substance or in the horny fibres or in both places in the same sponge. As I have pointed out in previous papers, such Flesh-spicules may aggregate to produce hard siliceous skeletons if no other skeleton was present at the time of their formation, but they remain loose and small if such a skeleton was present at that time. The cases where Flesh-spicules occur in the ground substance, and other differently shaped and closely packed monactinellid silicecus bodies form a fibrous reticulate skeleton, are numerous. These Flesh-spicules are rare in other Sponges than such, which possess a fibrous reticulate skeleton composed of closely packed siliceous spicules.

Only in a few Gumminæ star-shaped or globular siliceous bodies were known to occur, independantly of a silico-fibrous skeleton. These are, however, of a very different shape from those which are found in the Desmacidonidæ. The latter never were observed without a silico-fibred skeleton.

I however, discovered one exception to this in a Sponge from Port Phillip, as formerly no such exception was known. O. Schmidt, Vosmaer, and others were perfectly right to combine all these Sponges with monactinelled spicules in bundles, and Flesh-spicules of very varying shape to one Family, the Desmacidonidæ. The Desmacidonidæ are Sponges with fibres composed of monactinellid spicules as the Chalinidæ and others, which are distinguished from these latter Families by the possession of Flesh spicules.

On the ground of this exception mentioned above, where I found a Hircinia containing Flesh-spicules, I based the Hypothesis that such Flesh-spicules are of no great systematic value and may occur in any Family of Sponges.

The extraordinary rich material which five months dredging in Port Jackson has brought to light, together with the numerous and well-preserved Sponges of all parts of the Australian Coast in the Museum of the Hon. William Macleay, and in the Australian Museum, which I have had opportunity to examine has rendered fresh proofs to this hypothesis, which I wish to draw attention to.

I have found an Aplysillidæ with numerous anchors in the ground substance, and a representative of the Spongidæ, a Sponge which would otherwise be undoubtedly referred to Cacospongia containing numerous truncate spicules in the ground substance.

I therefore consider myself to be justified in arranging the Families without regard to the existence of Flesh-spicules beside the fibres in the ground substance, and so divide all Families in which Flesh-spicules are sometimes met with into Sub-families with and without siliceous bodies in the ground substance.

As these discoveries tend greatly to prove the correctness of my former statements, which may have appeared perhaps to stand on too weak a foundation of facts, it may be worth while to publish them now as it will be some time before I shall be able to lay that part of my Monograph of the Australian Sponges before the Linnean Society of New South Wales, which dwells on the Families of the Ceraospongiæ.

NOTE ON THE SLIMY COATINGS OF CERTAIN BOLTENIAS IN PORT JACKSON.

By R. von Lendenfeld, Ph.D.

A stalked solitary Ascidian, somewhat like Boltenia australis, which grows in depths between 6 and 10 fathoms in Port Jackson is characterised by its slimy surface. The pale brick-red colour of the outer surface of the slimy body of the cellulose mantle is similar to that of the stalk which does not appear slimy.

Expecting to find gland cells in the cellulose mantle I made sections which, however showed, that this slimy coating is nothing else than the ova of the Ascidian which cover the outer surface of it with a layer about 2 mm. in thickness.

These ova are surrounded by follicula, which consist of prismatic cells about three times as high as broad. The follicle-wall, consisting of a single layer of these cells, is as thick as the diameter of the spherical transparent ovum. As in other Ascidians these follicle-cells are filled with highly refractive granules, and there seems to be little doubt that these granules are nothing else than a muceous substance which is pressed forth when the Ascidian is touched, and then appears as that slippery slime which covers the parts of the surface which are coated with ova only, and is not met with on the stalk where the ova are absent. Out of the breeding season these Ascidians are ordinary, not slimy Boltenias.

NOTES ON A COLLECTION OF ECHINODERMATA FROM AUSTRALIA.

By F. Jeffrey Bell, M.A., Sec. R.M.S.

Professor of Comparative Anatomy in King's College, London.

One of the most solid and gratifying "results" of the Great International Fisheries Exhibition held in London in 1883, were the lessons zoologists learnt in the "New South Wales Court." Speaking here only of the department in which I take the greatest interest I have to express my thanks to the authorities in Sydney for sending over to this country one who displayed so generous a disposition as Mr. Ramsay ; to this gentleman's kindness I owe the opportunity of going through an excellent collection of Australian Echinodermata ; but I greatly regret that the rarer species of which he had only single specimens could not be left in my hands a little longer.

I have thought there might be some slight return on my part if I were to offer to the Linnean Society of New South Wales a systematic list of the species which I was able to determine, as a slight and preliminary contribution to a knowledge of the fauna of Australian Seas, and I only regret that prior engagements compel me to refrain from the discussion here of the kind of problems which had already been suggested to me by a study of the very magnificent collections made by Dr. Coppinger of the H.M.S. Alert. To the report on that collection, now shortly to be published* I must refer the student for details, descriptions of new species, and bibliographical references

* As a Catalogue of the British Museum, where the Report on the Echinodermata will occupy pp. 117-177.

After the list of the species of each class, I have added a few notes on those that have seemed to me to be of special interest or importance.

Here one general remark need alone be made ; the collections before me show that within a short distance of the meeting place of the Linnean Society, there is a bay teeming with species and individuals. The exact knowledge of the fauna of a given region —in other words a correct and full enumeration of the species—is a matter of considerable importance, but one cannot insist too often, too unweariedly, and even too fanatically on the great, though not always clearly perceived, truth that we are not a little like those who beat the air when we add species to species and genus to genus, and yet know of these nothing more than is sufficient to justify our framing our diagnoses. The knowledge of the variations during growth, of the variations due to slight alterations in the surroundings of the proportional frequency of individuals, and of the relation of species to one another will afford a firmer base for systematic work than synonymic catalogues or nominal check-lists.

The student who lives at Port Jackson might well take this truth to heart, for he lives in a region in which the number of individuals of certain species is sufficient for all the purposes just indicated.

DIVISION. PELMATOZOA.

Class. Cenioidea.

1. *Antedon milberti.*
   Port Denison, Port Molle.

2. *Antedon macronema.*
   Port Stephens.

3. *Antedon spicata.* (P. H. Carpenter. Notes Leyden Museum, III., p. 190.
   Ugi.

4. *Antedon* sp. Allied to but not the same as *A. spicata.*
   Ugi.

*5. *Antedon pumila.*
Nelson's Bay, Port Stephens.

6. *Actinometra solaris.*

*7. *Actinometra intermedia.*
Port Molle.

8. *Actinometra jukesi.* (P. H. Carpenter, Proc. Royal Soc., 1879, p. 390.)
Port Molle.

Together with several species of Antedon, hitherto undescribed, but here unfortunately represented by single, not always perfect, specimens.

DIVISION. ECHINOZOA.

Class. Asteroidea.

1. *Asterias calamaria.*
Tasmania.

2. *Echinaster purpurea.*
Port Molle.

3. *Linckia marmorata (?)*
Port Molle; (of Alert report.)

4. *Stellaster incei.*
Port Molle.

5. *Pentagonaster australis.*
Tasmania.

6. *Anthenea tuberculosa.*
Port Jackson. *Vide infra.*

7. *Asterina Gunnii.*
Tasmania.

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* 5 and 7 were discovered by the Alert and will be described in the report on that collection made by that vessel.

8. *Asterina calcar.*
Port Jackson.

9. *Asteropsis vermicina.*
Port Jackson.

10. *Astropecten polyacanthus* (Young)
Port Jackson.

11. *Astropectinid ?* Sp. nov.
Port Molle.

12. *Actaster insignis.* (Sladen, J. L. S. XVI., p. 200).
Port Jackson.

Anthenea tuberculosa : These are very fine specimens, and a comparison of their characters with those of the "type" teaches us that a comprehensive revision of this genus will have to be based on large series of specimens of very various sizes ; the genus is at present rather poorly represented in European Museums.

Class. Ophiuroidea.

1. *Pectinura stellata.*
Port Denison. *Vide infra.*

2. *Pectinura gorgonia.*
Sydney : Nelson's Bay, Port Stephens.

3. *Pectinura marmorata.*
(?) "Queensland."

4. *Ophioflocus imbricatus.*
Port Denison.

5. *Ophioglypha multispira.*
Port Jackson.

6. *Ophiactis resiliens.*
Port Jackson : Nelson's Bay.

7. *Amphiura constricta.*
Port Jackson. *Vide infra.*

8. *Ophionereis schayeri.*
Sydney, Tasmania, Nelson's Bay.

9. *Ophiocoma scolopendima.*
Port Moresby, New Guinea, Port Denison.

10. *Ophiocoma erinaceus.*
Port Moresby. *Vide infra.*

11. *Ophiarthrum elegans.*
Thursday Island. Ugi.

12. *Ophiarthrum* sp.
Ugi.

13. *Ophiomastix annulosa.*
Ugi.

14. *Ophiothrix longipeda.*
Port Molle, Thursday Id.

15. *Ophiothrix coespitora.*
Port Jackson. *Vide infra.*

16. *Ophiothrix fumaria.*
Nelson's Bay, Port Stephens.

17-18. *Ophiothrix.* Sp. f.
Nelson's Bay, Port Stephens.

19. *Euryale aspera.*
Port Denison.

Pectinura stellata. I am inclined to think that this sho form the type of a new genus.

Amphiura constricta. The present collection shows that these lately discovered species are very abundant in Port Jackson.

Ophiocoma erinaceus. The differences between this and *O. scolopendrina* have been very acutely detected by Mr. Lyman. (See his Challenger Report. S. V.)

Ophiothrix cæspitosa. This species is perhaps very variable, but the genus *Ophiothrix* will need the unreserved labour of many years before we can even hope to have its species satisfactorily marshalled. I would particularly direct the attention of the Australian naturalists to the constancy, variability, and patterns of the colour-markings of the species of this genus.

CLASS. ECHNOIDEA

1. *Phyllacanthus imperialis.*
   "Australian Coast."

2. *P. tenuiispinus.*
   Port Jackson. *Vide infra.*

3. *Phyllacanthus*, sp.
   Port Jackson. *Vide infra.*

4. *Goniocidaris geranioides.*
   S. E. Australia.

5. *Goniocidaris tubaria.*
   Port Jackson—5 fms.

6. *Diadema setosum.*
   Port Denison.

7. *Centrostephanus rodgersii.* (Young.)
   Port Jackson.

8. *Echinothrix calamaria.*
   Solomon Islands.

9. *Salmacis alexandri.* *Vide infra.*
   Port Jackson, Sow and Pig's Reef.

10. *S. bicolor.* *Vide infra.*
Port Denison.

11. *Salmacis sulcata.*
Ugi Islands.

12. *Salmacis dussumieri.*
Port Denison.

13. *Amblypneustes ovum.*
Port Jackson.

14. *Amblypneustes,* sp. *Vide infra.*
Port Jackson.

15. *Strongylocentrotus erythrogrammus.* *Vide infra.*
Port Stephens.

16. *S. tuberculatus.*
Lord Howe's Island.

17. *Sphærechinus australiæ.*
S. E. Coast of Australia.

18. *Echinostrephus molare.*
Lord Howe's Island.

19. *Echinometra lacunter.*
Lord Howe's Island; Ugi.

20. *Heterocentrotus mammelatus.*
Ugi.

21. *Echinanthus testudinarius.*
Port Denison, Port Jackson.

22. *Echinanthus tumidus.*
Hab? *Vide infra.*

23. *Laganum decagonale.*
Port Denison, Port Molle.

24. *Laganum peronii.*
Port Jackson. *Vide infra.*

25. *Arachnoides placenta.*
Port Denison.

26. *Maretia planulata.*
Port Jackson, Port Stephens.

27. *Lovenia elongata.*
Port Jackson.

28. *Breynia australasiæ.*
Lord Howe's Island. *Vide infra*

29. *Echinocardium australe.*
Port Jackson.

30. *Hemiaster apicatus.*
Port Jackson. *Vide infra.*

Phyllacanthus tenuispinus. This is perhaps a MSS. error for *Phyllacanthus parvispinus* of Tenison-Woods, or it is perhaps the MSS. name of some new and as yet undescribed species.

The specimens present sufficient points of resemblance to certain points of Mr. Wood's descriptions * to give some support to the former view ; on the other hand that description deals with what in one important point is a Goniocidarid rather than a Phyllacanthid character—no other *Phyllacanthus,* to my knowledge, having its longitudinal axis longer than the diameter of the test. I note so many misprints in Mr. Wood's paper that I am inclined to suppose that numbers of millimetres of height and diameter have been reversed.

In the next place, the specimens now being studied have only seven primary tubercles in each vertical row, while Mr. Wood's specimen has eight,

This difficulty, however, I think I can remove.

* Proc, L.S., N.S.W., IV., p. 286.

Though Mr. Tenison-Woods would appear to have an extraordinary familiarity and acquaintance with Echinoidea, second possibly only to that of Prof. Alex. Agassiz, with whose description and views his own so often and so curiously agree, yet he is, I think, mistaken in imagining that there is any mysterious constancy in the number of the primary tubercles; when there are but few tubercles, that is where the primary plates are large we easily count, and sharply note the number of such bosses; but with an increase in the size of the test, there must come some increase in the number of the plates. In other words, because the largest specimen (75 mm.* in diameter) known to-day has only 6 tubercles, it by no means follows that a specimen of the same species, found to-morrow with a diameter of 100 mm. with not have more.

At this moment a specimen of *Phyllacanthus imperialis* lying before me has a diameter of 80mm., and seven primary tubercles in a vertical row.

A specimen of 60 mm. in diameter may therefore well have only seven primary tubercles, and yet belong to the same species as the test with 100 mm. for diameter and eight primary tubercles.

I have followed Prof. Agassiz and Mr. Tenison-Woods in the term *Phyllacanthus*, but I have to say that I have done this rather because I have here wished to keep apart from all disputed questions, and not because I do not myself recognise a force in de Loriol's plea in favour of *Rhabdocidaris*. (See Palæontographica. Vol. XXX. pt. II., p. 6.

" *Phyllacanthus.* Sp. Nov. (unique.")—A specimen bearing the above remark cannot be passed over without notice. It will exhibit to the visitors of the Australian Museum an example of what may well be called symbiosis, for the well developed Polyzoan colonies must afford protection to the species, and the small parasitic *Balani* gain all the food they want in the currents that stream round so much larger an organism.

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*Strangely enough the American and the Australian Naturalist fix on just the same number of mm.

Mr. Ridley tells me that there are representatives of three Polyzoan genera here present—*Allopora*, *Lepralia*, (S. Str.) and *Retepora*.

Salmacis alexandri.—In the Proc. Zool. Soc., London, for the year 1880, I have (p. 433) pointed out that the *S. globator* of Agassiz is not the *S. globator* of Agassiz *fil.*; the former that I there distinguished and figured as form *B.*, is, no doubt, the true *S. globator*. The other and much more common species must have a new name, and in my forthcoming report on the Echinoidea of H.M.S. Alert, I propose to speak of it as *S. alexandri*.

Salmacis bicolor.—The abactinal spines of this species may be unicolor.

Amblypneustes, sp.—As specimens of this genus are beginning to accumulate, fresh doubts and difficulties arise as to the specific characters of the forms belonging to it; and I must take this opportunity to ask my friends in Australia, "the hot-bed of the genus," to let me have a large number of specimens from various localities and in all kinds of stages. I may, at this time, beg of those into whose hands fresh specimens may come to attempt to set at rest the difficulties which are connected with the differences in the size of the genital pores in specimens of *A. griseus* and *A. formosus*. Have we here different species, different races, or different sexes?*

Strongylocentrotus erythrogrammus.—Mr. Woods is both historically and etymologically wrong in writing the specific name *erythrogrammus*.

Laganum peronii.—Mr. Woods writes (Op. cit. II. p. 170) "Genus, *Peronella*, Gray, 1855; as he gives no reference I may assume that he refers to Dr. J. E. Gray's catalogue of the recent Echinida published in 1855; but, further, in giving no reference he gives no page, and I cannot, therefore, guess where to look for Dr. Gray's definition of the genus. It is not, at any rate, mentioned in the "Synopsis of Genera," on p. 3.

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* Cf. P. Z. S., 1880, pp. 436-7, and pl. XLI., fig. 3-6.

A somewhat similar statement with regard to Dr. Gray has been made by Mr. Alex. Agassiz, and with this I dealt in the early part of last year,* when I took occasion to point out the inconstancy and unimportance of the characters which were regarded as distinguishing *Peronella* from *Laganum*.

Breynia australasiæ.—When the specimens of this species attain a great size their general appearance is not a little altered, owing to the want of proportionate increase in the long abactinal spines, which, no doubt, are more needed by younger than by older and stouter individuals.

Hemiaster apicatus.—The specimens in which Mr. Tenison-Woods formed his new species of Hemiaster were without spines; the single specimen now before me is, I fancy, a representative of that species; as it is well provided with spines I stand aside to allow Mr. Woods to complete its description.

Class. Holothuroidea.

Unfortunately many of the species of this group are represented by single individuals only, and as the whole of the Holothurian collection in the British Museum has not as yet been specifically determined, the list is unsatisfactory and incomplete.

1. *Colochirus tuberculosus*.
   Port Denison.

2 *Colochirus australis*.
   Port Jackson.

3. *Actinocucumis difficilis*.
   [No locality: the Alert collected it in Torres Straits.]

4. *Thyone buccalis*. *Vide infra*.
   Port Denison.

5 *Orcula perspicillum*.
   Port Denison, Port Stephens.

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*Ann. N. H. (5) XI., p. 130, etc.

6. *Stereoderma validum, Bell, vide infra.*
Port Jackson.

7. *Stichopus*, sp., (allied to *S. chloronotus*, but apparently distinguished by the very long Polian vesicle.)

8. *Holothuria pulla. Vide infra.*
Ugi.

Thyone buccalis.—I am very doubtful as to the correctness of this determination. Stimpson unfortunately gives no details as to the characters of the spicules of the species, which was found by him in Port Jackson.

Stereoderma validum.—This species is extraordinarily abundant in Port Jackson. It would be well to examine carefully living specimens side by side with Quoy and Gaimard's figures of *Holothuria spinosa*, which they report to be very common in the same place. I have carefully considered the subject with Mr. Ramsay, who was at first inclined to think that the species might be identical, and we have come to the conclusion that, abundant as the species is, it has never yet been described. It now remains for the Zoologists of Port Jackson to rediscover Quoy and Gaimard's, *H. spinosa.*

Holothuria pulla.—I am a little doubtful as to the accuracy of this determination.

British Museum, April 30, 1884.

NOTES AND EXHIBITS.

Mr. Macleay exhibited for Mr. Wilkinson a very peculiar conical stone implement, found by Mr. A. G. Brook, of Gondoblui Station, embedded in the soil on the plains near the Queensland border, between the Narran and Barwon Rivers. The note accompanying the exhibit states that there are no rocks near that locality, and that the old aboriginals of the district know nothing about it. The stone is composed of a soft fine white sandstone, is of conical form, 19 inches in length, and four inches in diameter in the middle; the surface presents a smooth worn appearance. Dr. Cox suggested that it had probably been used for grinding nardoo, and that view seemed to receive most favour, though a number of different opinions were expressed.

Mr. Macleay also exhibited for Mr. Wilkinson, a number of Helix-like Shells, wound spirally round the leaf-stalks of a species of Eucalyptus, at Branxton, on the Hunter. These shells, though calcareous, were pronounced not to be the production of any Molluscous animal, and the general opinion was that they must be egg cases of some insect.

Mr. Dean exhibited a very perfect specimen of a caterpillar fungus (*Sphæria Robertsi*) from New Zealand.

Mr. Gilliatt exhibited two large masses of vegetable matter encrusted with lime taken by him from the surface of the Tarribar Spring, Bando, Liverpool Plains. The spring was overgrown with moss, weeds, &c., and amongst them on the water, the deposit exhibited was formed.

A large collection of shells and echinodermata from Cossack, Western Australia, sent by Mr. J. F. Bailey, of Melbourne, for exhibition were on the table. Among the rareties were *Conus trigonus*. Reeve. *Conus Victoriæ*. Reeve. *Ancillaria cingulata*. Sowb. *Ancillaria elongata*. Gray, *Oliva Caldania*. Duclos, *Spondylus Wrightianus*. Cross. Mr. Bailey also sent some packets of sand and other microscopic material for distribution among the members of the Society.

Dr. Cox exhibited a cluster of mud oysters, some of them measuring seven inches long by six broad, from Eden, Twofold Bay. It was unusual to find this kind of oyster attached either to others of its kind as in this instance, or to rocks. Formerly this species, judging from the number of the shells found in the cooking ovens at the camps of the natives along our shores, was very abundant, but is now fast disappearing. Although growing in abundance to the south, this oyster is never likely to become a marketable commodity, owing to the fact that it will t live beyond twenty-four hours out of the water.

Mr. John Brazier exhibited a fine specimen of a very rare fossil land shell--*Bulimus auris-vulpina* from St. Helena, which Mr. Ramsay had obtained from the authorities at the British Museum.

E. P. Ramsay, F.L.S., &c., exhibited on behalf of Mr. A. Campbell, of Melbourne, a specimen of *Pachycephala rufogularis* (Gould), in a remarkable rufescent stage of plumage. The whole of the head, fore and hind neck, chest, sides, and centre of the abdomen, were of a rich rust red, the interscapular region, rump, wing coverts and secondaries, washed with the same colour. The specimen was shot near Melbourne some months ago, in company with another of apparently the same plumage.

WEDNESDAY, 30TH JULY, 1884.

Dr. James C. Cox, F.L.S., Vice-President, in the chair.

S. C. Lindley, Esq., was introduced as a visitor.

MEMBERS ELECTED.

John Mackenzie, Esq., F.G.S., Government Examiner of Coal Fields, Newcastle; John Rossiter, Esq., Petersham; Thomas Worcester, Esq., Melbourne; and Percy Williams, Esq., of Sydney.

DONATIONS.

"Science," Vol. III., Nos. 66, 67, 68, and 69; May, 1884. From the Editor.

"Twelfth Annual Report of the Zoological Society of Philadelphia." 1883. From the Society.

"Proceedings of the Zoological Society of London." Part 4, for 1883. Also, "Supplement to Catalogue of Library," August 30th, 1883. From the Society.

"Re-statement of the Cell Theory, with Applications to the Morphology, Classification and Physiology of Protista, Plants and Animals." By Patrick Geddes. 1883. From the Author.

"Further Notes on the Coccidæ in New Zealand, with Descriptions of New Species." By W. M. Maskell, F.R.M.S. 1883. From the Author.

"Einige Bemerkungen zu den Regeln der Pflanzen-Benennungen." By Baron F. von Mueller, K.C.M.G. 1883. "Notes on some Plants from New Guinea." By Baron F. von Mueller, K.C.M.G., &c. From the Author.

"Feuille des Jeunes Naturalistes." No. 164; June, 1884. From the Editor.

"Zoologischer Anzeiger." Nos. 168 and 169; 26th May, and 9th June, 1884. From the Editor.

"Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirkes Frankfurt." II. Jahrg. Nos. 1 and 2; April and May, 1884. From the Society.

"Transactions of the Entomological Society of London." Part 1, for 1884. From the Society.

"Notes on a Critical Examination of the Mollusca of the Older Tertiary of Tasmania, alleged to have living representatives." By Professor Ralph Tate, F.L.S. 1883. From the Author.

"Victorian Naturalist." Vol. I., No. 6; June, 1884. From the Field Naturalists' Club of Victoria.

"Report of the Trustees of the Public Library, Museums and National Gallery of Victoria, for 1883." From the Trustees.

"Transactions and Proceedings of the Royal Society of Victoria." Vol. XX., for 1883. From the Society.

"Sydney University Calendar." 1884. From the Senate.

Two papers, "Description of a New Species of Odax," and "Description of a New Fossil Shell from the Eocene beds, Table Cape." By R. M. Johnston, F.L.S. 1884. From the Author.

REVISION OF THE RECENT LAMELLIBRANCHIATA OF NEW ZEALAND.

By Captain F. W. Hutton, F.G.S., &c.

Family. Teredidæ.*

Teredo antarctica. Hutton, Cat. Marine Moll. of New Zealand, p. 59 (1873).

Habitat.—Throughout New Zealand.

I find that the calcareous tube is sometimes fairly well developed.

Family. Pholadidæ.

Barnea similis. Gray in Dieffenbach's New Zealand. Vol. II., p. 254 (1843); Reeve, Conch. Icon. Pholas., fig. 10 (1872). *P. antipodum* Philippi, Zeitschrift, f.; Malakozoologie (1847), p. 71.

Habitat.—North Island, and as far south as Waikouaiti in Otago.

Pholadidea tridens. Gray in Dieffenbach's New Zealand. Vol. II., p. 254 (1843); Voy. Erebus and Terror, Moll., pl. 2, fig. 8 [not of Reeve.] *P. spatulata*, Reeve, Pro. Zool. Soc., 1849, p. 162, and Conch. Icon. Pholas., fig. 45.

Habitat.—North Island, and as far south as Waikouaiti, in Otago.

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* Species omitted as not inhabiting New Zealand:—
Aspergillum novæ Zealandiæ, Lamarck.

Family. GLYCIMERIDÆ.

SAXICAVA AUSTRALIS. Lamarck, Anim s. Vert, 2nd edition. Vol. V., p. 153 (1840); Reeve, Conch. Icon., fig. 8. *Hiatella minuta*, Gray in Dieffenbach's New Zealand. Vol. II., p. 252 (1843).

Habitat.—Throughout New Zealand in the roots of Kelp. Found also in Australia and Tasmania.

PANOPÆA NEOZELANICA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 547, pl. 83, fig. 7-9 (1835); Reeve, Conch. Icon., fig. 9; *P. Solandri*, Gray in Dieffenbach's New Zealand, Vol. III., p. 255 (1843); Reeve Conch. Icon., fig. 6.

Habitat.—Common in the north, rare in the south; Chatham Islands.

Family. CORBULIDÆ.*

CORBULA ERYTHRODON. Lamarck, Anim. s. Vert. 2nd edition, Vol. VI., p. 138 (1840); Reeve, Conch. Icon., fig. 4; *C. macilenta*, Hutton Cab. Tertiary Moll. of New Zealand, p. 18 (1873).

Habitat.—North Island.

Found also in Japan.

The shell is distinguished by having both valves longitudinally grooved.

CORBULA NEOZELANICA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 511, pl. 85, fig. 12-14 (1835); *C. catlowæ*, Reeve, Conch. Icon., fig. 21.

Habitat.—North Island.

Found also in Australia.

Both valves are finely longitudinally striated

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* The following species is omitted:—
Corbula adusta Hinds from W. Africa.

CORBULA HAASTIANA. Hutton, Jour. de Conch., 1871, p. 84.

Habitat.—Lyttelton Harbour.

Rounder in shape than the other species; the right valve finely striated, the left deeply grooved.

Family. ANATINIDÆ.*

ANATINA ANGASI. Sowerby; *A. Tasmanica*, Hutton, Man. New Zealand Moll., p. 136 (1880), [not of Reeve].

Habitat.—North Island, and Cook's Straits.

Found also in Tasmania.

THRACIA VITREA. Hutton, Cat. Marine Moll. of New Zealand, p. 61, (Lyonsia) (1873); *T. granulosa*, Hutton, Cat. Tertiary Moll. of New Zealand, p. 19 (1873).

Habitat.—North Island.

NEÆRA TRAILLI. Hutton, Cat. Marine Moll. of New Zealand, p. 62 (1873).

Habitat.—Stewart's Island.

MYODORA STRIATA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 537, pl. 83, fig. 10 (1835); Reeve, Conch. Icon., fig. 6; *M. brevis*, Woodward, Man. Moll., pl. 23, fig. 12, [not of Sowb].

Habitat.—Throughout New Zealand.

This is the largest species of the genus. The concentric striæ on the left valve † are comparatively fine, and generally less conspicuous than as represented in the figures in the "Astrolabe"

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* The following species is omitted:—
Thracia novæ-zealandiæ, Reeve.

† Mr. Smith says that considerable difference of opinion exists as to which is the posterior end of this shell. I do not understand how this can be for the pallial sinus is well marked. Mr. Smith's drawings show that it is the left valve which is flat. This is true for all the species that I have examined.

and the "Conchologia Iconica." The sculpture of the right valve is rather coarser than that of the other valve. (E. A. Smith, Proc. Zool. Soc., 1880, p. 580.

MYODORA ROTUNDATA. Sowerby, Pro. Zool. Soc., 1875, p. 129, pl. 24, fig. 8.

Habitat.—New Zealand. (British Museum).

I have seen no specimens.

This species differs from the last in having the right valve much deeper, the hinder dorsal margin proportionally shorter, less incurved and more sloping, the ligamental pit much smaller, and the contour of the shell more round (Smith, l. c., p. 580).

MYODORA BREVIS. Sowerby, Appendix to Stutchbury's Sale Catalogue, p. 3, plate, fig. 2; Reeve, Conch. Icon., fig. 7; Chem. Man. de. Conch., II., p. 52, fig. 217 [not of Woodward, nor of Adams]. *M. plana*, Hutton, Man of New Zealand Mollusca, (1880), p. 137 [not of Sowb].

Habitat.—Stewart's Island.

Found also in Australia and Tasmania.

Variable in shape. The microscopic sculpture consists of a very minute granulation, the granules being of unequal sizes, and frequently transversely oblong. This granulation is coarser than in other species of the genus; and the almost total absence of the radiating lines obtaining in all of them is remarkable (Smith, l. c., p. 580).

MYODORA PANDORIFORMIS. Stutchbury, Zool. Jour., V., p. 99; tab. Supp., 43, figs. 3-4; Reeve, Conch. Icon., fig. 10. *M. brevis*, Adams, Gen. Moll., III., pl. 98, fig. 2 [not of Sowb.]

Habitat.—Stewart's Island. (C. Traill).

I have not seen this species. It is also found in Australia.

Easily recognised by its transversely elongate form; its comparative smoothness, and the excessive fineness of the microscopic sculpture (Smith, l. c., p. 581.)

MYODORA CRASSA. Stutchburyi, Zool. Jour., V. p. 100, tab. Supp. 43, figs. 5-6; Reeve, Conch. Icon., fig. 1.

Habitat.—Stewart's Island. (C. Traill).

I have not seen this species. It is found also in Australia.

This species is remarkable for its solidity, and its left valve being less flattened, or concave, than in other species of the genus (Smith, l. c., p. 581).

MYODORA NEOZELANICA. Smith, (*Novæ-zealandiæ*), Pro. Zool. Soc., 1880, p. 584, pl. 53, fig. 5.

Habitat.—Stewart's Island.

More equilaterally triangular than any other species in the genus, and remarkable for the abrupt termination of the concentric grooves on the right valve, the smooth posterior dorsal area, and particularly for the two divergent impressed rays within both of the valves or radiating from the umbones as far as the pallial impression (Smith).

MYODORA SUBROSTRATA. Smith, Pro. Zool. Soc., 1880, p. 584, pl. 53, fig. 6. *M. ovata.* Hutton, Man. Moll. of New Zealand, p. 137 [not of Reeve].

Habitat.—Auckland and Stewart's Island.

More broadly and deeply sulcated than *M. striata*, and of a different form, the hinder dorsal slope being straighter, and the anterior more curved. The right valve has not the elevated and strongly sculptured hinder marginal ridge which is characteristic of that species (Smith).

MYODORA ANTIPODUM. Smith, Pro. Zool. Soc., 1880, p. 585, pl. 53, fig. 7.

Habitat —Auckland (Col. Bolton).

I have not seen this species.

Shell transversely elongated, but differs from *M. pandoriformis* in the front dorsal margin being straight, in being more inequilateral and in the right valve being more convex. From *M. boltoni* it differs by the broader posterior truncated end, and the fact of the hinder dorsal slope being longer than the anterior. (Smith.)

MYODORA BOLTONI. Smith, Pro. Zool. Soc., 1880, p. 585, pl. 53, fig. 9.

Habitat.—Auckland (Col. Bolton).

I have not seen this species.

Shell transversely elongated, but differs from *pandoriformis* in being less strongly sulcated, and less broadly truncated behind, less curved on the front dorsal margin, and the pallial sinus is deeper. The hinder dorsal slope is shorter than the anterior. The sculpture is not so coarse as in *antipodum*, and the pallial sinus is deeper and not so broad.

CHAMOSTRÆA ALBIDA. Lamarck, Anim, s. Vert., 2nd edition. Vol. VI., p. 585.

Habitat.—North Island ; Chatham Islands.

Found also in Australia and Tasmania.

Family. MACTRIDÆ.*

MACTRA DISCORS. Gray, Mag. Nort. Hist., 1837, p. 371, Voy. Erebus and Terror, Moll., pl. 2, fig. 4 ; Reeve, Conch. Icon, fig. 17 (1854). *M. murchisoni*, Deshayes, Pro. Zool. Soc., 1854 ; Reeve, Conch. Icon., fig. 76.

Habitat.—Throughout New Zealand.

MACTRA ÆQUILATERA. Deshayes, Pro. Zool. Soc., 1853, p. 17 ; Voy. Erebus and Terror, Moll., pl. 2, fig. 10 ; Reeve, Conch. Icon., fig. 14. *M. elegans*, Hutton, Cat. Tertiary Moll. of New Zealand, p. 19 (juv).

Habitat.—Thoughout New Zealand.

MACTRA SCALPELLUM. Deshayes, Pro. Zool. Soc., 1854 ; Reeve, Conch. Icon., fig. 106. *Darina pusilla*, Hutton, Cat. Marine Moll. of New Zealand, p. 64, (1873).

Habitat.—Stewart's Island ; Auckland (Strange).

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* The following species are omitted :—
Mactra donaciformis. Gray.
Cæcella Zealandica. Deshayes.

HEMIMACTRA OVATRA. Gray in Dieffenbach's New Zealand, II, p. 251 (1843); Reeve, Conch. Icon. Mactra., fig. 30. *M. deluta.* Gould. Pro. Bost. Soc. Nat. Hist., 1849, III., p. 215. *M. rudis.* Hutton, Cat. Tertiary Moll. of New Zealand, p. 19 (1873).

Habitat.—Throughout New Zealand, in estuaries.

HEMIMACTRA ELONGATA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 518, pl. 83, fig. 1-2 (1835) [not of Reeve]. *M. inflata.* Hutton, Cat. Tertiary Moll. of New Zealand, p. 18 (1873).

Habitat.—Cook's Straits and the South Island.

HEMIMACTRA NOTATA. Hutton, Cat. Marine, Moll. of New Zealand, p. 64 (1873). *M. elongata.* Reeve, Conch. Icon. Mactra., fig. 43 [not of Quoy and Gaimard].

Habitat.—Throughout New Zealand.

ZENATIA ACINACES. Quoy and Gaimard. Voy. Astrolabe, Zool. III., p. 545, pl. 83, fig. 5-6 (1835): Reeve, Conch. Icon. Lutraria, fig. 14. *Z. cumingiara*, Deshayes, Pro. Zool. Soc., 1854; Reeve, l.c., fig. 13. *Z. solenoides*, Deshayes, l.c, 1854; [not of Lamarck]. *Z. Deshaysii*, Reeve, l.c., fig. 1.

Habitat.—Throughout New Zealand.

VANGANELLA TAYLORI. Gray, Ann. Nat. Hist., 1853, XI., p. 476; Voy. Erebus and Terror, Moll, pl., 2, fig. 5. *Lutraria lanceolata*, Reev, Conch. Icon., fig. 17. Tryon Structural and Systematic Conchology III., pl. 110, fig. 10.

Habitat.—Cook's Straits and South Island.

RAETA PERSPICUA. Hutton, Cat. Marine Moll. of New Zealand, p. 65 (1873).

Habitat.—Bay of Islands, and Wellington (T. W. Kirk.)

Family. PAPHIIDÆ.*

PAPHIA NEOZELANICA. Chemnitz (Mya) Conch. Cab. VI., fig. 19-20 (1782); Reeve, Conch. Icon. Mesoderma, fig. 21; *Mya australis*, Gmelin, 13th edition; Linné's Syst. Nat., p. 3221; *Paphia Roissyana*, Lesson, Voy. Coquille, Zool. I., p. 424, pl. 15, fig. 4; *M. Chemnitzii*, Deshayes, Ency. Meth. II., p. 443; Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 505, pl. 82, fig. 9-11; Reeve, Conch. Icon. Mesoderma, fig. 21; *M. ovalis*, Deshayes, Pro. Zool. Soc., 1854, p. 336; Reeve, l.c., fig. 7; *M. aucklandicum*, Martens, Sitz. der Geselle. Nat. Freun. Zu Berlin, 1879, p. 37.

Habitat.—Throughout New Zealand and at the Auckland Islands.

PAPHIA VENTRICOSA. Gray in Dieffenbach's New Zealand II., p. 252; Voy. Erebus and Terror, Moll., pl. 3, fig. 6; *M. latum*, Deshayes in Guérin's Magasin de Zoologie, 1843, p. 80; Reeve, Conch. Icon. Mesoderma, fig. 4.

Habitat.—From Cook's Straits to the South of New Zealand.

PAPHIA SPISSA. Reeve, Conch. Icon. Mesoderma, fig. 18 (1854); *M. sub-triangulata*, Gray (?)

Habitat.—Throughout New Zealand and at the Chatham Islands.

Family. TELLINIDÆ.†

PSAMMOBIA STANGERI. Gray in Dieffenbach's New Zealand II., p. 253 1843; Reeve, Conch. Icon., fig. 12.

Habitat.—Throughout New Zealand.

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* The following species is omitted :—
Mesodesma cuneatum. Lamarck, from Australia.

† The following species are omitted :—
Tellina sublenticularis. Sowerby, inhabits Australia.
Tellina strangei. Deshayes.
Psammobia affinis. Reeve, inhabits the Philippines.

PSAMMOBIA LINEOLATA. Gray in Yate's New Zealand, p. 309 (1835); Voy. Erebus and Terror, Moll., pl. 2, fig. 11; Reeve, Conch. Icon., fig. 58.

Habitat.—Throughout New Zealand and at the Chatham Islands.

PSAMMOBIA NEOZELANICA. Deshayes, Proc. Zool. Soc., 1854, p. 319; *P. zonalis*, Cat. Marine Moll. of New Zealand [not of Lamarck].

Habitat.—Stewart's Island.

HIATULA NITIDA. Gray, in Dieffenbach's New Zealand, II., p. 253 (1843); Voy. Erebus and Terror, Moll., pl. 2, fig. 9.

Habitat.—New Zealand.

Height of the shell rather more than half the length; the posterior end sub-angulated.

HIATULA INCERTA. Reeve, Conch. Icon. Soletellina, fig. 13 (1857); Deshayes, MSS.; *H. nitens*, Tryon American Jour. of Conch., V., p. 171, pl. 16, fig. 9 (1870).

Habitat.—New Zealand (Strange and T. B. Wilson).

Height of the shell rather more than half the length; the posterior end rounded.

HITAULA SILIQUA. Reeve, Conch. Icon. Soletellina, fig. 10, (1857).

Habitat.—New Zealand. (Hart).

Height less than half the length.

TELLINA ALBA. Quoy and Gaimard, Voy. Astrolabe, Zool., III., p. 500, pl. 81, figs. 1-3 (1835); Reeve, Conch. Icon. fig. 180.

Habitat.—Throughout New Zealand.

TELLINA GLABRELLA. Deshayes, Pro. Zool. Soc., 1854, p. 366; Voy. Erebus and Terror, Moll., pl. 2, fig. 7; Reeve, Conch. Icon. fig. 296. *T. lactea*, Quoy and Gaimard, Voy. Astrolabe, Zool., III., p. 501, pl. 81, figs. 14-16 (1835) [not of Linné]. *T. deltoidalis*, Hutton, Man. Moll. of New Zealand, p. 143, (1880) [not of Lamarck].

Habitat.—Throughout New Zealand.

TELLINA DISCULUS. Deshayes, Pro. Zool. Soc., 1854, p. 360; Reeve, Conch. Icon., fig. 306, *T. lactea*, Gray in Dieffenbach's New Zealand, II., p, 254 [not of Linné].

Habitat.—North Island of New Zealand; Chatham Islands.

TELLINA SUBOVATA. Sowb. in Reeves' Conch. Icon., fig. 160 (1866). *T. lintea*, Hutton, Cat. Marine Moll. of New Zealand p. 67 (1873).

Habitat.—Stewart's Island.

TELLINA TICAONICA. Deshayes, Pro. Zool. Soc, 1854, p. 358; Reeve, Conch. Icon., fig. 303

Habitat.—Stewart's Island.

Found also in Australia and, according to Mr. Cumming, in the Philippines.

TELLINA RADIATA. Deshayes, (Capsella) Pro. Zool. Soc., 1854, p. 348.

Habitat.—Stewart's Island.

Found also, according to Mr. Cumming, at the Philippines.

Family VENERIDÆ *

VENUS OBLONGA. Hanley in Wood's Index Test. Suppl. (1828); Voy. Erebus and Terror, Moll., pl. 2, fig. 1. *V. zealandica*, Gray in Yate's New Zealand, p. 309 (1835) [not of Quoy and Gaimard].

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* The following species have been omitted :—
Venus nodosa, Dunker; inhabits West Africa.
Venus lima, Sowerby.
Chione lamellata, Lamarck; inhabits Australia.
Chione gibbosa, Hutton; found fossil only.
Chione paupercula, Chemnitz; inhabits India.
Callista disrupta, Sowerby; inhabits Australia.
Dosinia carpenteri, Romer.
Tapes fabagella, Deshayes; inhabits Australia.
Tapes galactites, Lamarck; inhabits Australia.

Habitat.—Throughout New Zealand, and at the Auckland Islands.

VENUS CREBRA. Hutton, Cat. Marine Moll. of New Zealand, p. 70 (1873).

Habitat.—North Island of New Zealand.

Perhaps a variety of the last but more swollen, smoother, and the concentric striæ crenulated at the anterior end by radiating lines.

VENUS YATEI. Gray in Yate's New Zealand (1835). *V. calcarea*, Gould, Pro. Bost. Soc. Nat. Hist. III., p. 277 (1850). *V. lucasii*, Hombron and Jacquinot, Voy. Pole Sud. Zool. V., p. 151, pl. 26, fig. 1 (1854).

Habitat.—Throughout New Zealand, but rare in the South.

Prof. v. Martens says that this species is allied to *V. exalbida*, Chemn. from the Straits of Magellan, and to *V. plicata*, Gmelin.

VENUS STUCHBURYI. Gray in Woods Index Test. Supp. (1828); and in Dieffenbach's New Zealand, II., p. 250; Voy. Erebus and Terror, Moll. pl. 3, fig. 4; Reeve, Conch. Icon. fig. 59. *V. Zealandica*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 522, pl. 84, fig. 5-6 (1835) [not good.] *V. Dieffenbachii*, Gray in Dieff., New Zealand, II., p. 250 (1843) (Young).

Habitat.—Throughout New Zealand, and at the Chatham and Auckland Islands.

Found also in Tasmania (Tenison-Woods), and according to Mr. S. P. Woodward at Kerguelen's Land.

VENUS COSTATA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 521, pl. 84, fig. 1-2 (1835). *V. crassicosta*, Hanley in Recent Shells, p. 118, pl. 16. fig. 39 (1844). *V. crassicostata*, Reeve, Conch. Icon., fig. 42.

Habitat.—Throughout New Zealand.

VENUS MESODESMA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 532, pl. 84, fig. 17-18 (1835); Deshayes, Cat. Brit. Mus. Veneridæ, p. 150; Römer, Mal. Blatt. XIV., p. 133 (1867). *V. spurea*, Sowerby. Pro. Zool. Soc., 1835 (?), Reeve, Conch. Icon., fig. 90. *V. denticulata*, Quoy and Gaimard, l c., p. 530, pl. 84, fig. 15-16. *V. violarea*, Quoy and Gaimard, l.c., p. 533, pl. 84, fig. 19-20. *V. crassa*, Quoy and Gaimard, l.c., p. 525, pl. 84, fig. 7-8. *V. spissa*, Deshayes in Lamarck's Anim, s. Vert., 2nd edition, VI., p. 373 (1840). *V. scansilis*, Römer, l.c., VII., p. 114 (1861).

Habitat.—Throughout New Zealand.

It is said to be also found at Valparaiso and in the Philippine Islands, but specimens from these localities have not, I think, been compared.

CYTHEREA MULTISTRIATA. Sowerby, Thes. Conch. I., p. 628, pl. 36, fig. 177; Reeve, Conch. Icon. Dione, fig. 60; Deshayes, Cat. Brit. Mus., Veneridæ, p. 64.

Habitat.—Cook's Straits to Stewart Island.

DOSINIA AUSTRALIS. Gray in Dieffenbach's New Zealand, II., p. 249 (1843); *D. anus*, Philippi, Icones, Cytherca, pl. 8, fig. 1 (1848); Reeve, Conch. Icon. fig. 10.

Habitat.—North Island and as far south as Oawaru in Otago.

DOSINIA SUBROSEA. Gray in Yate's New Zealand (1835) and in Dieffenbach's New Zealand, II., p. 249 (1843); Voy. Erebus and Terror, Moll., pl. 3, fig. 2.

Habitat.—North Island, and as far south as Dunedin.

Found also in Tasmania.

DOSINIA LIMBATA. Gould, Pro. Bost. Nat. Hist. Soc. III., p. 277 (1850); United States Exploring Expedition, XII., p. 422, atlas, fig. 536 (1852).

Habitat.—North Island; rare.

DOSINIA GRAYI. Zittel, Reise de Novara, Palæontology, p. 45, pl. 15, fig. 11 (1864).

Habitat.—Wellington (H. B. Kirk), and at the Chatham Islands; rare.

TAPES INTERMEDIA. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 526, pl. 84, fig. 9-10 (1835).

Habitat.—Throughout New Zealand and at the Auckland Islands.

According to Prof. v. Martens this species is allied to the European *T. decussatus. L.*

Family. PETRICOLIDÆ.*

VENERUPIS REFLEXA Gray in Dieffenbach's New Zealand, II., p. 250 (1843); Voy Erebus and Terror, Moll., pl. 2, fig. 3. *V. insignis,* Deshayes, Pro. Zool. Soc., 1853, p. 6, pl. 18, fig. 4; Reeve, Conch. Icon. fig. 2.

Habitat.—Auckland.

Shell shortly truncated, the lamellæ simply reflexed. Interior with a purple mark behind.

VENERUPIS ELEGANS. Deshayes, Pro. Zool. Soc., 1853, p. 5, pl. 18, fig. 2; Voy. Erebus and Terror, Moll., pl. 2, fig. 6.

Habitat.—Auckland.

Shell longer than the last, the lamellæ crisped behind. Interior white.

Family CARDIIDÆ.

CARDIUM STRIATULUM. Sowerby, Pro. Zool. Soc., 1840; Reeve, Conch. Icon, fig. 60. *C. pulchellum,* Gray in Dieffenbach's New Zealand, II., p. 252 (1843) [not of Reeve].

Habitat.—Throughout New Zealand.

* The following species have been omitted :—
Petricola serrata. Deshayes.
Venerupis paupercula Deshayes.
Venerupis siliqua. Deshayes.

Family LUCINIDÆ*

LUCINA DENTATA. Wood, Gen Conch., p. 195, pl. 46. fig. 7, (1817). *L. divaricata*, Lamarck, Anim. sans Vert., V., p. 541 (1818) [not of Linnè]. Reeve, Conch. Icon., fig. 47A.

Habitat.—Throughout Zew Zealand.

Found also in Tasmania, Australia and widely spread over the earth.

For the synonymy of this species see Brazier, Pro. Lin. Soc. of N. S. Wales, VIII., p. 229.

Family UNGULINIDÆ.

MYSIA NEOZELANICA. Gray in Dieffenbach's New Zealand, II., p. 256 (1843); Voy. Erebus and Terror, Moll., pl. 3, fig. 8. *L. inculta*, Gould, Pro. Bost. Nat. Hist. Soc., III., p. 255, (1850).

Habitat.—Auckland.

MYSIA GLOBULARIS. Lamarck, Ann. sans Vert., 2nd edition, VI., p. 231; Reeve, Conch. Icon. Lucina., fig. 55.

Habitat.—Throughout New Zealand.

Found also in Australia.

MYSIA STRIATA. Hutton, Jour. de Conch., 1878, p. 51. *L. Novæ-zealandiæ*, Reeve, Conch. Icon. Lucina. fig. 14 (1850) [not of Gray].

Habitat.—Cook's Straits.

Family. ERYCINIDÆ.

KELLIA CITRINA. Hutton, New Zealand Jour. of Science I., p. 477 (1883); Trans. New Zealand, Inst. XVI., p. 215 (1884).

Habitat.—Auckland.

* The following species has been omitted:—
L. lactea, Adams; inhabits Australia.

KELLIA SANGUINEA. Hutton, New Zealand, Jour. of Science I., p. 478 (1883); Trans. New Zealand, Inst., XVI., p. 215 (1884).

Habitat.—Stewart's Island.

KELLIA ANTIPODUM. Filhol, Comptes Rendus, XCI., p. 1095 (1880).

Habitat.—Campbell Island.

Near K. *cycladiformis*, but distinguished by the presence of very regular concentric lines. I have not seen this species.

PYTHINA STOWEI. Hutton, Cat. Marine Moll. of New Zealand, p. 76 (1873).

Habitat.—North Island of New Zealand.

Family. SOLEMYIDÆ.

SOLEMYA PARKINSONI. Smith, Voy. Erebus and Terror, Moll. p. 6, pl. 3, fig. 1; *S Australis* Reeve, Conch. Icon., fig. 4 [not of Lamarck]

Habitat.—Throughout New Zealand.

Family. ASTARTIDÆ.*

CRASSATELLA OBESA. Adams, Pro. Zool. Soc., 1852, p. 90, pl. 16, fig. 2.

Habitat.—New Zealand, in deep water (Strange.)

I have not seen this species.

CRASSATELLA BELLULA. Adams, Pro. Zool. Soc., 1852, p. 95. *Gouldia isabella*, Hutton, Cat. Marine Moll. of New Zealand, p. 76 (1873).

Habitat.—Cook' Straits, in deep water.

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* The following species have been omitted:—
Cardita amabilis, Deshayes; inhabits Tasmania.
Cardita bimaculata, Deshayes; inhabits Tasmania.

Cardita australis. Lamarck, Anim. sans Vert. 2nd edition, VI., p. 383; Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 480, pl. 78, figs. 11-14 (1835); Gray, Figures of Molluscous Animals, pl. 346, fig, 4. *C. Zealandica*, Potiez and Michaud, Gall. des Moll., 1838, p. 166. *C. tridentata*, Reeve, Conch. Icon. fig.-22 (1843) [not of Say]. *C. purpurata*, Deshayes, Pro. Zool. Soc., 1852, p. 100, pl. 17, figs. 12-13.

Habitat.—Throughout New Zealand, and at the Chatham Islands.

The interior is generally marked with rosy or purple, and the ribs are broader than the interstices.

Cardita difficilis. Deshayes, Proc. Zool. Soc., 1852, p. 103, pl. 17, figs. 16-17.

Habitat.—Stewart's Island.

The interior is white, and the interstices are sub-equal to the ribs. Perhaps a variety of the last species.

Cardita compressa. Reeve, Conch. Icon. fig. 46 (1843); *C. zealandica*, Deshayes, Proc. Zool. Soc., 1852, p. 101, [not of Potiez and Michaud]; *C. lutea*, Hutton, Man. of New Zealand Mollusca, p. 159 (1880).

Habitat.—Auckland.

Cardita tasmanica. Tenison-Woods (Mytilicardia) Proc. Roy. Soc. of Tasmania, 1875, p. 161; *Mytilicardia excavata*, Hutton, Man. New Zealeand Mollusca, p. 160 (1880) [not of Deshayes].

Habitat.—Throughout New Zealand and at the Chatham Islands. Found also in Tasmania.

Family. Arcidæ.*

* The following species have been omitted, but possibly some of them may yet be obtained by dredging.

Nucula castanea. Adams.
Nucula striolata. Adams, inhabits China.
Nucula grayi. D'Orbigny, inhabits S. America.
Leda fastidiosa. Adams.
Leda micans. Adams.

ARCA DECUSSATA. Sowerby, Proc. Zool. Soc., 1833, p. 18; Reeve, Conch. Icon., fig. 81.

Habitat.—Throughout New Zealand. Found also in Australia.

ARCA DONACIFORMIS. Reeve, Conch. Icon. fig. 104 (18); *Barbatia pusilla*, Hutton, Man. New Zealand Moll., p. 162 [not of Sowerby].

Habitat.—Throughout New Zealand. Found also in the Mozambique.

PECTUNCULUS LATICOSTATUS. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 466, pl. 77, fig. 4-6 (1835); Reeve, Conch. Icon., fig. 8; *P. ovatus*, Quoy and Gaimard, l.c., p. 467, pl. 77, figs. 1-2; *P. flammeus*, Reeve, Conch. Icon., fig. 7 (1843); *P. grayanus*, Dunker, Pro. Zool. Soc., 1856, p. 357.

Habitat.—Throughout New Zealand, and at the Chatham Islands. Found also in South Australia and Bass' Straits.

PECTUNCULUS STRIATULARIS. Lamarck, Anim. sans Vert., 2nd edition, VI., p. 493; Reeve, Conch. Icon., fig. 27.

Habitat.—Throughout New Zealand.

NUCULA NITIDULA. Adams, Pro. Zool. Soc., 1856, p. 51; Sow. Thesaur. III., pl. 229, fig. 142; Reeve, Conch. Icon. fig. 27.

Habitat.—Throughout New Zealand.

NUCULA STRANGEI. Adams, Pro Zool. Soc., 1856, p. 52; Reeve, Conch. Icon. fig. 15; Voy. Erebus and Terror, Moll., pl. 2, fig. 14.

Habitat.—Cook's Straits. Found also in Australia.

NUCULA LACUNOSA. Hutton (1884). *N. sulcata*, Adams, Pro. Zool. Soc. 1856, p. 53; Reeve, Conch. Icon., fig. 10 [not of Brown].

Habitat.—North Island of New Zealand.

LODA CONCINNA. Adams, Pro. Zool. Soc., 1856, fig. 48; Reeve, Conch. Icon., fig. 15.

Habitat.—Cook's Straits and South Island of New Zealand.

SOLENELLA AUSTRALIS. Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 471, pl. 78, fig. 5-10; Reeve, Conch. Icon., fig. 4; Voy. Erebus and Terror, Moll., pl. 2, fig. 13; Gray, Figs. Moll. Animals II., pl. 372 fig. 7A and 10. *Neilo cumingii*, Adams, Pro. Zool. Soc., 1852, p. 93.

Habitat.—Wellington and Stewart's Island.

Family. MYTILIDÆ.*

MYTILUS MAGELLANICUS. Lamarck, Anim. sans Vert., 2nd edition, VII., p. 37; Reeve, Conch. Icon. fig. 22. *M. polyodon*, Quoy and Gaimard, Voy. Astrolabe, Zool. III., p. 462, pl. 78, figs. 15-16 (1835).

Habitat.—Cook's Straits and the South Island of New Zealand, and at Chatham Islands, Auckland Islands and Campbell Island. Found also in S. America and Kergulen's Land.

MYTILUS LATUS. Chemnitz, Conch. Cab. VIII., f. 747 (1785); Reeve, Conch. Icon., fig. 12 and fig. 24 [not of Lamarck.] *M. durus*, Solander, Cat. Portland Museum. *M. caniliculatus* Martyn Univ. Conch., pl. 78 (?).

Habitat,—Throughout New Zealand. Found also in Tasmania.

MYTI US CHORUS. Molina, *M. latus*, Lamarck [not of Chemnitz]. *M. edulis*, Hutton, Tran. New Zealand, Moll., p. 167 [not of Linné].

Habitat.—Throughout New Zealand; and at the Auckland Islands and Campbell Island. Found also in Chili.

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* The following species have been omitted:—
Mytilus hirsutus, Lam; inhabits Australia.
Mytilus dunkeri, Reeve; inhabits America.
Modiola albicosta, Lam.; inhabits Australia.
Modula securis, Lam.; not recognised.
Lithodomus gruneri; Reeve, inhabits W. Africa.

MYTILUS ATER. Frauenfeld, Verhandl. Zool. Bot., Gesellsch. Wien., 1866, p. 916; Reise der Novara, Moll. pl. 2, figs. 29-30. *M. crassas*, Tenison-Woods, Pro. Roy. Soc. Tas., 1876, p. 157 (1877).

Habitat.—Throughout New Zealand. Found also in Tasmania.

MODIOLA AUSTRALIS. Gray in King's Voyage II., p. 477 (1827); Reeve, Conch. Icon., fig. 21; *M. areolata*, Gould, Proc. Bost. Soc. Nat. Hist. III., p. 353 (1850).

Habitat.—Throughout New Zealand, and at the Chatham and Auckland Islands. Found also in Australia.

MODIOLA FLUVIATILIS. Hutton, Jour. de Conch., 1878, p. 53.

Habitat.—Dunedin and Chatham Islands, in brackish water.

CRENELLA IMPACTA. Hermann (1782); Reeve, Conch. Icon. Modiola, fig. 64; *M. discors*, Chemnitz, Lamarck, and Quoy and Gaimard.

Habitat.—Throughout New Zealand and at the Chatham Islands. Found also in Europe and N. America.

LITHODOMUS TRUNCATUS. Gray in Dieffenbach's New Zealand II., p. 259; Reeve, Conch. Icon., fig. 3; Voy. Erebus and Terror, Moll., pl. 2, fig. 12.

Habitat.—North Island of New Zealand.

Family. AVICULIDÆ.*

PINNA NEOZELANICA. Gray in Dieffenbach's New Zealand II., p. 259 (1843); Voy. Erebus and Terror, Moll., pl. 3, fig. 7; Reeve, Conch. Icon., fig. 13; *P. senticosa*, Gould, Proc. Bost. Soc. Nat. Hist. III., p. 312 (1850).

Habitat.—Throughout New Zealand. Found also in Australia.

* The following species have been omitted:—
Avicula glabra. Gould.
Avicula fucata. Gould, inhabits Fiji.
Avicula lurida. Gould.

Family. LIMIDÆ.

LIMA NEOZELANICA. Sowerby, Proc. Zool. Soc., 1876, p. 754, pl. 75, fig. 1; *L. squamosa*, Hutton, Cat. Marine Moll. of New Zealand (1873), [not of Lam).

Habitat.—Stewart's Island.

LIMA ANGULATA. Sowerby, Thes. Conch.; Reeve, Conch. Icon., fig. 13.

Habitat.—North Island of New Zealand. Found also in Australia.

LIMA BULLATA. Born., Sowb., Thes. Conch. I., pl. 22, fig. 33; *L. japonica*, Adams, Proc. Zool. Soc., 1863, p. 509; Reeve, Conch. Icon., fig. 21 (?)

Habitat.—South Island of New Zealand. Found also in Tasmania.

Family. PECTINIDÆ.*

PECTEN ASPERRIMUS. Lamarck, Anim. sans Vert. *P. australis*, Sowerby. Thes. Conch. I., p. 76; Reeve, Conch. Icon., fig. 103.

Habitat.—Foveaux Straits. Found also in Tasmania and Australia.

PECTEN NEOZELANICA. Gray in Dieffenbach's New Zealand, II., p. 260 (1843); Voy. Erebus and Terror, Moll. pl. 3, fig. 7. *P. lætus*, Gould. Pro. Bost. Soc. Nat. Hist. III., p. 345 (1850). *P. dieffenbachii*, Reeve, Conch. Icon. fig. 88 (1852). *P. multicostatus*, Reeve, l.c., fig. 173.

Variety *gemmulatus*. Reeve, Conch. Icon., fig. III.

Habitat.—Throughout New Zealand, and at the Chatham Islands.

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* The following species have been omitted:—
Pecten pica; Reeve.
Plicatula nova-zealandica. Sowerby.

PECTEN RADIATUS.—Hutton, Cat. Marine Moll. of New Zealand, p. 82 (1873).

Habitat.—Stewart's Island.

PECTEN CONVEXUS. Quoy and Gaimard, Voy. Astrolabe Zool. III., p. 443, pl. 76, figs. 1-3 (1835); *P. roseo-punctatus*, Reeve, Conch. Icon., fig, 84; *P. vellicatus*, Hutton, Cat. Marine Moll. of New Zealand, p. 82 (1873).

Habitat.—Cook's Straits and the South Island of New Zealand.

PECTEN LATICOSTATUS. Gray in Dieffenbach's New Zealand II., p. 260 (1843); *P. novæ-zealandiæ*, Reeve, Conch. Icon.. fig. 36 (1852); *Pecten fumatus*, L. (?)

Habitat.—Throughout New Zealand, and at the Chatham Islands. Found also in Australia.

Family ANOMIIDÆ.

ANOMIA STOWEI. Hutton, Cat. Marine Moll. of New Zealand, p. 83 (1873).

Habitat.—Cook's Straits.

ANOMIA ALECTUS. Gray, Pro. Zool. Soc., 1819, p. 117; Reeve, Conch. Icon., fig. 28.

Habitat.—Stewart's Island.
A doubtful determination.

ANOMIA CYTÆUM. Gray, Pro. Zool. Soc, 1849, p. 115.

Habitat.—Stewart's Island.
A very doubtful determination.

PLACUANOMIA NEOZEALANICA. Gray in Dieffenbach's New Zealand, II., p, 260: Voy. Erebus and Terror, Moll., pl. 3, fig. 10; Reeve, Conch. Icon., fig. 4.

Habitat.—Throughout New Zealand.

PLACUANOMIA IONE. Gray, Pro. Zool. Soc., 1849, p. 123; Reeve, Conch. Icon., fig. 6.

Habitat.—Stewart's Island and Wellington (H. B. Kirk). Found also in Tasmania and Australia.

Family OSTREIDÆ.*

OSTREA EDULIS. Linné; Reeve, Conch. Icon., fig. 8. Variety PURPUREA. Hanly, Conch. Miscel., pt. 3.

Habitat.—Throughout New Zealand.

Variety ANGASI. Sowerby in Reeve's Conch. Icon., fig. 27 (1871). *O. lutaria*, Hutton, Cat. Marine Moll. of New Zealand, p. 84 (1873). *O. chilensis*, Sowb. in Reeves Conch. Icon., fig. 33 (?).

Habitat.—South Island of New Zealand.

OSTREA GLOMERATA. Gould, Pro. Bost. Soc. Nat. Hist., III., p. 346 (1850); Un. St. Ex. Ep., XII., p. 461, Atlas fig. 577; Reeve, Conch. Icon., fig. 52.

Habitat.—Auckland, on rocks.

OSTREA RENIFORMIS. Sowerby in Reeves Conch. Icon., fig. 57 (1871).

Habitat.—Dunedin and Banks Peninsula, on rocks.

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* The following species has been omitted:
Ostrea discoidea, Gould; inhabits Fiji Islands.

A RECORD OF LOCALITIES OF SOME NEW SOUTH WALES ZOOPHYTES, AS DETERMINED BY DR. KIRCHENPAUER.

Communicated By Sir F. von Muller, K.C.M.G., &c.

I. HYDROIDA

Thuiaria cartilaginea. N. sp.

Coast near Mount Dromedary ; Miss Mary Bate.

Sertularella Johnstoni. Gray.

Near the entrance of the Richmond River ; Miss Constance Hodgkinson.

Sertularella simplex. Hutton.

Coast near Mount Dromedary ; Miss Bate.

Sertularea Millefolium. Lamarck.

Coast near Mount Dromedary ; Miss Bate.

Sertularia Lycopodium. Lamarck.

Coast near Mount Dromedary ; Miss Bate. Near the entrance of the Richmond River ; Miss Hodgkinson.

Aglaophenia ramosa. Busk.

Coast near Mount Dromedary ; Miss Bate.

II. BRYOZOA.

Catenioella ventricosa. Busk.

Coast near Mount Dromedary. Miss Bate.

Catenioella margaritacea. Busk.

Coast near Mount Dromedary; Miss Bate. Near the entrance of the Richmond River; Miss Hodgkinson.

Catenioella elegans. Busk.

Entrance of the Richmond River. Miss Bate.

Catenioella Buskii. Thompson.

Coast near Mount Dromedary. Miss Bate.

Didymia simplex. Busk.

Entrance of the Richmond River. Miss Bate.

Cellularia cuspidata. Busk.

Coast near Mount Dromedary. Miss Bate.

Emma crystallina. Gray.

Coast near Mount Dromedary. Miss Bate.

Bugula dentata. Lamouroux.

Entrance of the Richmond River; Miss Hodgkinson. Coast near Mount Dromedary; Miss Bate.

Flustra denticulata. Busk.

Coast near Mount Dromedary. Miss Bate.

Steganiporella. Species forsan nova.

Entrance of the Richmond River. Miss Hodgkinson.

Membranipora membranacea. L.

Entrance of the Richmond River; Miss Hodgkinson.

Membranipora pilosa. L.

Entrance of the Richmond River; Miss Hodgkinson.

2. CYCLOSTOMATA.

Crisia margaritacea. Busk.

Entrance of the Richmond River; Miss Hodgkinson.

3. CHTENOSTOMATA.

Amathella cornuta. Gray.

Coast near Mount Dromedary; Miss Bate.

Spiralia crispa. Lamarck.

Entrance of the Richmond River; Miss Hodgkinson.

Spiralia dentata. N. sp.

Coast near Mount Dromedary; Miss Bate.

NEW FISHES IN THE QUEENSLAND MUSEUM.

No. 3.

By Charles W. De Vis, M.A.

Neoniphon hasta.

D. 11-1/12. A. 3/7. Lat. 40. Tr. 10.

The height of the body is 3 barely, the length of the head $2\frac{3}{4}$ in the length s.c. Orbit $2\frac{3}{4}$, interorbit and snout 4 each in the length of the head. Second dorsal spine $\frac{1}{2}$ of the height of the body; 2nd anal spine $\frac{4}{5}$ nearly of the same. Profile much more convex above than below. Caudal peduncle long, narrow, tapering. Lower jaw the longer. Second and third dorsal spines longest and equal. Second anal spine much the longest and strongest. All the bones of of the head serrated, the preorbital strongly. Two long spines overlying each other on the angle of the preopercle. Opercle crenulated with two short flat spines. Interorbit with two feeble ridges. Frontal with radiating grooves. Caudal bilobed. Scales strongly ctenoid.

Colour (dry) yellowish brown, an obscure longitudinal stripe from the occiput to the caudal. A large black blotch on the 1st to 4th dorsal webs above.

Length, $3\frac{3}{4}$ inches. Locality, Queensland.

The differences between this and *N. armatus* are, fewer anal rays and a longer spine, a much longer caudal peduncle, shorter snout and opercular spines and a higher body.

Polynemus multiradiatus, Gth., ascends the Brisbane River.

Corvina canina.

D. 10-1/29. A. 2/8. Lat. 50. Tr. 9/12.

The height of the body is 4, the length of the head $4\frac{1}{4}$ in the total length. Orbit and snout each 4, interorbit $3\frac{1}{2}$, second anal spine 3 nearly. in the length of the head. Snout obtuse with a sloping profile. Jaws nearly equal, the lower with an outer row of long teeth, the upper with a few longer curved teeth in front. Preopercle not denticulated. First ray of ventral a little produced. Dorsals conjoined, lowest over the tenth spine. Nostrils subequal.

Colour reddish brown above, silvery below the lateral line. First dorsal minutely black dotted, the dots aggregated into a black patch on the tip, a dark blotch on the opercle. Scales on the sides of the body minutely dotted with brown.

Length, 7 inches. Locality, Brisbane River.

Corvina comes.

D. 10-1/28. A. 2/7. Lat. 50. Tr. 6/12.

The height of the body and the length of the snout are each $\frac{1}{4}$ of the total length. Orbit $\frac{1}{5}$, interorbit $\frac{2}{5}$, second anal $\frac{1}{3}$, of the length of the head. Snout obtuse, swollen, with a deep vertical profile. Low jaw much the shorter. Outer rows of teeth scarcely larger than the rest. Preopercle not denticulated. First ray of ventral produced into a rather long filament. Dorsals confluent, lowest over the ninth spine. Anterior nostril much the smaller.

Colour pinky brown First dorsal minutely brown spotted.

Length, 6 inches, Locality, Brisbane River.

Corvina axillaris.

D. 10 1/29. A. 2/7. Lat. 56. Tr. 10/14.

The height of the body is $4\frac{4}{5}$ the length of the head 4 in the length of the body, s.c. Orbit $5\frac{1}{2}$, interorbit $4\frac{3}{4}$, snout $3\frac{3}{4}$, 2nd dorsal spine $4\frac{1}{5}$ in the length of the head. Snout obtusely pointed, profile sloping, jaws equal. Teeth of upper jaw small, recurved.

Dorsal continuous, lowest over the eleventh spine. Preopercle entire. First ray of ventral not produced. Anterior nostril much the smaller.

Colour uniform silvery grey (dry), paired fins yellow. A large deep chesnut blotch on the axil.

Length, 27 inches. Locality, Brisbane River.

Locally known as the Jewfish.

Naseus strigatus.

D. 4/33. A. 2/25.

The height of the body is 2 : the length of the head $3\frac{2}{3}$ in the total length. The snout is one half nearly of the length of the head. The height of the soft dorsal is one-half of the total length of the body. The profile of the head is straight, no horn being developed. A single caudal spine directed forwards. Teeth large, denticulated throughout. Form elevated, compressed. Tail truncated, anal deep.

Colour black. Preorbital portion of head and throat pale. Seven broad pale bands, indistinct posteriorly, across the body and tail, the first passing through the hinder part of the orbit to the ventral. Tail pale (yellow in life.)

Length, $2\frac{1}{2}$ inches. Locality, Queensland coast.

Caranx auriga.

D. 6, 1/21. A. 2, 1/20. Lat. 98, plates 38.

The height of the body in front of the pectoral is 4 nearly, in front of the anal $3\frac{1}{2}$, the length of the head is $4\frac{3}{4}$, in the total length. Orbit 4 nearly, snout $3\frac{1}{2}$, in the length of the head. First dorsal, weak first ray of second dorsal prolonged to the middle of the caudal, of anal a little prolonged. Caudal lobed, large. Length of pectoral more than the greatest height of the body, equal to the straight portion of the lateral line. Teeth villiform, with a stronger outer row on the jaws. Anterior half (nearly) of lateral line forms a low parabolic curve to below the eighth dorsal ray. Plates well developed, the middle ones half the length of the head. The maxillary reaches the fore edge of the orbit. Scales adherent. Breast naked.

Colour uniform silvery, with steel blue reflections on the dorsum.

Length, 10 inches. Locality, Cairns.

Caranx cives.

D. 5, 1/20. A. 1/10.

Height of body 3, length of head $3\frac{2}{3}$, in the length from the snout to end of middle rays of caudal. Orbit $6\frac{1}{3}$, snout $2\frac{2}{3}$ nearly, in the length of the head. Pectoral longer than the height of the body. Second dorsal spine rather more than $\frac{1}{4}$ of the length of the head. First dorsal spine weak. Second dorsal fulcate, anal low, none of the rays of dorsal or anal elongate. Lateral line peaked under the spinous dorsal, becoming straight under the 16th dorsal ray. Plates very feeble. Profile of head gibbous over the eyes, indented over the nostrils. Lower jaw the shorter. The maxillary extends to the anterior third of the orbit.

Colour uniform. Edge of opercle and axillary spot black.

Length, 22 inches. Locality, north coast of Queensland.

Caranx procaranx.

D. 5/25. A. 1/21.

The height of the body is $3\frac{2}{3}$, the length of the head $4\frac{1}{3}$, in the total length. Breast scaly. The maxillary reaches the fore-third of the orbit. Teeth minute. Lateral line gently curved anteriorly becoming straight beyond the middle of the soft dorsal. It is armed throughout, but the plates of the curved portion are smaller than those of the straight; scales small, with much larger irregularly scattered ones amongst them. The pectoral reaches the first anal spine. Fourth dorsal spine about half the height of the body, caudal forked.

Colour golden brown, the larger scales silvery white.

Length, 4 inches.

Locality, Cape York. Collected by Mr. K. Broadbent.

This fish is anything but a typical *Caranx*, yet hardly deserves isolation.

Caranx fcclipsifer.

D. 5, 1/32/2. A. 2, 1/27/2.

The height of the body is $4\frac{3}{4}$, the length of the head $4\frac{1}{6}$, in the total length. Orbit $3\frac{2}{3}$, interorbit $3\frac{3}{4}$, snout $2\frac{3}{4}$, in the length of the head. Breast scaly. The maxillary does not nearly reach the fore edge of the orbit, gape wide, lower jaw protuberant. The lateral line nearly follows the curve of the back to beyond the commencement of the soft dorsal. The straight portion consists of about 42 plates which are high, more than half the length of the orbit. The second dorsal spine is $\frac{2}{3}$ of the body. A separate finlet of two rays behind the dorsal and anal. Scales rather large. Teeth very small in a single series. Face concave before the eye. Opercular spot very distinct, round, in a golden areola. Above lead blue, beneath golden.

Length, 7 inches. Locality, Cape York. Collected by Mr. K. Broadbent.

Micropteryx Queenslandiæ.

D. 7, 1/20. A. 2, 1/20.

The height of the body is $4\frac{1}{4}$, the length of the head 5, in the total length. Orbit 4, snout 3, interorbit $3\frac{1}{3}$, in the length of the head. Gape rather wide, the maxillary reaching the posterior third of the orbit. The edge of the abdomen is compressed but not decidedly trenchant. The first dorsal spines barely continuous, the low web of each one merely reaching the base of its successor. The posterior rays are similarly connected, and have the form of finlets. The ventral reaches the vent, the pectoral rather shorter. The lateral line rises suddenly in a low arch then descends gradually but irregularly to the straight part, which commences opposite the first dorsal ray.

Colour on the head and back blackish, beneath silvery.

Length, 6 inches. Locality, Queensland Coast.

EQUULA DISPAR.

D. 8/20. A. 3/14.

The height of the body is 3, the length of the head $3\frac{2}{3}$, in the total length. Second dorsal and anal spines $1\frac{2}{3}$ in the length of the head. Superorbital spines distinct. Lower preopercular edge distinctly serrated, $\frac{4}{5}$ of the length of the mandible. The mandible rises at an angle of 50°. Lateral line continued to the caudal peduncle. Caudal emarginate. Scales minute. Teeth strong, especially the upper incisors, but without canines. Profile below more convex than above and anteriorly than posteriorly; silvery-brown on the back with a series of blotches below the base of the dorsals.

Cape York. One example.

EQUULA LONGISPINA.

D. 7/16. A. 3/14.

The height of the body is 3, the length of the head $4\frac{1}{2}$, in the total length. Second dorsal spine 2 in the same, second anal spine $\frac{4}{5}$ of the height. Superorbital spines small. Profile equal above and below. Lower preopercular edge obscurely serrated at the angle. The mandible rises at an angle of 30°. Lateral line continued to the middle of the soft dorsal. Caudal strongly emarginate. Scales minute. Uniform silvery, the upper lip black.

Cape York. One specimen.

EQUULA ARGENTEA.

D. 8/16. A. 3/14.

The height of the body is $2\frac{1}{2}$, the length of the head $3\frac{1}{2}$, in the total length. Second anal spine 2, second dorsal spine less than 2, in the length of the head. Superorbital spines moderate. Cavity on the head elongate oval, twice as long as broad. Lower preopercular margin distinctly serrated, $\frac{3}{4}$th the length of the mandible. The mandible rises at an angle of about 40.° Lateral line continuous. Caudal forked, scales minute. Profile equally convex above and below, regular or slightly gibbous at the insertion of the spinous dorsal.

Colour uniform silvery, or with the back tinged with pink.

Locality, Cape York. Two specimens.

EQUULA DECORA.

D. 8/16. A. 3/14.

The height of the body is $2\frac{3}{4}$, the length of the head $3\frac{2}{3}$, in the total length. Second dorsal and anal spines equal, $\frac{2}{5}$ of the length of the head. Superorbital spines small. Cavity on the head short, largely occupied by a median ridge. Lower pre-opercular margin and its rounded angle serrated, $\frac{7}{8}$ of the length of the mandible. The mandible rises at an angle of about 33.° Lateral lines continuous. Caudal? Scales minute. Upper profile much more convex than lower.

Colour silvery, with a pink tinge on the back. Three dark lines, terminating very obscure bands, across the back, at the base of the soft dorsal and one on the edge of the caudal peduncle.

Locality, Cape York. Six specimens.

EQUULA OVALIS.

D. 8/16. A. 3/14.

The height of the body is $2\frac{1}{2}$, the length of the head $3\frac{2}{3}$, in the total length. Second dorsal spine $1\frac{1}{2}$, second anal spine 2, in the length of the head. Superorbital spines moderate. Lower pre-opercular margin distinctly serrated, as long as the mandible. The mandible rises at an angle of about 40.° Lateral line continuous. Caudal emarginate. Scales large. Profile nearly equally convex above and below.

Colour silvery, with a brown tinge on the back and a black spot between the 1st to 4th dorsal spines.

Locality, Cape York. Several examples.

Equula simplex.

The height of the body is $2\frac{4}{5}$, the length of the head 4 nearly, in the total length. Second dorsal spine $1\frac{1}{2}$, second anal spine $1\frac{2}{3}$, in the length of the head. Superorbital spines rather large. Lower preopercular margin serrated, $\frac{4}{5}$th of the length of the mandible. The mandible rises at an angle of about 45.° Lateral line continued to caudal peduncle. Caudal emarginate. Scales small. Profile equal above and below, regular or angular.

Colour silvery, brownish on the back. A dorsal spot.

Locality, Cape York. Several examples.

Equula asina.

D. 8/16. A. 3/14.

The height of the body is $2\frac{1}{3}$ the length of the head, $3\frac{2}{5}$ in the total length. Second dorsal spine longer than the head, second anal spine $1\frac{1}{2}$ in its length. Superorbital spines distinct Lower preopercular edge faintly serrated, equal in length to the mandible. The mandible rises at an angle of 20°. Lateral line continuous. Caudal forked. Profile equally convex above and below. Scales minute, silvery with the back brownish silvery.

Cape York. Two examples.

Equula profunda.

D. 8/16. A. 3/14.

The height of the body 2, length of the head $4\frac{1}{4}$, in the total length. No teeth. Scales minutely granular. No lateral line. Supraorbital spines small. Interorbital cavity triangular, short, $\frac{1}{3}$ longer than broad. Lower limb of preopercle sub-convex, serrated, $\frac{2}{3}$ the length of the mandible. Mandible nearly straight, ascending a little beyond the vertical. Lower profile much more convex than the upper. The protracted snout directed upwards.

Colour above the vertical line silvery grey, above it a median black longitudinal streak; between this and the dorsal numerous oblique streaks descending backwards and on its lower side backwardly ascending streaks from a lower longitudinal stripe defining the vertebral line above.

Length, $1\frac{3}{4}$ inches. Locality, Queensland Coast.

EQUULA NUCHALIS. Gth.

Of this several Queensland examples are in the collection. Also of *Equula gerroides*, Blk., *Equula lineolata*, Rup., and *Gazza equulæformis*, Rup., all from Cape York.

CYBIUM TIGRIS.

D. 13, 4/13, IX. A. 4/14, IX.

Teeth elongate, compressed, irregularly distant. The height of the body is $4\frac{1}{2}$ in the length to the end of the middle ray of the caudal ; the length of the head $4\frac{2}{3}$. The lateral line resumes a straight course below the third finlet. Five distinct crossbands on the fore part of the back, several others very indistinct on the hinder part. Anterior portion of the spinous dorsal jet black, pectoral dark grey.

Locality, Cape York. Collected by Mr. K. Broadbent

PERCIS STRICTICEPS.

D. 5/21. A. 17. Lat. 69, about. Tr. 8/10.

The height of the body is 6, the length of the head more than 4, in the total length. Orbit $5\frac{1}{2}$, interorbit 12, snout $2\frac{3}{4}$, in the length of the head. The maxillary reaches the vertical from the fore edge of the orbit. The opercular spine is small, rounded. The spinous dorsal rises behind the base of the pectoral, the anal opposite the sixth ray of the dorsal. The head is broad and depressed above and below. The teeth of the lower jaw are four very strong curved canines. The eyes very close together, and the orbits sloping a little from the interorbit. Scales posteriorly striated, with a very low median ridge.

Colour (dry) smoky grey, marbled with dark grey on the back. Ten dark bars on the body, descending from the mottling of the back, partially interrupted above and below the lateral line. The lowest end forming as many oval black spots in a longitudinal row. Head blackish brown, paler on the cheeks except two blackish expanding stripes from the orbit to the preopercle. Soft dorsal with three rows of large blackish spots. Caudal transversely banded with dark spots.

Length, 7 inches. Locality, Southport (Brisbane.) Collected by Mr. E. Hanlan.

PERCIS CONCINNA.

D. 5/22. A. 1/18. Lat. 84.

The height of the body is more than 6, the length of the head $4\frac{3}{4}$, in the total length. Orbit 5 nearly, interorbit 7, snout $2\frac{2}{3}$, in the total length of the head. The maxillary reaches the vertical from the fore edge of the orbit. The opercular spine is flat. The first dorsal rises behind the level of the base of the pectoral, the anal opposite the fifth dorsal ray. The upper caudal lobe (and apparently the lower) is prolonged into a filament. Posterior scales with a low central ridge at base.

Colour (dry) light grey with six darker grey interrupted cross bands, except the fifth web and spine, and the lower part of the fourth web. Soft dorsal transparent grey with three rows of opaque white spots. Caudal barred with opaque white, anal obscurely spotted with same.

Length, 7 inches. Locality, Moreton Bay.

AUTENNARIUS MOLUCCENSIS. Blk.

A Queensland example, as I have every reason to believe, is in the collection.

THALASSOPHRYNE CŒCA.

D. 2/20. A. 18-19. V. 2.

The height of the body in front of the pectoral is rather more than 5, the length of the head $3\frac{3}{4}$, approximately in the total length. The interorbit broader than the long diameter of the orbit. The cleft of the mouth reaches beyond the fore edge of the orbit. Dorsal spines short, equal to the short diameter of the orbit, depressed. Gill covers with 5 spines. Teeth short but stout and sharp, especially on lower jaw. Short mandibulary tentacles. Pectoral short, wide, rounded; ventrals wing shaped. Lateral line of distant pores without filaments or hardly perceptible. Eyes covered by the skin of the head. Caudal rounded.

Length $9\frac{1}{2}$ inches. Locality Queesland coast.

The specimen being stuffed and its skin consequently stretched little reliance can be placed on the proportions of the body given above, nor can the peculiarities of the skin itself be stated. The only indication of an eye is an oval spot of lighter coloured skin. The two ventral rays are divided to the base, the outer one is broadly bordered with dense striated tissue.

Pelor barbatus.

D. 3, 14/8. A. 12.

Upper pectoral rays not produced. Eye three-fiths of the width of the interorbit. The interorbit, occipital groove and preocular portion of the head deeply sunken; a long pointed flap from each side of the lower jaw.

Colour brown, densely freckled with blackish brown. Soft dorsal with a pale blotch in the middle of its anterior half, caudal with a broad pale band across the centre flecked with dark brown. Pectoral with a pale central band becoming more distinct towards its upper edge. A white spot in front of each orbit.

Locality, Cape York. Collected by Mr. K. Broadbent.

CENSUS OF AUSTRALIAN SNAKES WITH DESCRIPTIONS OF TWO NEW SPECIES.

By William Macleay, F.L.S., &c.

In a very interesting collection of mammals and reptiles lately sent to me by J. A. Boyd, Esq., of Ripple Creek, Ingham, in Northern Queensland, I have found two species of Snakes not hitherto recorded. Their descriptions are as follows:—

Dipsas Boydii.

Ventral plates	252
Sub-caudal	90/90
Anal plate	entire.
Scales in	19 rows
Total length	3 feet 11 inches.
Tail	$9\frac{1}{4}$ inches.

Form slender and compressed behind the head, the rest of the body more robust and less compressed that in *D. fusca*. Head large, broad, much broader than the neck. Head shields much as in *D. fusca*, the anterior ocular large, intervening between the superciliary and the posterior frontals; the two posterior oculars very small; ten upper labials, the fourth, fifth and sixth touching the orbit; superciliaries much narrowed in front, triangular. Mouth much curved.

The colour is of a tolerably uniform dark olive brown, paler and more yellowish on the belly.

DIEMENIA ATRA.

Ventral plates.................. .	180
Sub-caudal	68/68
Anal	2
Scales in....................	15 rows.
Total length	40 inches.
Tail................................	9 inches.
Head	1 inch.

Body rather slender, the neck not narrower than the head, the tail very slender. The posterior nasal shield of triangular form, meeting the anterior ocular, which is very large, and completely separating the frontal from the labial shields ; the inferior of the two posterior oculars is the longest ; the third and fourth labials abut on the eye.

Colour jet black on the upper surface, and leaden black on the belly ; the labial shields, the under surface of the head, and the first three or four ventral plates are yellowish ; the tail is red towards the tip.

The other Snakes in Mr. Boyd's collection were *Liasis amythystinus*, *Tropidonotus picturatus*, *Dendrophis bilorealis*, *Pseudechis porphyriacus*, and *Hoplocephalus nigrescens*.

Of *Dendrophis bilorealis* I received several specimens, and an examination of them has shown that the name I have given to the species on account of the divided or double loreal shields is rather unfortunate, as the peculiarity is not by any means constant.

I subjoin a list of all the known Australian Snakes. Since the publication of Krefft's "Snakes of Australia," in 1869, many additions have been made to the Fauna but no attempt has, as far as I know, been made to revise the list. I believe, therefore, that the present census will be found useful to all who take an interest in the Herpetology of the country.

OPHIDIA.

DIVISION I. NON-VENOMOUS SNAKES.

A. LAND SNAKES.

Family. TYPHLOPIDÆ.

(Blind Snakes and Slow Worms.)

Genus. TYPHLOPS. Schn.

1. TYPHLOPS AUSTRALIS. Gray.

Cat. Liz. Brit. Mus.—Krefft, Snakes of Australia, p. 18.

Syn. T. Pressi Jan. Icon. libr. 1, pl. V., fig. 2. Krefft, Snakes of Australia, p. 19, pl. V., fig. 9-9a.

Hab.—West Australia (Gray.) South East Coast of New South Wales (Krefft.)

2. TYPHLOPS BICOLOR. Schmidt.

Peters Monatsb. der Berl. Akad Wiss., 1860, pl. 81, Jan. Icon. libr. 4., pl. IV., V., fig. 3.—Krefft, Snakes of Australia, p. 19, pl. V., figs. 10, 13, 13a.

Hab.—Melbourne, Victoria.

3. TYPHLOPS BITUBERCULATUS. Peters.

Monatsb. der Akad. Wiss. Berlin.—Krefft, Snakes of Australia, p. 17.

Hab.—South Australia.

4. TYPHLOPS GUNTHERI. Peters.

Monatsb. der Akad. Wiss. Berlin, 1865, p. 259, fig. 1.— Krefft, Snakes of Australia, p. 17.

Hab.—North Australia, Cape York.

5. Typhlops nigrescens. Gray,

Cat. Liz. Brit. Mus , p. 136.—Krefft, Snakes of Australia, p. 17, pl. 5., figs. 12, 12a, 26. *Syn. T. polygrammicus* Schleg.—Krefft (loc. cit.) *T. Russellii* Jan.—Krefft (loc. cit.), pl. V., fig. 11. *T. Temminckii*, Jan. Icon.

Hab.—Neighbourhood of Sydney.

6. Typhlops unguirostris. Peters.

Monatsb. der Akad. Wis. Berlin., 1867, p. 708, fig. 3.

Hab.—Queensland.

7. Typhlops wiedii. Peters.

Monatsb. der Akad. Wiss. Berlin, 1867, p. 24.

Hab.—Brisbane.

Family. BOIDÆ.

Genus. MORELIA. Gray.

8. Morelia spilotes.

(The Diamond Snake.)

Gray. Cat. Sn. Brit. Mus., p. 85.—Krefft, Snakes of Australia, p. 29, pls. 1 and V., figs. 1, 2.

Hab.—East Coast of New South Wales.

9. Morelia variegata.

(*The Carpet Snake.*)

Gray, Cat. Sn. Brit. Mus., p. 86.—Krefft, Snakes of Australia, p. 31, pl. II.

Hab.—Queensland, Victoria, South Australia, and inland parts of New South Wales.

Genus. LIASIS. Gray.

10. Liasis amethystinus. Gray.

Zool. Misc., 44.—Dum. and Bibr. Erp. Gen., VI., 432.—Cat. Brit. Mus. p 91.—Krefft, Snakes of Australia, pl. V., figs. 5, 5a.

Hab.—North Australia, Cape York, Herbert River, Islands of Torres Straits.

11. LIASIS CHILDRENII. Gray.

Zool. Misc. 44.—Dum. and Bibr. Erp. gen. VI., 438. Cat. Sn. Brit. Mus., p. 92. Krefft, Snakes of Australia, p. 34.

Hab.—North-West Australia, Port Essington.

12. LIASIS CORNWALLISIUS. Gunth.

Ann. and Mag. Nat. Hist. (5) III., p. 85, fig. 1.

Hab.—Cornwallis Island, Torres Straits.

13. LIASIS FUSCUS. Peters.

Monatsb. der Akad. Wiss. Berlin, 1873, p. 607.

Hab.—Port Bowen, Queensland.

14. LIASIS MACULOSUS. Peters.

Monatsb. der Akad. Wiss. Berlin, 1873, p. 608.

Hab.—Rockhampton, Port Mackay, and Bowen.

15. LIASIS OLIVACEA. Gray.

Zool. Misc. 45-54.--Dum. and Bibr. Erp. gen. VI., 442. Cat. Brit. Mus., p. 92. Krefft, Snakes of Australia, p. 35.

Hab.—Sir Charles Hardy's Island.

Genus. ASPIDIOTES. Krefft.

16. ASPIDIOTES MELANOCEPHALUS. Krefft.

Snakes of Australia, p. 33, pls. III. and V., fig. 4.

Hab.—Port Denison, northward to Cape York.

17. ASPIDIOTES RAMSAYI. Macleay.

Proc. Linn. Soc. New South Wales, Vol. VI,, p. 813.

Hab.—Bourke, Upper Darling River.

Genus. NARDOA. Gray.

18. NARDOA GILBERTI. Gray.

Zool. Misc. 45, 54.—Dum. and Bibr. Erp. gen. VI., 446. Cat. Brit. Mus., p. 93. Krefft, Snakes of Australia, p. 35, pl. V., figs. 3, 3a.

Hab.—Port Denison, Port Darwin,

Family. COLUBRIDÆ.

Genus. CORONELLA. Schl.

19. CORONELLA AUSTRALIS. Gunth.

Cat. Colub. Snakes Brit. Mus, p. 40. Krefft, Snakes of Australia, p. 20.

Hab.—North Australia. (Gunther.)

Genus. HERBERTOPHIS. Macleay.

20. HERBERTOPHIS PLUMBEUS. Macleay.

Proc. Linn. Soc. New South Wales, Vol. VIII., p. 434.

Hab.—Herbert River District, Queensland.

Genus. ZAMENOPHIS. Gunth.

21. ZAMENOPHIS AUSTRALIS. Gunth.

Ann. and Mag. Nat. Hist. (4) 1872, IX., p. 21.

Hab.—Cape York.

Genus. TROPIDONOTUS. Kuhl.

22. TROPIDONOTUS PICTURATUS. Schleg.

Gray Zool. Misc., p. 54.—Dum. and Bibr. Erp. gen. VII., p. 602. Gunth. Cat. Sn. Brit. Mus., p. 70. Krefft, Snakes of Australia, p. 20, pl. V., figs. 8, 8a.

Hab.—North and North-east Australia, Wide Bay, Clarence River,

23. TROPIDONOTUS ANGUSTICEPS. Macleay.

Proc. Linn. Soc. New South Wales, Vol. VIII., p. 433.

Hab.—Herbert River District, Queensland.

Family. DENDROPHIDÆ.

(Tree Snakes.)

Genus. DENDROPHIS. Boie.

24. DENDROPHIS BILOREALIS. Macleay.

Proc. Lin. Soc. New South Wales. Vol. VIII., p. 435.

Hab.—Herbert River District, Queensland.

25. DENDROPHIS CALLIGASTRA. Gunth.

Ann. and Mag. Nat. Hist. (3.) Vol. 20, p. 53. Krefft, Snakes of Australia, p. 25.

Hab.—Cape York, Islands of Torres Straits.

26. DENDROPHIS DARNLEYENSIS. Macleay.

Proc. Linn. Soc. New South Wales. Vol. II., p. 38.

Hab.—Darnley Island, Endeavour River?

27. DENDROPHIS GRACILIS. Macleay.

Proc. Linn. Soc. New South Wales Vol. 1, p. 15.

Hab.—Townsville, Queensland.

28. DENDROPHIS OLIVACEA. Macleay.

Proc. Linn. Soc. New South Wales. Vol. II., p. 220.

Hab.—Port Darwin.

29. DENDROPHIS PUNCTULATA. Gray.

(Green Tree Snake.)

Gunth. Cat. Sna. Brit. Mus., p. 149.—Krefft, Snakes of Australia, p. 23, pls. IV. and V., figs. 6, 6a.

Hab.—Coast Districts of New South Wales.

Family. DIPSADIDÆ.

Genus. DIPSAS. Gray.

30. DIPSAS BOYDII. Macleay.

Proc. Linn. Soc. New South Wales. Vol. IX., p. 548.

Hab.—Herbert River District, Queensland.

31. DIPSAS FUSCA. Gray.

Zool. Misc., 1842, p. 54. Gunth. Cat. Sn. Brit. Mus., p. 171.—Krefft, Snakes of Australia, p. 26, pl. V., figs. 7, 7a.

Syn. Tryglyphoden flavescens. Dum. and Bibr. Erp. Gen., p. 1880.

Hab.—New South Wales and Queensland.

32. DIPSAS IRREGULARIS. Merr.

Gunth. Cat. Snakes, Brit. Mus., p. 172.

Syn. Triglyphodon irregularis. Dum. and Bibr. VII., p. 1072.

Hab.—Cornwallis and Murray Islands, Torres Straits (Gunther.)

B. Water Snakes.

Family. HOMALOPSIDÆ.

(Fresh water Snakes.)

Genus. CERBERUS. Cuv.

33. Cerberus australis. Gray.

Cat. Snakes Brit. Mus., p. 65.—Krefft, Snakes of Australia, p. 22.

Hab.—Port Essington, Port Darwin.

Genus. MYRON. Gray.

34. Myron Richardsonii. Gray,

Cat. Snakes Brit. Mus., p. 70.—Krefft, Snakes of Australia, p. 23.

Hab.—North West Australia.

Genus. FORDONIA. Gray.

35. Fordonia variabilis. Macleay.

Proc. Linn. Soc. New South Wales. Vol. II., p. 219.

Hab.—Port Darwin.

DIVISION II. VENOMOUS SNAKES.

A. Land Snakes.

Family. ELAPIDÆ.

Genus. DIEMENIA. Gray.

36. Diemenia aspidorhyncha. McCoy.

Prod. Zool. Vict., Dec. III., pl. 23, fig. 4.

Hab.—Victoria.

37. DIEMENIA ATRA. Macleay.

Proc. Linn. Soc. New South Wales, *antea*, p. 549.

Hab.—Herbert River District, Queensland.

38. DIEMENIA FEROX. Macleay.

Proc. Linn. Soc. New South Wales, Vol. VI., p. 812.

Hab.—Bourke, Upper Darling River.

39. DIEMENIA MICROLEPIDOTA. McCoy.

Prod. Zool. Vict., Dec. III, pl. 23, figs. 2, 3.

Hab.—Junction of Murray and Darling.

40. DIEMENIA MULLERI. Schleg.

Krefft, Snakes of Australia, p. 41. Gunth. Cat. Brit. Mus., p., 213.

Syn. Pseudelaps Mülleri. Dum. and Bibr. VII., p. 1233.

Hab.—New Guinea, North Australia.

41. DIEMENIA OLIVACEA. Gray.

Zool. Misc., p. 54. Gunth. Cat. Brit. Mus., p. 212. Krefft, Snakes of Australia, p. 39, pl. VI., figs. 9, 9a.

Hab.—Port Essington, Port Darwin, Port Denison.

42. DIEMENIA PSAMMOPHIS. Schleg.

Gunth. Cat. Brit. Mus., p. 212. Krefft, Snakes of Australia, p. 28.

Syn. Pseudelaps psammophideus. Dum. and Bibr.

Hab.—North Australia, Port Essington.

43. DIEMENIA RETICULATA. Gray.

Zool. Misc. p. 54. Gunth. Cat. Brit. Mus., p 212. Krefft, Snakes of Australia, p. 40, pl. XII., fig. 10.

Syn. Elaps psammophis. Schlegel.

Hab.—From the Murray to Rockhampton, very abundant about Sydney.

44. Diemenia superciliosa. Fisher.

(The Brown Snake.)

Krefft, Snakes of Australia, p. 41, pls. VII. and XI., figs. 10, 10a.

Syn. Pseudelaps Sordellii and Kubingi, Jan. *Diemenia annulata*, Gunth. Cat. Brit. Mus., p. 212. *Furina textilis*, Krefft, Proc. Zool. Soc., 1862.

Hab.—All Australia.

45. Diemenia torquata. Gunth.

Ann. and Mag. Nat. Hist. (3), Vol. XX., p. 130. Krefft, Snakes of Australia, p. 43, pl. XII., figs. 11, 11a.

Hab.—Percy Islands, north-east coast.

Genus. PSEUDONAJA. Gunth.

46. Pseudonaja nuchalis. Gunth.

Cat. Snakes Brit. Mus., p. 227. Krefft, Snakes of Australia, p. 44, pl. XII., fig. 13.

Hab.—Port Essington, Port Darwin.

47. Pseudonaja affinis. Gunth.

Ann. and Mag. Nat. Hist. (4), Vol. IX., p. 35, pl. IV., fig. C.

Hab.—Australia, locality not given.

Genus. PSEUDECHIS. Wagler.

48. Pseudechis australis. Gray.

Gunth. Ann. and Mag. Nat. Hist. (3), Vol. XII., p. 362.—Krefft, Snakes of Australia, p. 47. pl. VII., figs. 11-11a.

Hab.—Murray River and Port Denison.

49. Pseudechis darwiniensis. Macleay.

Proc. Linn. Soc. N. S. Wales, Vol. II., p. 220.

Hab.—Port Darwin.

50. Pseudechis porphyriacus. Shaw.

(*The Black Snake.*)

Gunth. Cat. Snakes, Brit. Mus., p. 218.—Krefft, Snakes of Australia, p. 46, pls. VIII. and XI., fig. 8.—M'Coy Prod. Zool., Vict., Dec. 1, pl. 1.

Syn. *Naja australis.* Gray, Zool. Misc., p. 55.

Hab.—All Australia.

51. Pseudechis scutellatus. Peters.

Monatsb. der Akad. Wiss. Berlin, 1867, p. 710.

Hab.—Rockhampton.

Genus. BRACHYSOMA. Gunther.

52. Brachysoma diadema. Schleg.

Gunth. Ann. and Mag. Nat. Hist. (3.) Vol. XI., p. 23.—Krefft, Snakes of Australia, p. 48, pl. XII., fig. 12.

Syn. *Elaps ornata* Gray, *Furina diadema* Dum. and Bibr., *Rabdion occipitale* Girard, *Glyphodon ornatus* Gunther.

Hab.—New South Wales and Queensland.

53. Brachysoma simile. Macleay.

Proc. Linn. Soc. New South Wales. Vol. II., p. 221.

Hab.—Port Darwin.

54. Brachysoma triste. Gunth.

Ann. and Mag. Nat. Hist. (3.) Vol. XI., p. 24.—Krefft, Snakes of Australia, p. 50.—Ramsay, Proc. Linn. Soc. New South Wales. Vol. II., p. 113.

Syn. *Glyphodon tristis.* Gunth. Cat. Brit. Mus., p. 211.

Hab.—Cape York, North East Coast.

Genus. FURINA. Dum. and Bibr.

55. Furina bimaculata. Dum. and Bibr.

Krefft, Snakes of Australia, p. 51.

Syn. *Brachysoma bimaculatum.* Gunth. Cat. Brit. Mus., p. 229.

Hab.—West Australia.

56. Furina bicucullata. McCoy.

Prod. Zool. Vict., Dec. IV., pl. 32.

Hab.—Murray District.

Genus. RHINELAPS. Gunther.

57. Rhinelaps fasciolatus. Gunth.

Ann. and Mag. Nat. Hist. (4), Vol. IX., p. 34, pl. V., fig. B.

Hab.—West Australia.

Genus. BRACHYUROPHIS. Gunther.

58. Brachyurophis australis. Gunth.

Ann. and Mag Nat. Hist. (3), Vol. XV., p. 97. Krefft, Snakes of Australia, p. 52, pl. XI., figs, 3, 3a, 3b.

Syn. Simotes australis, Krefft Proc. Zool. Soc., 1864.

Hab.—Clarence River, Burdekin River.

59. Brachyurophis semifasciata. Gunth.

Ann. and Mag. Nat. Hist., 1863, XI., p. 21, pl. 3, and 1865, XV., p. 97.

Hab.—Perth, West Australia.

Genus. PETRODYMON. Krefft.

60. Petrodymon cucullatum. Krefft.

Snakes of Australia, p. 72, pl. VI., figs. 10, 10a.

Syn. Diemansia cucullata, Gunth.

Hab.—Sydney, East Coast north to Wide Bay.

Genus. CACOPHIS. Gunther.

61. Cacophis Blackmanni. Krefft.

Proc. Zool. Soc. 1869.—Snakes of Australia, p. 77, pl. XII., fig. 9.

Hab.—Pine Mountains, Queensland.

62. Cacophis Fordei. Krefft.

Proc. Zool. Soc., 1869.—Snakes of Australia, p. 75, pl., XII., figs. 8, 8a.

Hab. Pine M untains, Queensland.

63. CACOPHIS HARRIETTÆ. Krefft.

Proc. Zool. Soc., 1869.—Snakes of Australia, p. 76, pl. XI., fig. 13.

Hab.—Port Curtis, Queensland.

64. CACOPHIS KREFFTII. Gunth.

Ann. and Mag. Nat. Hist. (3.) Vol. XII., p. 361.—Krefft, Snakes of Australia, p. 74, pl. XI., figs. 5, 5a.

Hab.—Clarence River, New South Wales; Ipswich and Wide Bay, Queensland.

65. CACOPHIS MODESTA. Gunth.

Ann. and Mag. Nat. Hist. (4.) Vol. IX., p. 35, pl. 3, fig. c.

Hab.—West and North West Australia.

Genus. VERMICELLA. Gray.

66. VERMICELLA ANNULATA. Gray.

(*The Ringed Snake.*)

Gunth. Cat. Snakes Brit. Mus., p. 236.—Krefft, Snakes of Australia, p. 78, pl. XI., figs. 12, 12a.—M'Coy, Prod. Zool, Vict., Dec. 7, pl. 52.

Hab.—All Australia.

67 VERMICELLA BERTHOLDI. Jan.

Jan. Icon. Year not given.

Hab —West Australia (Gunther).

68. VERMICELLA LUNULATA. Krefft.

Snakes of Australia, p. 79, pl. 12, figs. 14, 14a.

Hab.—Upper Burdekin. A doubtful species.

Genus. ELAPOCRANIUM.* Macleay.

69. ELAPOCRANIUM ORNATICEPS. Macleay.

Elapidocephalus ornaticeps, Macleay, Proc. Linn. Soc., New South Wales, Vol. II., p. 321.

Hab.—Port Darwin.

* Substituted for *Elapidocephalus*, a name previously used by Dr. Gunther.

Genus. HOPLOCEPHALUS. Cuv.

70. Hoplocephalus ater. Krefft.

Snakes of Australia, p. 55, pl. XI., fig. 11.
Hab.—Flinders Range, South Australia.

71. Hoplocephalus Bransbyi. Macleay.

Proc. Linn. Soc. New South Wales. Vol. III., p. 52.
Hab.—Sutton Forest, New South Wales.

72. Hoplocephalus coronatus. Schleg.

Gunth. Cat. Snakes, Brit. Mus., p. 215.—Krefft, Snakes of Australia, p. 62, pl. VI., fig 3.

Syn. Elaps coronatus, Gray in Capt. Gray's Aust. *Alecto coronatus* Dum. and Bibr., p. 1255, pl. 76, fig. 2.
Hab.—West and South Australia.

73. Hoplocephalus coronoides. Gunth.

Cat. Snakes, Brit. Mus., p. 215.—Krefft, Snakes of Australia, p. 62, pl. XII., figs. 1. 1a.—McCoy, Prod. Zool. Vict. Dec. 11., pl. 11, fig. 9.
Hab.—Tasmania, Victoria, Bombala, New South Wales.

74. Hoplocephalus curtus. Schleg.

(The Brown Banded Snake, New South Wales. The Tiger Snake, Victoria.)

Gunth. Cat. Snakes, Brit. Mus., p. 216.—Krefft, Snakes of Australia. M'Coy, Prod. Zool. Vict. Decade 1, pl. 3.
Hab.—All Australia.

75. Hoplocephalus Damelii. Gunth.

Journ. Mus. Godeff. Hefte., XII., p. 46.
Hab.—Rockhampton and Peak Downs.

76. Hoplocephalus flagellum. M'Coy.

Prod. Zool. Vict., Dec. 2, pl. II., fig. 1.
Hab.—Neighbourhood of Melbourne.

77. HOPLOCEPHALUS GOULDII. Gray.

Gunth. Cat. Snakes, Brit. Mus., p. 215. Krefft, Snakes of Australia, p. 60, pl. XII., fig. 2.

Syn. *Elaps gouldii*, Gray in Captain Grey's Aust.

Hab.—West Australia.

78. HOPLOCEPHALUS MACULATUS. Steind.

Steindachner Voy. Novara, rept., p. 81, tab. 3.

Syn. *Denisonia ornata*, Krefft, Snakes of Australia. p. 82, pl. XI., fig. 4.

Hab.—Rockhampton.

79. HOPLOCEPHALUS MASTERSII. Krefft.

Proc. Zool. Soc., 1866.—Snakes of Australia, p. 63, pl. XII., fig. 6.

Hab.—Flinders' Range, South Australia.

80. HOPLOCEPHALUS MINOR. Gunth.

Ann. and Mag. Nat. Hist. (3), Vol. XII., p. 362.—Krefft, Snakes of Australia, p. 67, pl. 6, fig. 8.

Hab.—West Australia.

81. HOPLOCEPHALUS NIGRESCENS. Gunth.

Ann. and Mag. Nat. Hist. (3), Vol. IX., p. 131.—Krefft, Snakes of Australia, p. 68, pl. 7, figs. 4, 4a.

Hab.—Port Jackson, Port Macquarie, and Clarence River, New South Wales; Wide Bay and Herbert River, Queensland.

82. HOPLOCEPHALUS NIGRICEPS. Gunth.

Ann. and Mag. Nat. Hist. (3), Vol. VII., p. 362.—Krefft, Snakes of Australia, p. 68, pl. 12, fig. 7.

Hab.—Inland districts of New South Wales.

83. HOPLOCEPHALUS NIGRO-STRIATUS. Krefft.

Proc. Zool. Soc., 1864.—Snakes of Australia, p. 70, pl. 12, fig. 3.

Syn. *Alecto dorsalis*, Jan.

Hab.—Rockhampton and Cleveland Bay.

84. HOPLOCEPHALUS PALLIDICEPS. Gunth.

Cat. Snakes Brit. Mus., p. 214.—Krefft, Snakes of Australia, p. 59, pl. 11, fig. 1.

Hab.—Lachlan, Port Stephens, Clarence and Richmond Rivers, New South Wales; Port Denison, Queensland.

85. HOPLOCEPHALUS RAMSAYI. Krefft.

Proc. Zool. Soc., 1884.—Snakes of Australia, p. 66, pl. XI. fig. 2.

Hab.—Braidwood, New South Wales.

86. HOPLOCEPHALUS SIGNATUS. Jan.

Krefft, Snakes of Australia, p. 64, pl. XII., fig. 5.

Hab.—Victoria, Southern Districts of New South Wales, Ipswich, Queensland.

87. HOPLOCEPHALUS SPECTABILIS. Krefft.

Snakes of Australia, p. 61, pl. XII., fig. 4.

Hab.—Port Lincoln, South Australia.

88. HOPLOCEPHALUS STEPHENSII. Krefft.

Snakes of Australia, p. 58, pl. VI., fig. 7.

Hab.—Coast Districts of New South Wales, north of Sydney.

89. HOPLOCEPHALUS SUPERBUS. Gunth.

Cat. Snakes Brit. Mus. p. 217. Krefft, Snakes of Australia, p. 54, pl. VI., fig. 9. M'Coy, Prod. Zool. Vict, Dec. 1., pl. II.

Hab.—New South Wales, Victoria and Tasmania. Known in Tasmania as the "Diamond Snake" and in Victoria as the "Copper Head."

90. HOPLOCEPHALUS TEMPORALIS. Gunth.

Ann. and Mag. Nat. Hist. (3.) Vol. IX., p. 130, pl. IX., fig 11.—Krefft, Snakes of Australia, p. 65, pl. VI., figs. 5, 5a.

Hab.—South and West Australia.

91. Hoplocephalus variegatus. Dum. and Bibr.

Kreft, Snakes of Australia, p. 58, pl. VI., figs. 6, 6a, 6b.

Syn. *Alecto variegata and bungaroides.* Gunth. Cat. Snakes, Brit. Mus., p. 213.

Hab.—Sydney and Coast Districts South of Sydney in New South Wales.

Genus. TROPIDECHIS. Gunther.

92. Tropidechis carinata. Krefft.

Snakes of Australia, p. 71.

Hab.—Clarence and Port Macquarie District.

Family. VIPERIDÆ.

Genus. ACANTHOPHIS. Daudin.

93. Acanthophis antarctica. Wagler.

(The Death Adder.)

Gray, Zool. Misc. and Cat. Sn. Brit. Mus., p. 34. Krefft, Snakes of Australia, p. 80, pl. X. and XI., fig. 7. McCoy, Prod. Zool. Vict. Decade 11, pl. 12.

Hab.—All Australia.

B. WATER SNAKES.

Family. HYDROPHIDÆ (Sea Snakes).

Genus. PLATURUS. Latr.

94. Platurus Fischeri. Jan.

Icon.; Rev. et Mag. Zool., 1859.—Gunth. Rept. Brit. India, p. 356.—Krefft, Snakes of Australia, p. 90.

Hab.—Tropical Australian seas.

95. Platurus scutatus. Gunth.

Rept. of Brit. India, p. 356.—Krefft, Snakes of Australia, p. 89.

Hab.—Seas from Port Jackson to China.

Genus. AIPYSURUS. Lacep.

96. Aipysurus anguilliformis. Schmidt.

Gunth. Rept. Brit. India, p. 357.—Krefft, Snakes of Australia, p. 90.

Hab.—Tropical Australia seas.

97. Aipysurus fuscus. Fischer.

Gunth. Rept. Brit. India, p. 358.—Krefft, Snakes of Australia, p. 91.

Hab.—Australian seas.

98. Aipysurus laevis. Lacep.

Gunth. Rept. Brit. India, p. 358. Krefft, Snakes of Australia, p. 91.

Hab.—Tropical Australian Seas.

Genus. EMYDOCEPHALUS. Krefft.

99. Emydocephalus annulatus. Krefft.

Proc. Zool. Soc., 1869. Snakes of Australia, p. 92.

Hab.—Australian Seas.

100. Emydocephalus tuberculatus. Krefft.

Proc. Zool. Soc., 1809. Snakes of Australia, p. 93.

Hab.—Australian Seas.

Genus. DISTEIRA. Lacep.

101. Disteira doliata. Lacep.

Dum. and Bibr. Erp. Gen. VII., p. 1331. Gunth. Rept. Brit. India, p. 359. Krefft, Snakes of Australia, p. 94.

Genus. ACALYPTUS. Dum. and Bibr.

102. Acalyptus superciliosus. Dum. and Bibr.

Erp. Gen. VII., p. 1340. Gunth. Rept. Brit. India, p. 359. Krefft, Snakes of Australia, p. 24.

Hab.—South West Pacific Ocean.

Genus. HYDROPHIS. Daud.

103. Hydrophis Belcheri. Gray.

Cat. Snakes, Brit. Mus., p. 46. Gunther, Rept. Brit. India, p. 364.—Krefft, Snakes of Australia, p. 95.

Hab.—North Australian Seas.

104. Hydrophis elegans. Gray.

Zool. Misc. p. 61.—Gunth. Rept. Brit. India, p. 369.—Krefft, Snakes of Australia, p. 96, pl. XII., figs. 16, 16a, 168.

Syn. *H. doliata.* Gray, Zool. Misc. and Cat. Sn. Brit. Mus., p. 51.

Hab.—Coasts of New South Wales and Queensland.

105. Hydrophis ocella. Gray.

Cat. Snakes, Brit. Mus., p. 53.—Gunth, Rept. Brit. India., p. 378, pl. XXV., fig. 8.—Krefft, Snakes of Australia, p. 97, pl. XII., figs. 15, 15a.

Hab.—Australian Seas.

106. Hydrophis Stokesii. Gray.

Stoke's Australia, 1, p. 502, tab. 3.—Gunther, Rept. Brit. India, p. 363.—Krefft, Snakes of Australia, p. 95, pl. XII., fig. 17.

Hab.—North Coast of Australia.

Genus. ENHYDRINA. Gray.

107. Enhydrina bengalensis. Gray.

Cat. Snakes Brit. Mus., p. 48.—Gunth., Rept. Brit. India, p. 381.—Krefft, Snakes of Australia, p. 98.

Hab.—Tropical Australian seas.

Genus. PELAMIS. Daud.

108. Pelamis bicolor. Daud.

Gray, Cat. Snakes Brit. Mus., p. 41.—Gunth., Rept. Brit. India, p. 382.—Krefft, Snakes of Australia, p. 98, pl. 12, fig. 19.

Hab.—Australian Coasts, Port Jackson, Botany Bay.

An analysis of the foregoing list discloses the remarkable facts, that, unlike all other countries, the venomous snakes of Australia are much more numerous than the harmless; that out of 108 species of Ophidians known to inhabit Australia, 35 species only are innocuous, while 73 are venomous, and that no country in the world possesses so many species of poisonous reptiles as this. In India, which is looked upon as the home of venomous serpents, there is nothing like the same number. Dr. Gunther in the "Reptiles of British India," gives 18 species as the number of the *Elapidæ* or venomous Colubrine Snakes and 19 as that of the Viperine Snakes, or 37 in all; whereas in Australia there are, after deducting the *Hydrophidæ*, or Sea Snakes, 58 species. In America, too, also famed for its numerous reptiles, the numbers are few in comparison to ours. In that enormous Continent, extending from the Arctic to the Antarctic regions, there are scarcely more than twenty species regarded as venomous, though these, no doubt, belong chiefly to the much dreaded Family of *Crotalidæ*, or Rattle Snakes. Such being the facts, it seems strange that cases, or reported cases, of snake bite, are so seldom heard of here. In India, where an annual record is kept of all casualties proceeding from this cause, I find that the deaths from Snake bite in 1877 amounted to 16,777, or one death to every 15,000 of the population, taking that at about 240,000,000. The same ratio of deaths applied to the present population of Australia, would give about 170 as the annual loss from Snake bite.

There is in this country no official record of deaths from this cause, but newspapers are so numerous and so widely spread throughout the country, that I am satisfied that no casuality occurs that is not duly notified once or even oftener in one or other of those publications. The probability is that not only are these cases repeated at intervals as fresh cases, but that some are not caused by the bites of venemous Snakes, or even of Snakes at all.

I think, therefore, that we may safely take it for granted, that no casualities occur in any part of this country, without its being publicly announced, and looking at the paucity of these announcements, we may confidently conclude that the Indian death rate is in proportion to the population, quite ten times greater than ours. This immunity from Snake casualties, I shall not attempt to explain, it may be in part owing to the difference in the mode of life of the Australian, exposing him less to contact with the reptiles, or it may be that the Indian species are of more aggressive tendencies, but I would caution any one from being led into the belief that the immunity is owing to the harmless character of the Snakes themselves.

Fatal effects from Snake bite are rare, but that is because the bites themselves are rare. There is neither evidence nor reason to suppose that the virulence of the poison is less in the *Elapidæ* of Australia than in those of India.

The venom of some Australian species of the genera *Diemenia* and *Hoplocephalus*, is, when introduced into the human system, as deadly in its effects as that of the Cobra of India or Rattlesnake of America, and I am convinced, notwithstanding the repeated tales of marvellous cures effected, that recovery from the effects of the bite of one of them, is, even under the most prompt and skilful treatment, a very rare occurrence.

ON A NEW SPECIES OF KANGAROO (DORCOPSIS CHALMERSII) FROM THE SOUTH-EAST END OF NEW GUINEA.

By N. de Miklouho-Maclay.

(Plate 19.)

During my visit to the South-east and South-Coast of New Guinea, in December, 1880, I got a young Kangaroo from the mainland, opposite to Dinner Island. I obtained the animal an hour or two after death, having previously seen it alive for weeks. Without delay I took some measurements, and made a few sketches and notes, before putting it in spirits, but only had the opportunity a few weeks ago of examining it more completely.

On the first inspection it appeared to me very like, and possibly identical with the Kangaroo, known as *Halmaturus luctuosus* (1), but which is, as Mr. A. H. Garrod has proved, more correctly called *Dorcopsis luctuosa* d'Albertis (2.)

The examination of the dentition confirmed me in including the animal in the Genus *Dorcopsis* (on account of the size of the premolars, the general shape of the skull, and the direction of the hair of the neck), but it became evident that it could not be rightly identified with the species *D. luctuosa*. The dentition

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(1.) Proceedings of the Zoological Society, 1874, p. 110, and loc. cit, 1874. p. 247, pl. XLII.

(2.) On the Kangaroo called Halmaturus luctuosus, by D'Albertis, and its Affinities, by A. H. Garrod, M.A., F.R.S., in Proceedings of the Zoological Society, 1875. p.p. 48-59, pls. VII.-IX., or in collected scientific papers of late A. H. Garrod, 1881, p.p. 264-276, pls. VIII.-X.

proved also that the specimen was a young animal: the temporary premolar and temporary-molar, (1) were followed only by 2 molars, with the third molar just cutting the gum.

The plates appended to Garrod's paper made the comparison easy between the dentition of this young Kangaroo and that of *Dorcopsis luctuosa.* The form of the incisors of the canine and of the permanent premolars (which I cut out of their formative cells) was so different from that of the corresponding teeth of *Dorcopsis luctuosa,* that I found it justifiable to describe this animal as a new species: *Dorcopsis Chalmersii,* in honour of the Rev. James Chalmers, the well-known and distinguished missionary of the South Coast of New Guinea.

DORCOPSIS CHALMERSII. Mcl. (Young ♂.)

$$\frac{3\text{ i.,}}{1}\ \frac{1}{0}\text{ c.,}\ \frac{1\text{ temp, p.m.}}{1\text{ temp, p.m.}},\ \frac{1\text{ temp. m.}}{1\text{ temp. m.}},\ \frac{2}{2}\text{ m., the 3rd m. cutting the gums}$$

(1.) Prof. Flower says that "in Hypsiprymnus" (a genus which in many respects agrees with the gen. Dorcopsis. *Vide* Prof. Owen on a new species of Sthenurus. Proc. Zool. Soc., 1877, p. 357 and 358), "the reserve premolar is relatively later in acquiring its position in the jaw than in Macropus, being still in germ, at least in some species (pl. XXIX., fig. 4), after the last permanent molar is in place and use." (W. H. Flower. On the development and succession of the teeth in the marsupialia. Philos. Transact. for the year 1867, p. 634). On pl XXIX., fig. 4, (l.c.) the "temporary" molar (coloured red) were followed by 4 "true" molars.

Prof. Owen (loc. cit. Proceed, Zool. Soc, 1877. p 352), taking as the base of his terminology a comparison of the dentition of the marsupials with higher mammals (he compared as is well known, the dentition *Macropus Major* with that of *Sus scrofa.* Loc. cit., p. 358), calls *all* the teeth between the molars and canines, or [in case of the non-existence of the latter], the incisors; *deciduous molars* (*Vide* Prof. Owen on the Fossil Mammals of Australia." Philos. Transact., 1874), which on the figures of the plates illustrating the above paper, and others of the same author, are designated: *d* 1, *d* 2, *d* 3, *d* 4; *d* 2 is the tooth I have called "the temporary premolar," and *d* 3 "the temporary molar." In the last mentioned paper (p. 246), Prof. Owen describing the dentition of *Macropus* (*Halmaturus*) *erubescens.* Scl., calls *d* 3 "the second deciduous molar."

In the paper about *Sthenurus* (loc. cit., p. 353, and pl. XXXVII., *d* 2 and *d* 3 are called by Prof. Owen, "deciduous predecessors of the premolar."

According to the last named author, the dentition of our young *Dorcopsis Chalmersii* would consist of:—

$$\frac{3\text{ i.,}}{1\text{ i.,}}\ \frac{1\text{ c.,}}{0}\ \frac{d\,2}{d\,2}\text{ (temp. premolars.) }\frac{d\,3,}{d\,3,}\ \frac{d\,4,}{d\,4,}\text{ and }\frac{m\,1,}{m\,1,}\text{ or}$$

Measurements :—

From tip of nose to base of tail	400	Mm.	or	about	26·2 in.
Tail	270	„	—	„	15·8 „
From tip of nose to occiput...........	96	„	—	„	3·8 „
Fore limb	180	„	—	„	7·1 „
{ From caput humeri to elbow	62	„	—	„	2·4 „
{ From elbow to wrist	78	„	—	„	3·1 „
{ From wrist to end of nail middle finger	40	„	—	„	1·6 „
Hind limb..............................	385	„	—	„	15·2 „
{ From Trochanter to knee..............	111	„	—	„	4·4 „
{ From knee to ankle	142	„	—	„	5·6 „
{ From heel to end of nail of fourth toe	132	„	—	„	5·2 „
Length of ear (from behind).........	49	„	—	„	1·9 „
Circumference of base of tail	52	„	—	„	2·1 „

Colour.—Back dark grey, with a silvery tinge on the neck and shoulders. Fur short, soft, white on the roots. (1) Chin, throat and chest light grey. Feet dark, covered with shorter hair than on the back. The arms light grey inside, and of the general colour of the body outside.

The peculiar direction of the hair on the neck, which occurs in *Dorcopsis luctuosa* exists in *D. Chalmersii* and may be described just as Garrod (2) does it, in *D. luctuosa* and others, namely :—

(1.) The hair on the back is from 26-28 mm. (about 1 inch long.) Each hair is whitish on the base for $\frac{2}{3}$ of its length, and black for the next $\frac{1}{3}$, with a white tip (1 mm.) on the end, which tip however, could not be distinguished in many hairs. The hair of the tail about 12 mm. long, is black, nearly the whole length. On the arms, as well as on the head, where it is 6-8 mm. long, the hair was whitish on roots for 2 or 3 mm. The black portion of the hair is also the thickest. The light hair on the chest is about 13 mm. long.

(2) *Garrod.* (Loc. cit. p. 51) mentions, that this peculiarity in the direction of the hair of the neck has been found in *Dendrolagus ursinus, Dendrolagus inustus, Dorcopsis Muelleri and Dorcopsis luctuosa.* To this number *Dendrolagus Dorianus.* (*Vide:* E. P. Ramsay. Contributions to the Zoology of New Guinea. Proceedings of the Linnean Society of New South Wales, Vol. VIII., p. 15). may be added as well as *Osphranter rufus.* The occurrence of this peculiarity in the last named species, I have observed in a very fine specimen of *O. rufus* in the Macleay-Museum (♂, 5 feet from the tip of the nose to the base of the tail, and the tail 3 feet 3 inches long),

"All the hair covering the space bounded in the front by a line "running transversely across the parietal region, and behind by two "lines joining the middle line between the shoulders to form a right "angle, seven inches behind the occiput and extending, forward and "outward to the shoulder joint, being directed *forward*, whilst the "general body covering of hair is directed normally backward."

Eyes large, with very distinct eyelashes, Iris dark brown.

Ears rather narrow, covered inside with very fine hair.

Muzzle divided in the middle line by a perpendicular groove and the margin of the lips naked. Instead of 4 large conspicuous glandular *hair-follicles* in the middle-line over the laryngeal region of *Dorcopsis luctuosa*, shown on pl. VIII., in Garrod's paper, there are in *D. Chalmersii* only 3 of them arranged to form a triangle. (Fig. 2.) (1) Some long hairs are also found between the conspicuous hair-follicles and the underlips. Similar hair-follicles appear as well over the upper eyelid (over the inner canthus) and three larger ones under the outer canthus. (Fig. 1.)

The *skull* of *Dorcopsis Chalmersii* resembles that of *D. luctuosa*.
Length of the skull ....90 mm. (3, 6 inch.)
Greatest breadth from Zygoma to Zygoma...46 mm. (1, 8 inch.)

The *Palatine Foramina*. Two large ones on each side with several smaller behind.

Teeths of the upper jaw. (Fig. 5.)

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about which I was informed by Mr. W. Macleay, that the skin for the specimen in question, was quite fresh and in the best order when it was stuffed, so that no artificial manipulation during the stuffing could have produced an abnormal diversity in the direction of the hair.

The hair-ridge (where the hair of the head meets the hair of the neck) is in *Osphranter rufus* (of the Macleay-Museum) on the occiput, just behind the ears; and the converging point, between the shoulders, is 18 inches behind the occiput. On two other specimens of *Osphranter rufus* in the Australian Museum, I found, however, the hair turned backwards. These two contradicting statements leave therefore the question about the direction of the hair of the neck of *O. rufus* open.

(1) I do not think, however, that the number and position of the *glandular hair-follicles* presents a constant character for a species.

The under surface of the lateral incisors is an oval flat groove, surrounded with a cuspidated margin. The exterior margin is divided in both teeth into 4 distinct cusps, which are characteristic of the incisors of this species.

Incisors. The size of the first (central) incisor, compared with the lateral ones, shows less difference in *Dorcopsis Chalmersii* than in *D. luctuosa*, and the second incisor of the former is, relatively to his neighbours, not so small as in the latter species.

In the second right incisor the incision between the median cusps, extends in a vertical ridge, (fig. 8) which is not marked in the corresponding (left) tooth of the other side. (Fig. 7.)

The *canines* are in *D. Chalmersii*, relatively to the other teeth, smaller and shorter than in *D. luctuosa.*

The *temporary premolar*, measured on the neck, is only a little more than half the breadth of the permanent one [the first being 9 mm. or 0·4 inch, the second 16 mm. or 0·65 inch.] On the cutting edge 4 cusps are distinguishable, of which the first (the anterior) is the most marked. These cusps are the ends of vertical ridges which run from the base (the cingulum) on the internal as well as on the external side.

The *permanent Premolar* (fig. 9, A.-E.) which I dug out of its formative cell, showed a breadth (16 mm.) just equal to the breadth of the temporary premolar and the temporary molar together.

On the external side, 7 ridges ending in the same number of cusps may be distinguished, of which however, only 3 are well-marked. On the internal side, the ridges, with the exception of the first (or the anterior), are less apparent than on the external side. On the posterior end of the tooth, behind the cutting edge, appears a tubercle, the cusp of which is lower than the edge. A smaller tubercle is to be found on the base corresponding to the second, anterior ridge on the internal side of the premolar.

The *temporary molar.* Though in general, presenting the character of the permanent molar, the temporary molar is smaller in size, and shows a marked differenee from the molars, in the shape of an elongated anterior and external cusp, which gives the tooth, examined from the outside, a somewhat premolar-like appearance.

The *Molars* of *D. Chalmersii* do not present any special deviation from the general type of Molar teeth of Macropodidæ.

Teeths of the lower jaw. (Fig. 6.)

Incisors.—Rather long and narrow, terminating not in a point, but with a horizontal edge of 1½ mm. breadth.

The *temporary premolar,* smaller than the corresponding tooth of the upper jaw; 4 euspidate and 4 ridged, with the cutting edge slightly convex outwards.

The *permanent premolar.* (Fig. 9, A.-E.) The under jaw being much harder than the maxillary bone, as well as on account of the fangs of the temporary teeth, it was not easy to get the permanent premolar out of its formatory cell. Not having sufficiently delicate instruments and fearing to destroy not only the jaw but the tooth, I thankfully accepted the kind assistance of Mr. P. R. Pedley, who, after fully 45 minutes of filing and breaking away, succeeded in making the tooth free without the slightest injury. The premolar of the under jaw showing a general resemblance to the corresponding tooth of the upper jaw is shorter, (12½ mm. on the neck and 10 mm. between the extreme cusps), and on the cutting edge only 6 cusps are visible, corresponding to the number of vertical ridges on the external and internal side of the tooth. Another distinction from the premolar of the upper jaw is the absence of tubercles on the internal side of the mandibular premolar; the tooth consists only of a cutting edge, like the temporary premolar.

The *temporary Molar.* Very different from the other molars, consists of an elongated premolar-like anterior half and a molar-like posterior half. The cutting edge of the anterior part forms a sort of continuation of the edge of the temporary premolar, and is higher than the two molar-like cusps of the posterior portion of the tooth.

The *Molars* are macropodiform, smaller than those of the upper jaw, and presenting some differences in the shape of the trans versal ridges. (Fig. 10 and fig. 11.)

Habitat. The specimen of *Dorcopsis Chalmersii* has been, as already mentioned, caught by the natives of the mainland of New Guinea, opposite Dinner Island, one of the small islands in the China Strait. The coast in that locality is hilly and intersected by grassy plains. The *D. Chalmersii* is found solitary, not in mobs.

During my stay of about one month at Aruabada (the principal village of Port Moresby) I saw numbers of *Macropus papuanus* (called by the natives there "Makane"), but never met a single *Dorcopsis*. *Dorcopsis luctuosa* appears to be plentiful further north. Signor D'Albertis mentions in his book (1), that during his stay in one of the villages near Hall Sound, "that at dusk several men and women arrived in the village on their return from hunting the Kangaroo, or 'Barai' (*Dorcopsis luctuosa*), of which they have killed twenty. They use long nets in hunting, with which they surround its haunts, and when it is entangled in the nets they kill it with clubs."

The specimen of *D. luctuosa* in the Australian and Macleay Museum, have been received from Mr. Goldie, who got them inland, at some distance from Port Moresby. The name for *Dorcopsis luctuosa* in use by the natives of the Motu tribe (on the coast near Port Moresby) is "Gove."

(1.) L. M. D'Albertis. New Guinea. Vol. I., p. 295.

Explanation of Plate 19.

Fig. 1.—Outline of the lateral view of the head of *Dorcopsis Chalmersii*, a short time after death, accurately drawn to show the relative position and size of the eyes, ears, hair follicles, &c., &c. (Natural size.)

Fig. 2.—Fore-part of the same head showing the outline of the mouth and the position of the three conspicuous glandular hair follicles. (Natural size.)

Fig. 3.—The under surface of the hand. (Natural size.)

Fig. 4.—The under surface of the foot covered with thick black scales, which near the heels are worn down and the skin there appears glossy and flaky. (Natural size.)

Fig. 5.—Teeth of the upper jaw and the posterior palatine openings. (Natural size.)

Fig. 6.—Teeth of the lower jaw. (Natural size.)

Fig. 7.—Lateral view of the teeth of both jaws. *Twice* the natural size. The dotted line indicates the position of the formative cells (f.e.) of the permanent premolars.

Fig. 8.—Side view of the second, right upper incisor with a verticle ridge which is not marked in the corresponding tooth of the other side. (*Twice* the natural size.)

Fig. 9, A.-E.—Upper permanent premolar. (*Twice* the natural size.)

A.—View from below. t.—tubercle on the posterior end, behind the cutting edge (e).

B.—View from outside.

C.—View from inside.

D.—View from the front.

E.—View from behind.

Fig. 10, A′.-E′.—Permanent premolar of the lower jaw. (*Twice* the natural size.)

A′.—View from above.

B′.—View from outside.

C′.—View from inside.

D′.—View from the front.

E′.—View from behind.

Fig. 10.—Crown of the upper molar from below, to show the ridging. (*Twice* the natural size.)

Fig. 11.—Corresponding mandibular molar, to show the ridging of the crown, from above. (*Twice* the natural size.)

The same lettering in all the figures.

i. —Incisors.

c. —Canines.

tp. —Temporary premolars.

tm.—Temporary molars.

m. —Molars.

fc. —Formative cells.

ON A COMPLETE DEBOUCHEMENT OF THE SULCUS ROLANDO INTO THE FISSURA SYLVII IN SOME BRAINS OF AUSTRALIAN ABORIGINALS.

By N. de Miklouho-Maclay.

(Plate 18.)

One of the most characteristic of the Sulci of the human brain, as well as one of the first [recognisable at the end of the fifth month] is, as we know, the Sulcus Rolando.

By reason of the constancy of the presence of this Sulcus in the human brain, the variations of the same appear to me the more important. A complete junction of the Sulcus Rolando with the Fissura Sylvii is very rare in the brains of our race, though a case of this variation has been described by Turner. Prof. D. Zernoff, who has studied the *individual* types of the Sulci in the human brain and has published a very interesting and useful work (1) about the subject, has carefully examined the Sulci of not less than 100 brains, which have served him as materialfor this work, does not mention one case of this variation (2). Prof. A. Ecker in his work about the Convolutions of the human brain (3) says:—A

(1). *Individual Types of the Sulci in the human brain.* By D. Zernoff, Professor of Anatomy of the University of Moskow. With 74 woodcuts. Moskow 1877, (in Russian).

(2) Prof. Zernoff says:—"About their (the Sulci in general), constancy "and variation of shape there exists in the literature very different accounts. "But all agree, that Fis. Rolando and the Ram. Ascendens fis. Sylvii are "absolutely constant and their individual variations are insignificant. . . . "As regards variableness in the position and outlines the fis. Rolando is the "least susceptible. All its individual peculiarities are limited to small "variations in the position of the upper end, sometimes a little further "forward, sometimes further back. Its lower end approaches more or less "the horizontal ramus of the fis. Sylvii." (Loc. cit, p. 11.)

(3) *On the Convolutions of the human brain.* By Dr. A. Ecker, Professor of Anatomy and Comparative Anatomy in the University of Freiburg, Baden. Translated by John C. Galton, M.A. Oxon., M.R C.S., F.L.S. London, 1873.

complete " Debouchement of the Central Sulcus into the Fissure of Sylvius, " such as is described by Turner, has not yet come undei my " observation" (1).

Having examined a considerable number of brains myself, I have never observed it before 1881. It was in a brain of an Australian Aboriginal who died in the Sydney Infirmary.

The Sulcus Rolando was connected with the Fissura Sylvii only in the right hemisphere ; in the left, it terminated very near the edge of the horizontal ramus of the Fissura Sylvii. With the exception of the complete debouchement of the Sulcus Rolando into the Fissura Sylvii, the position and the course of the former presented in this brain nothing abnormal. (Fig. 2, A.-B.), gives the illustrations of the case (2).

Since my return from Europe, I was fortunate enough to obtain two other brains of Australian Aboriginals.

It was again on the right hemisphere of one of these brains, that the variation presented itself. (Fig. 1 A). A little lower than the middle, the Sulcus Rolando divides into two rami ; one, running obliquely down, taking the usual course of the Sulcus Rolando ; the other, the posterior, joining the Sulcus interparietalis, runs likewise down to the Fissura Sylvii. [This second or posterior ramus can be regarded just as well as an abnormal extension of the Sulcus interparietalis, as the closer examination of the corresponding Sulci of the left hemisphere (fig. 1 B) makes it easy to understand.] On the left hemisphere of the same brain, there is a junction between the Sulcus Rolando and the Sulcus præcentralis.

The two cases of the complete Debouchement of the Sulcus Rolando into the Fissura Sylvii, are also remarkable, because, out of four brains of Australian Aboriginals which I have had the opportunity of examining, *two* showed this peculiarity.

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(1). Loc. cit. p. 11.

(2). The specimen which served as the original to these illustrations, is, I am sorry to say, one of the five brains of my collection which were burned in the Linnean Societys Rooms during the fire of the Exhibition building in 1882.

Having examined carefully more brains of men belonging to the dark races, I may also state that junctions of the Sulcus Rolando with the other Sulci, are not uncommon and, very likely, occur more frequently than in the brain of men of our race.

Explanation of Plate 18.

Fig. 1, A.—Part of the right hemisphere of the Cerebrum of the Australian Aboriginal. showing a complete junction of the *Sulcus Rolando* (R.), with the horizontal ramus of the Fiss Sylvii (S.)

B.—Corresponding part of the left hemisphere of the same brain, showing a junction of the *Sulcus Rolando* (R.) with the *Sulcus præcentralis* (P.)

Fig. 2, A.—Part of the right hemisphere of the brain of another Australian Aboriginal, showing also a complete debouchement of the *Sulcus Rolando* into the Fiss. Sylvii (S.)

B.—Corresponding part of the left hemisphere of the same brain.

The same lettering in all the figures.

R.—Sulcus Rolando.

S.—Fissura Sylvii.

S'.—Ramus ascendens Fiss. Sylvii.

T.—Sulcus Interparietalis.

F.—Sulcus frontalis, Imp.

P.—Fiss. Præcentralis.

T.—Sulcus Temporo Sphenoidalis primus.

THE AUSTRALIAN HYDROMEDUSÆ.

By R. von Lendenfeld, Ph.D.

Part V.—Conclusion.—Plates XX. to XXIX.

THE HYDROMEDUSINÆ, HYDROCORALLINÆ AND TRACHYMEDUSÆ.

II. SUBORDER HYDROMEDUSINÆ.

Von Lendenfeld, 1884.

COLONIES OF POLYMORPHIC ZOOIDS. THE ALIMENTARY ZOOIDS RETAIN THE SHAPE OF POLYPES, WHILST THOSE IN WHICH THE SEXUAL PRODUCTS REACH MATURITY ARE MEDUSÆ, WHICH MAY BECOME FREE OR REMAIN ATTACHED TO THE COLONY AND BECOME RUDIMENTARY.

9. FAMILY ANTHOMEDUSIDÆ. Von Lendenfeld, 1884.

ANTHOMEDUSÆ. Haeckel, without the Cytaeidæ of Haeckel.

Medusæ become free, without Otoliths, with Ocelli at the base of the tentacles. Gonads in the outer or oral wall of the gastral cavity. Mostly four Radial Canals. The Polyp colonies on which these Medusæ bud, contain alimentary Zooids, which are not invested by chitinous cups. The Medusæ bud mostly on the ordinary alimentary Polyps, exceptionally they are also born on peduncles and bud direct from the Hydrorhiza. A division of labour between alimentary Polyps and Polyps which produce Medusæ ; Polypostyles do not occur.

I. SUB-FAMILY. CODONINÆ.

CODONIDÆ. Haeckel.

Mouth simple, with flaps or barbels. Gonad simple tube shaped, not divided radially, with four simple Radial Canals and unbranched tentacles. Alimentary Zooids, with tentacles, which are scattered, or in two verticils.

33. GENUS SARSIA. Lesson.

Codonidæ with four perradial tentacles of equal size. Manubrium often very long, never cubic, surrounded by a single large Gonade which has the shape of a tube. Umbrella without cap on the vortex. Exumbrella smooth, without projecting nettle warts.

The Medusæ bud on Polyp colonies the members of which are nearly alike, club or spindle-shaped with scattered capitate tentacles. The Perisarc does not extend to form cups for the Polyps. The structure both of the Medusa and the Polyp has been studied by F. E. Schulze. (1)

The Medusa possesses mesenterial pouches in the Umbrella, so that a cœlom is formed. The Polyps bear on their tentacles Palpocils, long bristles, discovered and named by P. Wright (2), which are considered by Schulze to be organs in connection with the sense of touch. These peculiarities of Sarsia tubulosa, the species studied by F. E. Schulze, are also met with in the Australian species. Allman (3) figures and describes the species of the Polyps. Weismann (4) endorses the statements of F. E. Schulze.

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(1) *F. E. Schulze.* Ueber den Bau von Syncoryne Sarsii Lovèn und die zugehörige Meduse Sarsia tubulosa. Lesson, Leipzig, 1873.

(2) *Percival Wright.* Proceedings of the Royal Physical Society of Edinburgh. Vol. I., p. 341.

(3) *J. Allman.* A Monograph of the Tubularian, etc. Hydroids, Vol. II., p. 274 ff.

(4) *A Weismann.* Die Entstehung der Geschlechtszellen bei den Hydromedusen. Seite 56.

177. SARSIA RADIATA. nov. sp.

The Medusa.

Plate XX., fig. 31.

Umbrella semi-ovate, slightly higher than broad. Manubrium cylindrical, half as long as the Umbrella, spindle-shaped containing deep brown Entoderm and covered from the Gonade. Tentacles a little longer than the Ocellar bulbs, which are half as thick as the Manubrium, globular. Medusæ do not multiply by budding.

Colour: Entoderm of Manubrium and Ocellar bulbs deep brown. Medusæ otherwise colourless.

Size: 3 mm. high, and 2·5 mm. broad.

The Polyp.

Plate XX., fig. 32.

From a creeping rarely branched Hydrorhiza, which forms a network of anastomosing threads, the Hydrocauli arise. At the end of each, one Polyp is situated ; they are unbranched. The Perisarc which invests Hydrorhiza and Hrodrocaulus terminates below each Hydranth with an oblique elliptical margin.

The Hydranth possesses a muscle which acts as a flexor at this point, by the means of which it is enabled to bend down and shut up as it were like a penknife.

The Hydranths possess 6-8 verticils of four tentacles which are situated in four adradial Meridians. They are spindle shaped. Those producing Medusæ are shorter and stouter than the others.

The Proboscis is large and often extended, and then shows a richly folded Entoderm on its inner surface.

Colour: Entoderm, particularly of the central wide part of the gastral cavity, intensely brown, Persiarc light brownish yellow. The other parts of the animal colourless,

Size: Height of Polyps, 3-5 mm.

Ontogenesis: I have succeeded in obtaining the Medusæ from the Syncoryne-Polyps, and also have bred small Polyp-colonies from adult Medusæ, which were obtained with the surface-net.

Locality: Laminarian zone. Port Phillip (I only obtained the Polypes there, but I do not hesitate to designate them as belonging to this species), Port Jackson, Polyps and Medusæ.

Season: Medusæ are produced in April and May.

178. SARSIA MINIMA. nov. sp.

The Medusa.

Plate XXI., fig. 34.

I did not obtain any adult Medusæ, which I might refer to this species with certainty. The young Medusæ with only slightly developed Gonade in the Manubium is very small and has a *long* Manubrium like the northern Sarsiæ. It can hereby readily be distinguished from the foregoing species.

The Umbrella is semi-spherical with large globular Ocellar bulbs and four tentacles with rings of Cnidoblasts. Manubrium long, stomach, slightly spindle-shaped, nearly cylindrical.

Colour: Entoderm of stomach pale brown. The Medusæ otherwise colourless.

Size: At time of liberation, 1 + 1 mm.

The Polyps.

Plate XXI., fig. 35.

From a creeping *not* anastomosing Hydrorhiza slightly branched stems arise, with about two or three Hydranths to the stem. The Perisarc which invests Hydrorhiza and Hydrocaulus is irregularly annulated or wavy throughout, and terminates at the proximal end of the Hydranths with transverse circular margin. The Hydranths possess from 8-12 scattered tentacles and are slender. at the time of forming Medusæ they become stouter and produce so many medusa-buds that nothing of their bodies remains visible.

Colour : Perisarc reddish brown.

Size : Height of stem, 2-3 mm. Length of Hydranth, 0·6—0·8 mm.

Ontogenesis : I have bred the Medusæ from the Syncoryne-Polyps in the Aquarium, but have not been able to obtain adult Medusæ.

Locality : Laminarian zone. Port Jackson, on buoys and submerged ropes.

Note : I have always found this species together with Obelia geniculata, and over-growing the latter, quite hidden by the long stems of the Obelia, it doubtlessly derives great protection from its neighbour. I think it by no means impossible that it is a parasite on the Obelia, and that it extracts its food from the Hydrorhiza of the Obelia. I hope to be able to decide this interesting question in another paper.

Season : Medusæ are produced in April and May.

34. GENUS DICODONIUM. Haeckel.

The Medusæ are Codonidæ with two opposite tentacles. On the vortex of the Umbrella there is a conic Gallert protruberance with axial canal. Manubrium short, scarcely projecting beyond the orifice of the Umbrella. The Polyp colonies are unknown.

179. DICODONIUM DISSONEMA. Haeckel.

Haeckel (1) obtained this Medusa, the Ontogenesis of which is unknown, from Australia.

35. GENUS EUPHYSA. Forbes.

Codonidæ, with three tentacle rudiments and one well developed arm. Umbrella regular and bilateral (excepting the larger dorsal ocellar bulbe).

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(1) *E. Haeckel.* Das System der Medusen. Seite 28.

On the vortex of the Umbrella there is no Gallert protuberance. The Polyp colonies are gymnoblastic Hydroids with two verticils of filiform tentacles, the Medusæ bud at the base of tentacles belonging to the aboral verticil.

180. EUPHYSA AUSTRALIS. nov. sp.

The Medusa.

Plate XXI., fig. 33.

Umbrella semiovate. Stomach cylindrical, about half as long as the Umbrella is high. The developed tentacle long and very retractile with rings of Cnidoblasts in the Ectoderm.

The other three tentacles quite rudimentary, all equal in size, and not so long as broad.

The ocellar bulbs are large and the three smaller ones about half the diameter of the larger.

Colour: Medusa colourless and transparent. Mouth deep violet. In the Gonad on the Manubrium 4 brown patches and also a few brown spots at the proximal end of the Manubrium. Ocellar bulbs and the large tentacle brown, with violet spots.

Size: Height of Umbrella, 2·5 mm.; breadth, 1·7 mm. (The Umbrella becomes shorter and broader after death, in consequence of the relaxation of the Subumbral muscles.)

The *Polyp colonies* and *Ontogenesis* are unknown.

Locality: Port Jackson, rare; caught 3 specimens with the surface net.

Season: May and June.

II. SUB-FAMILY. TIARINÆ.

TIARIDÆ. Haeckel.

Anthomedusidæ with four broad Moutharms, with four or four pair of gonads, four simple Radial Canals and unbranched tentacles. The alimentary Zooids of the Polyp colonies with scattered capitate tentacles.

36. GENUS TIARA. Lesson.

Tiarinæ with numerous tentacles in one row (8-16 or more.) Abaxial ocellae outside on the base of the tentacles. No stalk to the stomach. Edges of the stomach coalesce above through four mesenteria with the four radial canals. (Therefore four narrower and wider funnel cavities between the four interradial stomach surfaces and the Subumbrella.) Gonads four pinnate leaves or 8 longitudinal masses in the surface of the stomach; which bear irregular transverse folds. The Polyp colonies are unknown, but according to Haeckel probably similar to Clavula.

181. TIARA PAPUA. Haeckel.

This species, described as Turris papua by Lesson (1), Eydoux et Sanleyet (2) and L. Agassiz (3), and as Aegnorea mitra by Lesson (4), has been found at New Guinea (Waigiu. Lesson), and in the Indian Ocean (Eydaux et Sanleyet), and has been referred to the Genus Tiara by Haeckel (5.)

37. GENUS TURRITOPSIS. MacCrady.

Tiarinæ with numerous tentacles (12-16 or more) in one row. One Ocellus inside on the axial side of the base of the tentacle, Stalk to the stomach. No Mesenteria. Gonads four simple perradial, simple or bipartate, longitudinal folds in the wall of the stomach, divided from each other by a deep furrow, with smooth surface.

Mouth flaps with stalked nettle warts on the margin.

The Polyp colonies are Tubularians.

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(1) *Lesson.* Prodrôme des Acalèphes, 1843, p. 283.
(2) *Eydaux et Sanleyet.* Voyage de la Bonite. Tom. II., p. 639.
(3) *L. Agassiz.* Monograph of Acalephæ. Cont. Natural Hist., N.S A. Vol. IV., p. 346.
(4) *Lesson.* Voyage de la Coquille. Zoology, p. 127.
(5) *E. Haeckel.* System der Medusen. Seite, 5, 8.

182. TURRITOPSIS PLEUROSTOMA. Haeckel.

This species was obtained from De Witt's Land, North-west Coast of Australia, and described by Péron et Leseur (1), as Melicerta pleurostoma. Haeckel (2) refers it to the Genus Turritopsis.

183. TURRITOPSIS LATA. nov. sp.

Plate XXII, fig. 36.

Umbrella broad, cylindrical, with a conic roof on the vortex, scarcely higher than broad. Stomach a spindle-shaped tube, about $\frac{2}{3}$ as long as the Umbrella is high. Gonads large; each having the shape of a quarter sphere, they altogether appear as a sphere round the stomach tube like a time-ball on a staff. Their surface is uneven, much and irregularly folded. Mouth flaps small, $\frac{1}{3}$ of the length of the Manubrium, lancet-shaped and slightly recurved. Ocellar bulbs large, touching each other in the adult animal; to every one there is a tentacle. Tentacles about twice as long as the Umbrella, very numerous. Four in the youngest Medusæ I obtained, and 60-130 in the largest.

Colour: Medusa colourless. Gonads and Entoderm of Ocellar bulbs intensely brown. Ocella with red pigment.

Size: Umbrella of the largest Medusæ 3·5 mm. high and 3 mm. broad.

Ontogenesis and *Polyp colonies* unknown.

Locality: Port Jackson.

Note.—This Medusa is by far the most common Craspedota in the harbour. Sometimes I have endeavoured to estimate the number per cubic meter of water. My surface net measured 26 cm. across, surface of orifice therefore 530 □ cm.; pulled for a length of 50 meters (dropped from boat and hauled in from land) it should have caught the Medusæ contained in 5,000 × 530 cm.

(1) *Péron et Leseur.* Tableau des Meduses, 1809, p. 353.
(2) *E. Haeckel.* System der Medusen. Seite 67.

of water, that is $2\frac{1}{2}$ cubic meters. The surface net washed out in a glass containing 1 litre of sea water (1,000 cm.), stirred up, and the number of Medusæ counted, which were contained in 5 cm., water taken out from the glass multiplied by 200 and divided by 2·5 gave the approximate number per cubic meter :

1884—18th March, 620.
5th April, 790.
22nd April, 510.

If we were to multiply these numbers with the number of tons of water in Port Jackson, 1 ton=1 cubic meter, we would obtain numbers, which are otherwise only met with in Astronomy.

Season : Summer and autumn.

III. SUB-FAMILY. MARGELINÆ.

MARGELIDÆ. HAECKEL, WITH THE EXCEPTION OF HAECKEL'S GENERA CYTAEIS, CUBO-GASTER, DYSMORPHOSA, CYTÆANDRA.

Anthomedusæ, with simple or branched moutharms. Gonad divided into four or eight marginal flaps. The Medusæ bud on Colonies of Polyps, which contain alimentary Zooids, with one verticil of filiform tentacles. I do not consider Stauridium productum, and its Medusa to belong to this Family.

38. GENUS LIZUSA. Haeckel.

The Medusæ are Margelinæ with simple unbranched styles round the mouth, and with four perradial bundles of tentacles. The Polyp colonies are probably, according to Haeckel similar to Eudendrium.

184. LIZUSA PROLIFERA. nov. sp.

Plate XXIII., figs. 38-39.

Umbrella semispherical or ovate higher than broad. Stomach nearly cubic, small, four simple styles round the mouth, about $\frac{2}{3}$ of the length of the stomach. Tentacles of the smallest Medusæ two in each bunch. Ocellar bulbs scrota-shaped, very large about half the size of the stomach. The number of tentacles in each bunch increases to five, so that the adult animal possesses twenty tentacles. These are about half as long as the Umbrella is high.

The Medusa multiplies at every stage rapidly by forming numerous buds at the base of the Manubrium. These buds are prolific when they are born. They show traces of buds even before. Mesenterial pouches are present as in Sarsia.

Colour: Ocellar bulbs and stomach brown. Medusa otherwise colourless.

Size: Height of Umbrella, 3 mm. Breadth, 2·5 mm.

Ontogenesis and *Polyp colonies* unknown.

Note: I found a good many of the young stages of this Medusa one morning in a glass containing Hydroids. In searching for the Polyp colonies, from which these Medusæ were probably produced, I only found Endendrium pusillum without traces of Medusa-buds, a Syncoryne and Obelia geniculata. It is just possible that our Medusæ budded on the Syncoryne, in which case it would be necessary to refer the species to another subfamily (together with Stauridium). As the Medusa multiplies rapidly by producing buds at every stage of its development, it is not unlikely that the numerous Medusæ in my Aquarium were produced in this way from one or two which had been in the water.

Locality: Port Jackson.

Season: April and March.

39. GENUS LIMNOREA. Péron et Leseur.

The Medusæ are Margelidæ with branched or otherwise complicated moutharms (styles), and with numerous tentacles which are not situated in bunches. (16-32 or more.)

Polyp colonies unknown.

185. LIMNOREA TRIEDRA. Péron et Leseur.

This species was obtained in Bass' Straits and briefly noticed by Péron (1). From Leseur's (2) drawing Haeckel (3) compiled a diagnosis, and described it at Limnorea proboscidea. De Blainville (4) and Milne Edwards (5) mention the Medusæ under the name Limnorea triedra. De Lamarck (6) names to it as Dianæa triedra.

40. GENUS NEMOPSIS. A. Agassiz.

The Medusæ are Margelidæ with branched or composite mouth styles, and with four perradial bunches of tentacles. Mouth small. The mouth styles originate at the base of the Œsophagus separately. The Gonads extend from the stomach edges to the Radial Canals. Polyp colonies unknown.

186. NEMOPSIS FAVONIA. Haeckel.

This species was obtained at Arnheim's Land, and described by Péron et Leseur (7) under the name Favonia octonema. De Blainville (8), and L. Agassiz (9), mention it under the same name. De Lamarck (10), names it Orythia octonema. Haeckel (11), places it in the Genus Nemopsis.

IV. SUB-FAMILY. CLADONEMINÆ.

CLADONEMIDÆ. Gegenbaur.

Anthomedusæ, with branched tentacles, with 4-8 simple or branched Radial Canals, and four or four pair of Gastral Gonads.

(1) *Péron et Leseur.* Tableau des Meduses, 1809, p. 329.
(2) *Leseur.* Precueil des Planches (inédites) des Meduses, Planche III., fig 5.
(3) *E. Haeckel.* Das System der Medusen, Seite 87.
(4) *De Blainville.* Actinologie, p. 290.
(5.) *Milne Edwards.* Cuvier régne animal illustré, Zoophytes Planche 52, fig. 1.
(6) *De Lamarck.* Histoire Naturelle des animaux ans Vertebres, Tom II., p. 505.
(7) *Péron et Leseur.* Tableau des Meduses, 1809, p. 328.
(8) *De Blainville.* Actinologie, 1834, p. 290.
(9) *L. Agassiz.* Monograph of Acalephæ, Contrib. Nat. Hist., U.S.A. Vol. IV., p. 135, 159.
(10) *De Lamarck.* Hist. Nat. des animaux sans vertébres. Tom II., p. 503.
(11) *E. Haeckel.* Das System der Medusen. Seite 34.

The Medusæ bud on Polyp colonies which contain alimentary Zooids, with scattered capitate tentacles.

41. GENUS PTERONEMA. Haeckel.

Cladoneminæ with four simple Radial Canals, and with four perradial tentacles, which are studded with secondary tentacles, or with stalked nettle warts. A large brooding cavity above the stomach. Four simple Gonads in the wall of the stomach. Mouth with four lips. Exumbrella smooth, without nettle ribs. Polyp colonies unknown.

187. PTERONEMA DARWINII. Haeckel.

This species was obtained in Australian waters, and has been described by Haeckel (1.)

188. PTERONEMA AMBIGUUM. Haeckel.

This species was obtained at New Guinea (Waigiu), and described by Lesson (2), as Microstoma ambiguum. Haeckel (3), combines it with the foregoing species to form the Genus Pteronema. L. Agassiz (4), names it Zanclea ambigua.

10. FAMILY TUBULARIDÆ. Von Lendenfeld, 1884.

The Medusæ in this Family become rudimentary and remain attached to the Polyps. The Zooids are all either alimentary Polyps or Medusostyles, no Polypostyles are formed. The Zooids are destitute of a Perisarc.

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(1) *E. Haeckel.* Das System der Medusen. Seite 101.

(2) *Lesson.* Zoologie de la "Coquille," 1829. Tom II., p. 130. Acalèphes, 1843, p. 295.

(3) *E. Haeckel.* Das System der Medusen. Seite 102.

(4) *L. Agassiz.* Monograph of Acalephæ. Contrib. Nat. Hist, U.S.A. Vol. IV., p. 344.

If we accepted the hypothesis of Weismann (1), many of the Families described in the Suborder Hydropolypinæ would have to be placed here.

I. SUB-FAMILY PENNARINÆ.

The Polypes possess a distal set of capitate and a proximal set of filiform tentacles. The filiform tentacles possess a longitudinal stripe of high Ectodermal nettle-epithel on their dorsal side.

42. GENUS PENNARIA. Goldfuss.

Hydrophyton composed of a symmetrically ramified Hydrocaulus, rooted by a creeping filiform Hydrorhiza, the whole invested with a chitinous Perisarc. Hydranths flask-shaped, with the filiform tentacles, constituting a proximal set, and arranged in a single verticil round the base of the Hydranth, and the capitate tentacles a distal set scattered on the body of the Hydranth.

From the ordinary alimentary zooids, Medusæ bud, which become rudimentary in so far as the Manubrium is destitute of oral appendages. The tentacles are four in number, rudimentary and short. Ocelli absent.

The structure of Pennaria cavolini was investigated by Hamann (2), and particularly by Weismann (3).

The tentacles are bilateral symmetrical, with a ridge running down one side. The Hydranths are not all alike inasmuch as the terminal Hydranth produces the other Hydranths of the Pinna by budding, but never a Medusostyl. The Medusostyles are exclusively produced from the Proximal Zooids.

189. PENNARIA AUSTRALIS. Bale.

Bale (1) describes this species from Port Jackson.

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(1) *A. Weismann.* Die Entstehung der Geschlechtszellen bei den Hydromedusen.

(2) *O Hamann.* Der Organismus der Hydroidpolypen Jenaische Zeitschrift. Band XV., Seite 520.

(3) *A. Weismann.* Die Entstehung der Geschlechtszellen bei den Hydromedusen. Seite 119-126.

190. PENNARIA ROSEA. nov. sp.

Plate XXIV., figs. 40-42.

The Medusostyles are met with on the proximal Hydranths, from 2-6 on each. They possess very large tentacular rudiments which are about three times as long as broad, and traces of ocelli can be detected at their base. The Umbrella is oval, slender, the space between the large Manubrium and the Subumbrella is taken up entirely by the genital products. In the Aquarium the Medusostyles always drop off before they discharge their contents, which latter action is performed apparently by contractions of the Umbrella. The presence of a Subumbrellar circular muscle is proved hereby.

On each stem about 20 Pinnæ, and from 4 to 6 Hydranths on each Pinna. The Hydranths are stout, somewhat flask shaped, with a long mouth. The capitate tentacles numerous (20-30), short and thick ; the verticil of filiform arms consists of 30-40 tentacles.

Colour: Perisarc of Hydrorhiza and stem black and intransparent. Proximal end of Pinna likewise deeply coloured, distal half light yellow and transparent. Hydranths and Medusostyles intensely rose coloured.

Size: Medusostyles, 2 x 1 mm. ; Hydranths, 2·5 mm. long and 1·5 thick. Stems attaining a height of 8 cm. Pinna, 9-15 mm. long.

Ontogenesis unknown. The first stages only of the development of the ovum were observed.

Locality: Port Jackson. Laminarian Zone, together with Tubularia, not rare.

Season: Medusostyles are produced in autumn. (May.)

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(1) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes, p. 45.

191. PENNARIA ADAMSIA. nov. sp.

Plate XXV., fig. 45-48, Plate XXVI., fig. 49.

The Medusostyles different in the two sexes, highly developed in the male and more rudimentary in the female.

The male Medusostyles are slender, nearly cylindrical and truncate at both ends. The four tentacles are about as long as the Medusostyle is broad and *move about* freely. Ocelli are present, although rudimentary as in P. cavolini (1.) The Spermatozoa fill the space between the small Manubrium and the Subumbrella. In the Aquarium, the Spermatozoa were ejected within an hour after the Medusostyle had dropped off. Also, in this case active contractions of the Umbrella could be observed in connection with the ejection of the Sperma.

The female Medusostyles are short and broad nearly spherical. The tentacle rudiments are small, shorter than broad. No traces of Ocelli are visible In the Aquarium these did not eject the ova by contraction of the Umbrella.

The Hydranths are slender, the proximal ones only about half as large as the distal primary one of each pinna. They possess 8 slender capitate tentacles, placed in two verticils of four. Four small ones on the top of the proboscis near the mouth, disposed regularly in the four perradii and four longer ones on the body in the four interradii, and 24 (always ?) filiform arms in the aboral verticil.

The stems bear from 15 to 20 pinnæ, and there are about 8 Hydranths on each pinna.

Colour: Perisarc of the Hydrorhiza and stem black and intrans parent. Pinna transparent and yellow. Zooids white.

Size: Length of stems 6-8 cm. Pinna 12 mm. Medusostyles ♂ 1·5 mm. long, 0·7 mm. thick. ♀ 1·5 mm. long, and as broad. Hydranths 1·7 mm. long.

Ontogenesis unknown.

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(1) *A. v. Kölliker, Gegenbaur und Müller.* Berichte über einige im Herbste, 1852, in Messina angestellte vergleichend anatomische Untersuchungen. Zeitschrift für wiss. Zool. Band IV. Seite 303.

Locality : Port Jackson, rare, I found this species only once on the bottom of a yacht in March 1884, and named it after the owner of the boat.

Season : Medusostyles in March.

II. SUB-FAMILY. TUBULARINÆ.

The Polyps possess two verticils of filiform tentacles.

43. GENUS TUBULARIA. Linné.

Medusostyles bud on tentacular processes on the oral part of the Hydranth. The first stages of the development of the ovum are passed through *within* the Medusostyle, which remains attached to the Hydranth all the while. The Medusostyles are more or less rudimentary.

Stems simple or branched, rooted by a filiform stolon, the whole invested by a chitinous Perisarc ; Polyps flask shaped with two verticils of filiform tentacles. The oral short and surrounding the proboscis, the aboral long and forming a circle near the aboral end of the Hydranth.

The structure and development of many species has been studied by Hamann (1), Jickeli (2), Ciamician (3), and Weismann (4).

The statements regarding the embryology differ to a great extent, Ciamician (l.c.) supposing the Gastrula to be formed by invagination and not by delamination as the other authors suppose.

The tissue is similar to that of other Hydroids. The visceral membrane (subepithel of the Entoderm) acquires a higher developement and forms a sort of internal skeleton.

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(1) *O. Hamann.* Der Organismus der Hydroidpolypen. Jenaische Zeitschrift, Band XV., Seite 510.

(2) *C. Jickeli.* Der Bau der Hydroidpolypen II. Morphologisches Jahrbuch. Band VIII., Seite 580.

(3) *Ciamician.* Ueber den feineren Bau und die Entwickelung von Tubularia mesembryanthemum. Zeitschrift fur wis. Zool. Band XXXII.

(4) *A. Weismann.* Die Entstehung der Geschlechtszellen bei den Hydromedusen Seite 127-128.

192. TUBULARIA RALPHI. Bale.

Bale (1) describes this specie, found in Hobson's Bay, from the manuscript on this Tubularia bei Halley.

193. TUBULARIA PYGMÆA. Lamouroux.

Lamouroux (2) describes this species from Amphorea dilatata of Australia.

194. TUBULARIA SPONGICOLA. nov. sp.

Plate XXVI., fig. 50.

From a creaping Hydrorhiza, which is immersed in horny Sponges, short stems arise, the terminal ends of which are in the surface of the Sponge.

The Hydranths are small and have the ordinary shape. The distal set of tentacles consists of arms, which are about twice as long as those which compose the proximal verticil. The tentacular processes on which the Medusostyls bud are short and unblanched, so that the Medusostyls are not numerous but of large size, as long as the oral tentacles and possessing a serrated Umbrella margin. The whole, therefore, appears similar to Tubularia bellis.

Colour: Medusostyls and central part of Hydranth dark flesh-colour, tentacles light rose colour. Hydrorhiza and Hydrocaulus the Perisarc light brown, the coenosarc colorless.

Size: Breadth of Hydranth (aboral tentacles) 4 mm. Height, 3 mm. Hydrocaulus, 2-3 cm.

Octogenesis: Actinulæ are born with 7-9 tentacles.

Locality: Port Jackson in a depth of 10 metres.

Season: Medusostyls, May.

195. TUBULARIA GRACILIS. nov. sp.

Plate XXVII., fig. 51-32.

From a creeping Hydrorhiza Hydrocauli grow up which bear the Hydranth's terminally. The Perisarc is perfectly smooth throughout. The tentacles of the aboral verticil are about three

(1) *W. Bale.* Catalogue of Australian Hydroid Zoophytes, p. 42.
(2) *Lamouroux.* Histoire Naturelle des Coralliers flexibles, p. 232.

times as long as those in the oral circle. The former are generally recurved S—shaped, which makes the Hydranths appear so graceful. The oral tentacles are curved downwards. Between the two verticils the much branched tentacular processes are inserted, which bear the numerous Medusostyles, which appear like bunches of grapes. They are however, carried erect, and are not suspended as the Medusostyles of Tubularia indivisa for instance, although the number of Medusostyles on each process greatly exceeds that of other Tubularia with erect Genital tentacles. The Medusostyles are highly rudimentary and small They appear as simple ovoid sacs.

Colour: Tentacles white, stomach of Hydranth and Entoderm of the genital tentacles rose-coloured. Perisarc of Hydrorhiza and Hydrocaulus light yellow.

Size: Hydranths (aboral tentacles), 7 mm. across and 5mm. long. Hydrocauli 10-12 cm.

Ontogenesis. The Actinulæ are born with four tentacles.

Locality: Port Jackson, Laminarian Zone, very common.

Season: Medusostyles in May.

Note.—I have kept Hydranths with young Medusostyles alive, after they had dropped off the Hydrocaulus in consequence of being put into an Aquarium, for over a fortnight in a glass cylinder closed at both ends with muslin and submerged in the sea, and I obtained well developed Actinulæ from several of these. A few Actinulæ settled in the glass tube, but they were killed and lost by the repeated visitations to which the cylinder was subjected.

44. GENUS TIBIANA. De Lamarck.

Polyp colonies consisting of a Hydrocaulus from which stems arise which bear Polyps laterally, alternate or rarely scattered.

196. TIBIANA RAMOSA. De Lamarck.

This species was described from Australia, by De Lamarck (1.)

(1) *De Lamarck.* Histoire Nat. des animaux sans Vertébres Tom II, p. 149.

III. SUB-FAMILY ATRACTYLINÆ.

The Polypes possess a single verticil of filiform tentacles. The Medusoid buds are produced on the Hydrocaulus.

No Australian representatives of this Subfamily are known.

II. FAMILY LEPTOMEDUSIDÆ. Von Lendenfeld, 1884.

LEPTOMEDUSÆ. Haeckel.

Medusea with Ocelli or Ectodermal Otolithes and Gonads, developed in the walls of the Radial Canals

Medusæ always budding on transformed Polyps, Polypostyles and never on the alimentary Zooids.

Alimentary Zooids and Polypostyles invested by a chitinous Perisarc, and possessing one verticil of filiform tentacles with the exception of Campanopsis. Claus (1.)

I. SUB-FAMILY THAUMANTINA.

THAUMANTIDÆ. Gegenbaur.

Leptomedusæ without marginal vesicles, simple Radial Canals. Polyp colonies similar to Lafoea (2.)

45. GENUS DISSONEMA. Haeckel.

Thaumantiæ with four Gonads along the four Radial Canals, two opposite perradial tentacles. No marginal clubs or cirrhi. Polyp colonies unknown.

197. DISSONEMA SAPHENELLA. Haeckel.

This species has been obtained from Australia and described by Haeckel (1.)

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(1) C. *Claus.* Eucopidenentwickelung etc. Arbeiten Zool. Inst Wien, Band IV. Seite 89.

(2) *L. Agassiz.* North American Acalephæ. Contrib. Nat. Hist, U.S.A. Vol. IV., p. 124.

II. SUB-FAMILY. CANNOTINÆ.

CANNOTIDÆ. Haeckel.

Leptomedusæ, without marginal vesicles, with branched Radial Canals.

Polyp colonies unknown.

46. GENUS CANNOTA. Haeckel.

Cannotinæ, with four radial canals, from each of which two branches originate, so that 12 terminations occur, on each of which there is a Gonad.

198. CANNOTA DODECANTHA. Haeckel.

This species, which also occurs near the African coast has been obtained from New Guinea, and described by Haeckel (2.)

47. GENUS CLADOCANNA. Haeckel.

Cannotinæ, with six dichotomously branched radial canals. These branch dichotomously repeatedly, the branches (about 48) all extend to the ring-canal. Numerous gonads in the distal part of the branch canals.

199. CLADOCANNA THALASSINA. Haeckel.

This species from northern Australia was described first by Péron et Leseur (1), under the name Berenice thalassina. Eschscholtz (2) and L. Agassiz (3) refer to it under the same name. The Berenice euchroma of de Blainville (4), Milne

(1) *E. Haeckel.* System der Medusen. Seite 126.

(2) *E. Haeckel.* System der Medusen, Seite 151.

(1) *Péron et Leseur.* Tableau des Meduses, 1809, p. 327.

(2) *Eschscholtz.* System der Acalephen. Seite 120.

(3) *L. Agassiz.* Monograph of Acalephes. Contrib. Natural Hist., U.S.A., Vol. IV., p. 345.

(4) *De Blainville.* Actinologie, p. 276.

Edwards (1) and L. Agassiz (2), the Aequarea thalassina of de Lamarck (3) and the Cuviera euchroma of Leseur (4), are identical. Haeckel (5) has placed this species in his genus Cladocanna

200. CLADOCANNA POLYCLADA. Haeckel.

This species has been obtained at New Guinea and described by Haeckel (6).

III. SUB-FAMILY EUCOPINÆ.

EUCOPIDÆ. Gegenbaur.

Leptomedusæ, with marginal vesicles, four simple unbranched Radial Canals.

Polyp colonies mostly consisting of a creeping Hydrorhiza from which either simple Hydrocauli arise or high more or less branched stems. Terminally the Hydrocauli extend to form chitinous cups around the alimentary Zooids.

The Polypostyles are invested by a chitinous Gonangium, which has a flattened appearance.

Sometimes (Octorchis.) Claus (7.) The Polype colonies consist of Gymnoblastic Hydranths and the Medusæ bud on the ordinary Hydranths laterally (Claus l.c.)

Should, as is highly probable, more Hydromedusæ be discovered the Medusa of which were Eucopidæ, the Hydranth and Medusoid buds of which were to possess characters of our Anthomedusidæ, it would be necessary to make a new family or sub-order for these forms. At present we are not able to do this because our knowledge of the Ontogenesis of the Eucopinae is so very limited.

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(1) *Milne Edwards.* Cuvier régne animal illustré, Planche 53, fig. 3.
(2) *L. Agassiz.* Monograph of Acalephes. Contrib. Nat Hist., U.S.A., Vol. IV., p. 345.
(3) *De Lamarck.* Hist. Nat. des animaux sans Vertebres, 1817. Tom II., p. 497.
(4) *Leseur.* Recuiel des Planches (inédites) des Meduses, 1839. Planche II., fig. 2.
(5) *E. Haeckel.* Das System der Medusen. Seite 160.
(6) *E. Haeckel.* Das System der Medusen. Seite 161.
(7) *C. Claus.* Beiträge zur Kenntniss der Geryonopsiden und Eucopiden Entwicklung. Arbeiten aus dem Zoologischen Institute der Universität Wien. Band IV. Seite 89.

48. GENUS EUCOPE. Gegenbaur.

Eucopinae with eight marginal vesicles, 8 tentacles, no marginal cirrhi, no stalk to the stomach and four Gonads in the four Radial Canals. The Polypcolonies consist of much branched stems growing up from a creeping Hydrorhiza.

201. EUCOPE ANNULATA. nov. sp.

Plate XXVIII., figs. 53-57.

The Medusa.

Umbrella semiovate slightly higher than broad. Manubrium quadrangular prismatic wider at the mouth end with a slight constriction in the lower third. Connected with the Umbrella by a narrow neck. About a third as long as the Umbrella-cavity. Mouth without flaps, four cornered, the corners slightly projecting. Gonads oval in the distal third of the Radial Canals about a quarter of their length. Tentacles very short and thick about as long as a third of the height of the Umbrella. Basal bulb not very conspicuous.

The marginal vesicles contain generally two Otoliths.

Irregular Medusæ with five Radial Canals were very frequent and in those there were also five tentacles present. The pentameral form originates by one Radial Canal branching dichotomously in a greater or smaller distance from the central stomach.

Colour: Medusa colourless. Gonads light yellow.

Size: Height of Umbrella, 2·5 mm.; breadth, 2 mm.

The Polyp Colony.

From a creeping reticulate anastomosing Hydrorhiza stems rise up which are much branched, all branches diverge at small angles, so that thecolony attains the shape of a populus pyramidalis. The branches are annulated *throughout*, but the transverse incisions are deeper near the base than near the Hydranths.

The Hydranths are invested by conic, thin and transparent cups, they possess a single verticil of 30-35 (mostly 32) tentacles, and a wide mouth.

The Polypostyles on which the Medusæ bud, are invested by long nearly cylindrical Gonothecæ.

The Polypostyle has the shape of a simple tube, which is spread out laterally at the terminal end. Numerous Medusæ bud in each Gonophor.

Colour : Perisarc light brown. The depth of colour depends on the thickness of the Perisarc. Entoderm of Polypostyles dark brown, in the other parts light brown.

Size : The stems attain a height 12-16 mm.

Ontogenesis unknown.

Locality: Laminarian Zone, Lyttleton, New Zealand.

Season : Gonophores produce Medusæ in June and July.

49. GENUS OBELIA. Péron et Leseur.

Eucopinæ with eight adradial marginal vesicles and numerous tentacles (12-24 or more often over two hundred.) Marginal vesicles at the axial side of the base of the tentacles. No marginal cirrhi, four Gonads on the four Radial Canals. Subumbrella with rudimentary velum. No stalk to the stomach.

Polyp colonies with a much branched stem and elongate Gonophores. The Perisarc smooth, generally with a few transverse incisions at the proximal end of each branch.

202. OBELIA GENICULATA. Allman.

This cosmopolitan species has been observed on the Southern Coast of Australia and on the Coast of New Zealand by Caughtrey (1.) I have observed a Hydromedusa which I am inclined to place in this species in Port Jackson. This one however, differs from the ones I have seen at home, but not sufficiently to make a new species of it.

203. OBELIA AUSTRALIS. nov. sp.

The Medusa is not known to me in the adult stage. At the time of liberation it is similar to a newly-born Obelia geniculata for instance.

The Polype colony however, presents a few peculiarities by which it differs from other species of Obelia. The stem of this Obelia is creeping, adnate to foreign bodies, to which it clings like a Hydrorhiza. The stem bears Hydranths on very short annulated stalks, and also a few very short branches with nearly sessile Hydrothecæ. These creeping stems are short, and take their origin from a distinct Hydrorhiza, which differs from the creeping stem by the much greater thickness of its Perisarc and by the numerous anostomoses which cause it to attain a reteform appearance. The Gonophores have the ordinary elongate shape.

Colour: Perisarc of Hydrorhiza reddish brown. Perisarc of stem and branches light orange. Entodermal Epithelium of Polypostyles, Medusa buds and the proximal part of the stomach of the Hydranths brown.

Size: Length of creeping stems 12-16 mm., erect branches, 3-4 mm.

Ontogenesis unknown.

Locality: East coast of New Zealand, Sumner, Laminarion zone.

Season: Gonophores produce Medusæ from May to July.

50. GENUS TIAROPSIS. L. Agassiz.

Eucopinæ with eight adradial marginal vesicles and numerous tentacles (16 or more up to 300). Eight marginal vesicles with numerous Otolithes, always *between* two tentacles. No marginal cirrhi. Four Gonads around the four Radial Canals, no stalk to the stomach. Polyp colonies unknown.

204. TIAROPSIS MACLEAYI. nov. sp.

Plate XXIII., fig. 37.

I have named this beautiful, but unfortunately rare Medusa after the worthy patron of Zoology in the Australian Colonies. The Umbrella is flat, corresponding to about the quarter of a sphere, twice as broad as high. Stomach quadrangular, prismatic, about $\frac{1}{3}$ as long as the Umbrella cavity, mouth with four very small lips. Gonads along the upper two-thirds of the Radial Canals. Tentacles about 100, short and slender, with small basal Ocellus, which is however, perceptible only at the base of a few tentacles and makes the impression of a rudimentary organ, Eight large marginal vesicles. The structure of these vesicles differs in so far from the ordinary auditory organs of the kind, as its inner wall is produced into numerous folds *between* which the Otoliths lie. Polyp colony unknown.

Colour: Medusa light rose-coloured. Gonads dark red. Bulbs at the base of the tentacles and Entoderm of the stomach brown. Tentacles nearly colorless.

Size: The largest adult specimen measurtd 12 mm. across, and was 5 mm. high.

Ontogenesis. The first stages at the development of the ovum were traced, and it appears that the development of this Hydromedusa is most like that desciibed by H. Fol (1) of Geryona. The cells of the blastula, when 32 in number divide *irregularly* in a similar way as in Geryonia (l.c.) A division between a clear Entodermal, and an opaque Ectodermal portion does not take plac in such a manner as in Geryonia. Ectoderm and Entoderm are nearly alike as far as the *contents* of the cells are concerned ; they differ only in shape. The cells of the delaminated Entoderm are higher and altogether much bulkier than the cells of the Ectoderm. All the Embryos died at a certain age, when they consisted of about 200 cells, so that the further development could not be traced.

(1) *H. Fol.* Die erste Entwickelung des Geryonidencies, Jenaische Zeitschrift. Band VII.

Locality: Port Jackson.

Season: April, July.

51. GENUS MITROCOMIUM. Haeckel.

Eucopinæ with sixteen marginal vesicles and eight tentacles (4 perradial and 4 interradial); marginal cirrhi between them. Four Gonads along the Radial canals. No stalk to the stomach. Polyp colonies unknown. The structure of the marginal vesicles was studied by the brothers Hertwig (1.)

205. MITROCOMIUM ANNAE. nov. sp.

Plate XXIX., fig. 58-60.

Umbrella flat, resembling a low cone and not watch-glass shaped. Twice as broad as high. Stomach globular, small, with four interradial dark spots, connected with the Umbrella by a narrow neck only, about a third as long as the height of the Umbrella-cavity. Mouth with four extended membranous lips, which have radial grooves but no other folds. Gonads oval, close to the ring-canal, and joined to the radial canal by a narrow neck. Eight tentacles, with globular basal bulbs $1\frac{1}{2}$ times as long as the diameter of the Umbrella. On each side of the tentacle-bulbs a small bunch of short cirrhi. Sixteen marginal vesicles between the tentacle bulbs. No marginal bulges. A black Ocellus on the abaxial side of each tentacle-bulb. Polyp colonies unknown. I have named this species after my wife, who discovered it in the "Auftrieb."

Colour: Medusa colorless, Gonads pale greenish-yellow. Entoderm of stomach brown. Ocelli black.

Size: Height of Umbrella, 2·5 mm.; breadth, 5 mm.

Ontogenesis unknown.

Locality: Port Jackson, rare. I obtained only 5 adult specimens during the autumn.

Season: Autumn, April-June.

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(1) *O. und R. Hertwig*. Das Nervensystem und die Sinnesorgane der Medusen. Seite 90.

52. GENUS EUTIMALPHES. Haeckel.

Eucopinæ, with eight adradial marginal vesicles and numerous tentacles (12-16 or more). Between them marginal cirrhi. Four Gonads in the course of the four Radial Canals. A long stalk to the stomach.

Polyp colonies unknown.

206. EUTIMALPHES PRETIOSA. Haeckel.

This species, obtained in Australian waters, was described by Haeckel (1).

IV. SUB-FAMILY EUCOPELLINÆ. Von Lendenfeld. 1883.

Medusa without stomach, highly developed organs of sense, no tentacles, eight marginal vesicles. Four radial canals, which send branches into the Gonads.

Alimentary Zooid, with 32 tentacles and a Perisarc. Blastostyle consisting of four radial tubes, between which the Medusæ bud.

Ova formed as in the Campanularinæ in the Hydrorhiza.

53. GENUS EUCOPELLA. Von Lendenfeld.

Characters of the Sub-Family. The structure, both of the Medusa and the Polyp colonies was investigated by von Lendenfeld (2).

The Polyps are histologically very highly developed. Sub-epithelial muscular and nervous layers were discovered, not only in the Ectoderm but also in the Entoderm. Particularly a ring of nerve-fibres and ganglia cells in the Entoderm of the proboscis. The shape of the chitinous cups varies very much, and there are forms with thick Hydranth cups living in the open sea and such with slender cups in the harbour. The cells in the threads which connect the Coenssarc with the Perisarc are considered as gland-cells which secrete Chitin and occasionally resorb it.

(1) *E. Haeckel.* Das System der Medusen. Seite 195.
(2) *Von Lendenfeld.* Eucopella Campanularia. Zeitschrift für wiss. Zool. Band XXXVIII., Seite 497.

The Medusa differs as far as its histology is concerned, not essentially from other Craspedotæ.

The ova are Entodermal, the sperma is Ectodermal. The formation of the Medusa bud led the author to consider the Umbrella cavity as a cœlom.

207. EUCOPELLA CAMPANULARIA. Von Lendenfeld.

This species is very abundant in Port Phillip and other places on the Coast of Victoria, and has been described by Von Lendenfeld (1.)

V. SUB-FAMILY AEQUORINÆ.

AEQUORIDÆ. Eschscholtz.

With marginal vesicles and numerous (at least 8) often branched Radial Canals

The Polype colonies are known of a single species only (Zygodactyla vitrina. L. Agassiz)

The Hydranth is characterized by a thin membrane, which joins the tentacles at their base. The Hydranths are invested by a Perisarc with a lid consisting of numerous pieces.

54. GENUS ZYGOCANNA. Haeckel.

Aequoridæ with numerous 16 or more dichotome Radial Canals. To every branch a Gonad is attached, which may be simple or bilamellar. Stomach without stalk, broad and long. Margin of mouth split into numerous folded mouth flaps. Polype colonies unknown.

208. ZYGOCANNA COSTATA. Haeckel.

This species was obtained on the Coast of New Guinea and described by Haeckel (1.)

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(1) *Von Lendenfeld.* Eucopella Campanularia. Zeitschrift für wissenschaftliche Zoologie. Band XXXVIII. Seite 497.

(1) *E. Haeckel.* Das System der Medusen. Seite 214.

209. ZYGOCANNA PLEURONOTA. Haeckel.

This species wasobtained off Arnheim's Land, North Coast of Australia, and described by Péron et Leseur (1) under the name Aequorea pleuronota. Leseur (2), refers to it under the same name. Eschscholtz (3) describes it as Polyxenia pleuronota. Haeckel (4) refers it to the Genus Zygocanna.

55. GENUS ZYGOCANNOTA. Haeckel.

Aequoridæ with twelve dichotome Radial Canals. Crisp-shaped Gonads in the shape of composed branches at the terminations of the 24 branches. Stomach broad and flat without stalk. Mouth wide. Margin of mouth simple without flaps or frils.

210. SPECIES ZYGOCANNOTA PURPUREA. Haeckel.

This species was obtained off the Western Coast of Australia, and described by Péron et Leseur (5), as Aequorea purpurea. Leseur (6), Milne Edwards (7), and L. Agassiz (8), mention it under this name. Eschscholtz (9), describes it as Polyxenia purpurea. Haeckel (10) places it in the Genus Zygocannota.

56. GENUS ZYGOCANNULA. Haeckel

Aequoridæ with numerous, 16 or more, dichotome Radial Canals. A Gonad on each branch. Stomach at the termination of a large conical stalk, split up into mouth-flaps. The splits reach nearly to the stalk. Mouth-flaps large and folded.

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(1) *Péron et Leseur.* Tableau des Meduses. 109, p. 338.
(2) *Leseur.* Recueil des Planches (inédites) des Meduses, 1839, Planche XI., fig. 3-6.
(3) *Eschscholtz.* System der Acalephen, 1829. Seite 119.
(4) *E. Haeckel.* Das System der Medusen. Seite 215.
(5) *Péron et Leseur.* Tableau des Meduses, 1809, p. 337.
(6) *Léseur.* Recueil des Planches des Meduses (inédites) Planche XI, fig. 1, 2.
(7) *Milne Edwards.* Cuvier régne animal illustré Zoophytes. Planche 43. Fig. 3.
(8) *L. Agassiz.* Monograph of Acalephae. Contributions to the Natural History of the U.S A. Vol. IV., p. 360.
(9) *Eschscholtz.* System der Acalephen, 1829. Seite 119.
(10) *E. Haeckel.* Das System der Medusen. Seite 215.

211. ZYGOCANNULA DIPLOCONUS. Haeckel.

This species was obtained in the Sundasee, and described by Haeckel (1).

212. ZYGOCANNULA UNDULOSA. Haeckel.

This species was obtained off Arnheim's land, north coast of Australia, and described by Péron et Leseur (2) as Æquorea undulosa. Leseur (3) mentions it as Æquorea undulosa, Lesson (4) describes it as Polyxenia undulosa and Haeckel (5) refers it to the genus Zygocannula.

57. GENUS ÆQUOREA. Péron et Leseur.

Æquoridæ, with numerous Radial Canals (16-32 or more), which take their origin separately from the central stomach. The latter broad and flat without Œsophagus-tube. Lateral stomach wall rudimentary, very low. Mouth wide open. Margin of mouth simple, without flaps or frils.

213. ÆQUOREA EURHODINA. Péron et Leseur.

This species was obtained from Bass' Straits, and described by Péron et Leseur (6) is also mentioned by Leseur (7), L. Agassiz (8) and Haeckel (9) under the same name.

58. GENUS RHEGMATODES. A. Agassiz.

Aequoridæ with numerous simple Radial Canals (16-32 or more.) These are simple and originate separately from the stomach. Stomach small, funnel-shaped, reversed conic, constricted below. Lateral wall of stomach high and richly folded. Mouth aperture, small and narrow. Margin of mouth simple, smooth, or crispy, without flaps or frils.

Polyp colonies unknown.

(1) *E. Haeckel.* Das System der Medusen. Seite 216.
(2) *Péron et Leseur.* Tableau des Meduses, 1809, p. 338.
(3) *Leseur.* Recueil des Planches (inédites), pl. XII., figs. 1-4.
(4) *Lesson.* Acaléphes, 1843, p. 314.
(5) *E. Haeckel.* Das System der Medusen. Seite 217.
(6) *Péron et Leseur.* Tableau des Meduses, 1809, p. 336.
(7) *Leseur.* Recueil de Planches des Meduses (inédites). Planche IX.
(8) *L. Agassiz.* Monagraph of Acalephæ. Contribution to the Nat. Hist. of the U.S A., Vol. IV., p. 359.
(9) *E. Haeckel.* Das System der Medusen. Seite 220.

214. RHEGMATODES THALASSINA. Haeckel.

This species was obtained off Arnheim's Land, North Coast of Australia. It was described by Péron et Leseur (1), under the name Aequorea thalassina, Aequorea eganca, Péron et Leseur (2) is identical. De Blainville (3) mentions the latter only. L. Agassiz (4) refers to both.- Haeckel (5) places this species in the Genus Rhegmatodes.

12. FAMILY CAMPANULINIDÆ. Von Lendenfeld, 1884.

Colonies of Polyps which are differentiated into alimentary Zooids with one verticil of filiform tentacles and generative Polypes, Polypostyles without mouth or tentacles. Both kinds of Zooids are invested by chitinous capsules. The Polypostyles only, produce by budding sexual Zooids, which are rudimentary Medusæ and never become free.

No Australian representatives of this family are known.

13. FAMILY HYDRACTINIDÆ. Von Lendenfeld, 1884.

HYDRACTINIDÆ. Claus (?).

Polyp colonies with free or rudimentary Medusæ. The free Medusæ belong to Haeckel's Sub-family Cytæidæ, and posses Ocelli at the base of the tentacles, and no Otoliths. The tentacles are scattered and equally distributed. With simple Mouth-arms.

The Polyp colonies consist of a dense mass of entwined Hydrorhizæ from which the Hydrocauli, simple or slightly branched grow forth. The alimentary Zooids possess one verticil of filiform tentacles. The Medusæ bud from the Hydrorhiza, or on mouthless Polyps, Polypostyles, rarely on the alimentary Polyps. Besides the alimentary and Generative Zooids we meet with defensive Spiral Zooids. (P. Wright.)

(1) *Péron et Leseur.* Tableau des Meduses. 1809. Planches (inédites.)
(2) *Péron et Leseur.* Tableau des Meduses, 1809. Planches (inédites.)
(3) *De Blainville.* Actinologie, 1834, p. 277.
(4) *L. Agassiz.* Monograph of Acalephæ. Contrib. Nat. Hist. U.S.A. Vol. IV.
(5 *E. Haeckel.* Das System der Medusen. Seite 222.

I. SUB-FAMILY CYTÆINÆ

CYTÆIDÆ. Haeckel.

Producing free Medusæ, which bud from the Hydrorhiza. No Australian species.

II. SUB-FAMILY HYDRACTININÆ,

Medusæ bud on Polypostyles, remain sessile and become rudimentary (or immersed in the basal plate ?)

59. GENUS CERATELLA. Gray (?)

Hydrophyton irregularly dichotomous. Perisarc dark brown. Hydranths, Polypostyles, and Medusoid buds unknown. The detailed description of the skeleton by Gray (1) is worthless.

215. CERATELLA FUSCA. Gray.

Gray (2) and Carter (3) mention this species, which was obtained from Bondi, near Sydney, in all probability washed up on the sands.

60. GENUS DEHITELLA. Gray. (?)

Hydrophyton dichotomous, Perisarc dark brown. Perisarc of Spiral zooids vertical on the stem and branches. (?) Differs from Ceratella by the equal distribution of the "tufts of spicules."

216. DEHITELLA ATRORUBENS. Gray.

It is doubtful whether this species described by Gray (4) and Carter (5) is Australian.

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(1) *Gray.* Proc. Zool. Soc. of London, November, 1868.

(2) *Gray.* Proceedings of the Zoological Society of London, November, 1868.

(3) *Carter.* Annals and Magazine of Natural History, January 1873.

(4) *Gray.* Pooc. Zool. Soc., London, November, 1868.

(5) *Carter.* Ann. Mag. Nat. Hist., January, 1873.

III. SUBORDER HYDROCORALLINÆ.

Moseley.

ALIMENTARY ZOOIDS WITH FEW VERTICILLATE, CAPITATE TENTACLES. HYDRORHIZA FORMING A DENSE CALCAREOUS SKELETON WHICH ALSO INVESTS THE POLYPES. GROUPS OF MACHOPOLYPES, IN THE FORM OF TENTACULAR ZOOIDS, SURROUND THE ALIMENTARY POLYPES.

Ultimately generative Zooids are probably Medusæ.

14. FAMILY. STROMATOPORIDÆ. Murie and Nicholson.

Possessing undulating laminæ in the skeleton.

No Australian representatives are known of this extinct family of the Hydrocorallinæ.

15. FAMILY. MILLEPORIDÆ. Mosely.

Alimentary Zooids, with from 4 to 6 tentacles. Polypary with many conic spaces, divided by Tabulæ. Coenenchym with reticulating canals.

Dactylozooids, with numerous tentacles. Ampullæ absent.

61. GENUS MILLEPORA. Mosely.

The calcareous skeleton attains different shapes. The colonies have an uneven surface. In the centre of each irregular group of Dactylozooids one Alimentary Zooid.

217. MILLEPORA TORTUOSA. Dana.

This species was dredged off Fiji, and described by Dana (1).

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(1) *Dana.* United States Exploring Expedition, Zoophyta, Phila 1846, p. 545.

62. GENUS ARACHNOPORA. Tenison-Woods.

The colony spreading like a small thin web over Corals.

218. ARACHNOPORA ARGENTA. Tenison-Woods.

This single species of the above Genus was described by Tenison Woods (1), without mentioning the locality, probably Australia.

16. FAMILY STYLASTERIDÆ. Moseley.

Alimentary Zooids with from 4 to 12 tentacles. Massive Hydrosome containing tubes which possess pseudosepta formed by the regular position of the tentacular Zooids.

Dactylozooids devoid of tentacles, Gonangia contained in Ampullæ.

63. GENUS DISTICHOPORA. Lamarck.

Pores sporadic, Dactylopores of one kind only. Pores simple in a triple linear row at the lateral edges of the branches of the flabellum rarely on its faces.

219. DISTICHOPORA VIOLACEA. Pallas.

This species has been dredged North of Australia in several places, and described by Pallas (2) and Tenison Woods (3.)

220. DISTICHOPORA ROSEA. Kent.

This species is found on the East Coast of Australia. It was described by Kent (4.)

221. DISTICHOPORA COCCINEA. Gray.

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(1) *Tenison-Woods*. On a new Genus of Milleporidæ. Proceedings of the Linnean Society of New South Wales. Vol. III., p. 8,

(2) *Pallas*. Elenchus Zoophytorum.

(3) *Tenison Woods*. On the Anatomy of Distichopora. Transactions of the Royal Society of New South Wales. Vol. XIII., p. 61.

(4) *S. Kent*. On Corals, etc. Proceedings of the Zoological Society of London, 1871, p. 281.

This species is found on the north-east coast of Australia. It has been described by Gray (1).

222. DISTICHOPORA GRACILIS. Dana.

This species was dredged off the Paumatu Islands and described by Dana (2).

223. DISTICHOPORA LIVIDA. Tenison-Woods.

This species was obtained from several places in the north of Australia, and described by Tenison-Woods (3).

64. GENUS STYLASTER. Gray.

Pores occurring in regular cyclo-systems. Both kinds of pores with styles, Corallum increasing by regular alternate germination of the cyclosystems from one another. Gasterozooids with eight tentacles.

224. STYLASTER GRACILIS. Milne Edwards et Haime.

This species was obtained near the Australian shore, and described by M. Edwards et Haime (4).

225. STYLASTER SANGUINEUS. Valenciennes.

This species, which also occurs at Florida (Pourtale's), was obtained near Australia and New Zealand. It was described by Valenciennes (5).

226. STYLASTER GEMMASCENS. Milne Edwards et Haime.

This species, obtained from the Indian Ocean, was described by M. Edwards et Haime (6),

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(1) *T. E. Gray.* Proceedings of the Zoological Society of London, 1860, p. 244.

(2) *T. Dana.* United States Exploring Expedition. Zoophytes, Phila 1846. p. 151.

(3) *Tenison-Woods.* Proceedings of the Linnean Society of New South Wales, Vol. IV.

(4) *M. Edwards et Haime.* Coralles etc, Annales des Sciences Naturelles 3 Ser. Tom XIII., p. 98.

(5) *Valenciennes.* In M. Edward et Haime Coralles etc., Annales des Sciences Naturelles 3 Ser, Tom XIII , p. 96.

(6) *M. Edwards et Haime.* Histoire Naturelle des Coralles. Tom II., p. 130.

65. GENUS CRYPTOHELIA. Milne Edwards et Haime.

Pores in regular cyclo-systems. Styles absent, Gastro zooids without tentacles. Gastropores with two chambers. Summits of the cyclosystems covered by a lid.

227. CRYPTOHELIA PUDICA. Milne Edwards et Haime.

This species has been obtained from New Guinea and many other places. It has been described by Milne Edwards and Haime (1).

IV. SUBORDER, TRACHOMEDUSINÆ.
Von Lendenfeld, 1884.

TRACHOMEDUSÆ. CLAUS.

HYDROMEDUSÆ WHICH ARE MEDUSÆ, AND ARE PROPAGATED SEXUALLY WITHOUT A CHANGE OF GENERATION AND WITHOUT FORMING POLYPOID ZOOIDS. MEDUSÆ WITH ENTODERMAL ACAUSTIC CLUBS.

17. FAMILY TRACHOMEDUSIDÆ. Von Lendenfeld, 1884.

TRACHOMEDUSÆ. Haeckel,

The Gonads are developed in the walls of the Radial Canals,

1. SUB-FAMILY PETASINÆ.

PETASIDÆ. Haeckel.

With 4 Radial Canals, with long tube-shaped stomach. Acaustic clubs free or in vesicles on the margin of the Umbrella.

No Australian species.

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(1) *M. Edwards et Haime.* Annales des Sciences Naturelles, 3 Ser. Tom. XIII., p. 93.

II. SUB-FAMILY TRACHONEMINÆ.

TRACHONEMIDÆ. Gegenbaur.

With 8 Radial Canals, with long tube-shaped stomach.

No Australian species.

III. SUB-FAMILY AGLAURINÆ.

AGLAURIDÆ. L. Agassiz.

With 8 Radial Canals and with a pedicle to the stomach.

66. GENUS STAURAGLAURA. Haeckel.

Aglauridæ with 4 Gonads in connection with 4 alternating Radial Canals, the other 4 Canals sterile. Gonads on the stalk of the stomach not on the Subumbrella. The 4 acaustic clubs in the interradii.

228. SPECIES STAURAGLAURA TETRAGONIMA. Haeckel.

This species was obtained in Australian waters and described by Haeckel (1.)

IV. SUB-FAMILY GERYONINÆ.

GERYONIDÆ. Haeckel.

Four or 6 radial tubes, leaf-shaped Gonads. Long stomach pedicle, 8 or 12 marginal peroniæ, and as many acustic vesicles.

67. GENUS GERYONIA. Péron et Leseur.

Geryoninæ with six Gonads in the vicinity of the six Radial Canals, without centripetal Canals. Only 6 permanent hollow perradiale, tentacles (no interradial ones.) Twelve acaustic vesicles (6 primary interradial ones and 6 secondary perradial ones.).

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(1) *E. Haeckel.* Das System der Medusen. Seite 277.

229. GERYONIA DIANAEA. Haeckel.

This species was described by Quoy et Gaimard (1) under the name Dianaea endrachtensis (= Gaberti.) De Blainville (2) describes this Medusa as Dianaea Gaberti, Eschscholtz (3), as Eirene endrachotensis and L. Agassiz (4) as Orythia viridis. Haeckel (5), named it Geryonia dianaea.

This species was obtained off the West Coast of Australia near Endracht's Land.

68. GENUS CARMARIS. Haeckel.

Geryonidæ, with six Gonads in connection with the six Radial Canals, between which coecal canals run centripetally from the ring canal. Twelve permanent tentacles (6 hollow perradial ones and 6 solid interradial ones). Twelve auditory vesicles (6 primary interradial and 6 secondary perradial.)

230. CARMARIS GILTSCHII. Haeckel.

This species was obtained in Australian waters and described by Haeckel (6).

18. FAMILY. NARKOMEDUSIDÆ. Von Lendenfeld, 1884.

NARKOMEDUSÆ. Haeckel.

Trachomedusæ, with gastral gonads.

I. SUB-FAMILY. CUNANTHINÆ.

CUNANTHIDÆ. Haeckel.

With broad pouch-shaped Radial Canals, with Otoporpa.

No Australian species.

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(1) *Quoy and Gaimard* Voyage de l'Uranie et la Physicienne. Zoology, p. 566.
(2) *De Blainville.* Actinologie, p. 289.
(3) *Eschscholtz.* System der Acalephen. Seite 94.
(4) *L Agassiz.* Monograph of Acalephæ, Contrib. Nat. Hist. U.S.A., Vol. IV., p. 363.
(5) *E. Haeckel.* System der Medusen. Seite 295.
(6) *E. Haeckel.* System der Medusen. Seite 296.

II. SUB-FAMILY. PEGANTHINÆ.

PEGANTHIDÆ. Haeckel.

Without Radial Canals and without gastral pouches in the sub-umbrella. With Otoporpa.

No Australian species.

III. SUB-FAMILY. ÆGININÆ.

ÆGINIDÆ. Gegenbaur.

Circular canal in communication with the gastral cavity by double peranial tubes. With gastral pouches without Otoporpa.

69. GENUS ÆGINURA. Haeckel.

Æginidæ, with eight perradial double canals and eight tentacles (four perradial and four interradial) and with sixteen interradial genital pouches.

231. ÆGINURA MYOSURA. Haeckel.

Haeckel (1) describes this species, which was obtained in Australian waters.

IV. SUB-FAMILY. SOLMARINÆ.

SOLMARIDÆ. Haeckel.

Without circular canal and without Otoporpa, with or without Radial Canals.

No Australian species.

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(1) *E. Haeckel.* Das System der Medusen. Seite 343.

STATISTICS OF THE AUSTRALIAN HYDROMEDUSÆ.

In the following table I have enumerated all the known Australian species.

I comprise within the Australian area the South Coast of New Guinea, Fiji, New Zealand, Australia and Tasmania, and the Islands South-west of Fiji.

The total number of species is 231, which are distributed among 69 genera.

Hydropolypinæ..................	176
Hydromedusinæ	40
Hydrocorallinæ..................	11
Trachomedusinæ	4

This list is an extract from the five papers on the subject published in these proceedings. Besides the older authors, De Lamarck, Lamouroux, M. Edwards, Busk, and others who described some Australian species, we are mainly indebted to W. Thompson, Coughtrey, Bale, Kirchenpauer and Haeckel for our present knowledge of the species.

The number of species which I have described for the first time is 30. The table is arranged according to the system expounded in the introduction of this Monograph.

THE AUSTRALIAN HYDROMEDUSÆ.

I. Suborder Hydropolypinæ.

1. Family. Hydridæ

1. Genus Hydra

1. H. oligactis. Pallas
2. H. fusca. Linné
3. H. viridis. Linné

2. Family Clavidæ

1. Sub-family Clavinæ
2. Genus Clava

4. C. simplex. Von Lendenfeld

2. Sub-family Corininæ

3. Family Eudendridæ

3. Genus Eudendrium

5. E. generale. Von Lendenfeld
6. E. pusillum. Von Lendenfeld

4. Family Myriothelidæ

5. Family Blastopolypidæ

1. Sub-family Cordylophorinæ
2. Sub-family Bimerinæ
3. Sub-family Campanularinæ
4. Genus Campanularia

7. C. urnigera. De Lamarck
8. C. macrocyttaria. De Lamarck
9. C. costata. Bale
10. C. tincta. Hincks

5. Genus Laomedea.

11. L. antipathes. Lamouroux
12. L. Torresii. Busk
13. L. reptans. Lamouroux
14. L. Lairii. Lamouroux
15. L. marginata. Von Lendenfeld
16. L. rufa. Von Lendenfeld
17. L. undulata. Von Lendenfeld

6. Genus Lafoea

18. L. fructicosa. Sars

7. Genus Halecium

19. H. tenellum. Hincks

4. Sub-family Sertularinæ

8. Genus Lineolaria.

20. L. spinulosa. Hincks
21. L. flexuosa. Bale

9. Genus Sertularia

22. S. fertilis. Von Lendenfeld
23. S. irregularis. Von Lendenfeld
24. S. operculata. Linnè
25. S. bispinosa. Coughtrey
26. S. trispinosa. Coughtrey
27. S. Maplestonei. Bale
28. S. bidens. Bale
29. S. pulchella. W. Thomson
30. S. australis. W. Thomson
31. S. penna. Bale
32. S. elongata. Lamouroux
33. S. unguiculata. Busk
34. S. germinata. Bale
35. S. flexilis. W. Thomson
36. S. tridentata. Busk
37. S. recta. Bale

38. S. macrocarpa. Bale
39. S. divergens. De Lamarck
40. S. tenuis. Bale
41. S. bicornis. Bale
42. S. trigonostoma. Busk
43. S. acanthostoma. Bale
44. S. insignis. W. Thomson
45. S. crenata. Bale
46. S. tuba. Bale
47. S. patula. Busk
48. S. orthogonia. Busk
49. S. minima. Bale
50. S. minuta. Bale
51. S. loculosa. Busk
52. S. conferta. Bale
53. S. grosse-dentata. Bale
54. S. arbuscula. Lamouroux
55. S. tubiformis. Bale
56. S. turbinata. Bale
57. S. obliqua. De Lamarck
58. S barbata. Bale
59. S. typica. Von Lendenfeld
60. S. rigida. Lamouroux
61. S. distans. Lamouroux
62. S. tridentata. Lamouroux
63. S. scandens. Lamouroux

10. Genus Diphasia

64. D. symmetrica. Von Lendenfeld
65. D. pinnata. Agassiz
66. D. attenuata. Hincks
67. D. digitalis. Bale
68. D. mutulata. Bale
69. D. subcarinata. Bale

11. Genus Sertularella

70. S. microgonia. Von Lendenfeld
71. S. polyzonias. Gray

72. S. indivisa. Bale
73. S. solidula. Bale
74. S. macrotheca. Bale
75. S. lævis. Bale
76. S. pygmaea. Bale
77. S. Johnstoni. Gray
78. S. divaricata. Busk
79. S. neglecta. W. Thompson
80. S. ramosa. Thomson

12. Genus Pasythea

81. P. quadridentata. Lamouroux
82. P. hexodon. Busk

13. Genus Idia

83. J. pristis. Lamouroux

14. Genus Thuiaria

84. T. fenestrata. Bale
85. T. quadridens. Bale
86. T. lata. Bale

6. Family Graptolithidæ

I. Graptoloidæ

A Monoprionidæ

1. Sub-family Monograptinæ

2. Sub-family Leptograptinæ

3. Sub-family Dichograptinæ

15. Genus Didymograpsus

87. D. fruticosus. Hall
88. D. quadribrachiatus. Hall
89. D. bryonoides. Hall
90. D. octobrachiatus. Hall
91. D. Logani. Hall

92. D. extensus. Hall
93. D. caducens. Salter
94. D. gracilis. Hall
95. D. Thureani. McCoy
96. D. Headi. McCoy

16. Genus Cladograpsus

97. C. ramosus. Hall
98. C. furcatus. Hall

4. Sub-family Dicranograptinæ

B. DIPRIONIDÆ

5. Sub-Family Diplograptinæ

17. Genus Diplograptus

99. D. mucronatus. Hall
100. D. pristis. Hisinger
101. D. rectangularis. McCoy
102. D. palmeus. Barrande

18. Genus Climacograptus

103. C. bicornis. Hall

6. Sub-family Phyllograptinæ

19. Genus Phyllograptus

104. P. folium. Hisinger

II. RETIOLOIDEA

7. Sub-family Glassograptinæ
8. Sub-family Gladiograptinæ

20. Genus Retiolithes

105. R. australis. McCoy

7. Family Plumularidæ

21. Genus Plumularia

106. P. companula. Busk
107. P. Buski. Bale
108. P. aglaophenoides. Bale

109. P. obconica. Kirchenpauer
110. P. radia. Kirchenpauer
112. P. Ramsayi. Bale
113. P. cornuta. Bale
114. P. producta. Bale
115. P. filicaulis. Pœppig
116. P. setaceoides. Bale
117. P. delicatula. Bale
118. P. Goldsteinii. Bale
119. P. obliqua. Hincks
120. P. spinulosa. Bale
121. P. P. pulchella. Bale
122. P. Hyalina. Bale
123. P. compressa. Bale
124. P. australis. Kirchenpauer
125. P. filamentosa. De Lamarck
126. P. sulcata. De Lamarck
127. P. scabra. De Lamarck
128. P. laxa. Allman
129. P. gracilis. Von Lendenfeld
130. P. rubra. Von Lendenfeld
131. P. Torresia. Von Lendenfeld
132. P. tripartita. Von Lendenfeld

22. Genus Antennularia

133. A. cylindrica. Bale
134. A. cymodocea. Busk

23. Genus Sciurella

135. S. indivisa. Allman

24. Genus Acanthella

136. A. effusa. Busk

25. Genus Heteroplon.

137. H. pluma. Allman

27. Genus Aglaophenia

138. A. Kirchenpaueri. Von Lendenfeld

139. A. plumosa. Bale
140. A. urens. Kirchenpauer
141. A. squarrosa. Kirchenpauer
142. A. rubens. Kirchenpauer
143. A. longicornis. Kirchenpauer
144. A. phœnicæ. Kirchenpauer
145. A. Huxleyi. Busk
146. A. divaricata. Bale
147. A. ramosa. Bale
148. A. parvula. Bale
149. A. pluma. Lamouroux
150. A. delicatula. Busk
151. A. crucialis. Lamouroux
152. A. formosa. Kirchenpauer
153. A. aurita. Busk
154. A. brevirostris. Busk
155. A. Macgillivrayi. Bale
156. A. ramulosa. Kirchenpauer
157. A. brevicaulis. Kirchenpauer
158. A. flexuosa. Lamouroux
159. A. fimbriata. Bale
160. A. glutinosa. Lamouroux

28. Genus Diplocheilus

161. D. mirabilis. Allman

29. Genus Halicornaria

162. H. superba. Bale
163. H. ascidioides. Bale
164. H. Baileyi. Bale
165. H. furcata. Bale
166. H. hians. Bale
167. H. Haswelli. Bale
168. H. longirostris. Bale
169. H. humilis. Bale
170. H. prolifera. Bale
171. H. ilicistoma. Bale

30. Genus Halicornopsis

172. H. avicularis. Bale

31. Genus Azygoplon

173. A. rostratum. Allman

31. Genus Pentandra

174. P. parvula. Von Lendenfeld

175. P. Bailei. Von Lendenfeld

8. Family Dicorynidæ

32. Genus Dicoryne

176. D. annulata. Von Lendenfeld

II. Suborder Hydromedusinæ

9. Family Anthomedusidæ

1. Sub-family Codoninæ

33. Genus Sarsia

177. S. radiata. Von Lendenfeld

178. S. minima. Von Lendenfeld

34. Genus Dicodonium

179. D. dissonema. Haeckel

35. Genus Euphysa

180. E. Australis. Von Lendenfeld

2. Sub-family Tiarinæ

36. Genus Tiara

181. T. papua. Haeckel

37. Genus Turritopsis

182. T. pleurostoma. Haeckel

183. T. lata. Von Lendenfeld

3. Sub-family Margelinæ

38. Genus Lizusa

184. L. prolifera. Von Lendenfeld

39. Genus Limnorea

185. L. triedra. Péron et Leseur

40. Genus Nemopsis

186. N. favonia. Haeckel

4. Sub-family Cladoneminæ

41. Genus Pteronema

187. P. Darwinii. Haeckel

188. P. ambiguum. Haeckel

10. Family Tubularidæ

1. Sub-family Pennarinæ

42. Genus Pennaria

189. P. australis. Bale

190. P. rosea. Von Lendenfeld

191. P. Adamsia. Von Lendenfeld

2. Sub-family Tubularinæ

43. Genus Tubularia

192. T. Ralphii. Bale

193. T. pygmæa. Lamouroux

194. T. spongicola. Von Lendenfeld

195. T. gracilis. Von Lendenfeld

44. Genus Tibiana

196. T. ramosa. De Lamarck

3. Sub-family Atractilinæ

11. Family Leptomedusidæ

1. Sub-family Thamantinæ

45. Genus Dissonema

197. D. saphenella. Haeckel

2. Sub-family Cannotinæ

46. Genus Cannota

198. C. dodecantha. Haeckel

47. Genus Cladocanna

199. C. thalassina. Haeckel

200. C. polyclada. Haeckel

3. Sub-family Eucopinæ

48. Genus Eucope

201. E. annulata. Von Lendenfeld

49. Genus Obelia

202. O. geniculata. Allman

203. O. australis. Von Lendenfeld

50. Genus Tiaropsis

204. T. Macleayi. Von Lendenfeld

51. Genus Mitrocomium

205. M. Annæ. Von Lendenfeld.

52. Genus Eutimalphes

206. E. pretiosa. Haeckel

4. Sub-family Eucopellinæ

53. Genus Eucopella

207. E. Campanularia. Von Lendenfeld

5. Sub-family Aequorinæ

54. Genus Zygocanna

208. Z. costata. Haeckel

209. Z. pleuranata. Haeckel

55. Genus Zygocannota

210. Z. purpurea. Haeckel

56. Genus Zygocannula

211. Z. diploconus. Haeckel

212. Z. undulosa. Haeckel

57. Genus Aequorea

213. A. eurhodina. Péron et Leseur

58. Genus Rhegmatodes

214. R. thalassina. Haeckel

12. Family Campanulidæ

13. Family Hydractinidæ

1. Sub-family Cytæinæ

2. Sub-family Hydractininæ

59. Genus Ceratella

215. C. fusca. Gray

60. Genus Dehitella

216. D. atrorubens. Gray

III. Suborder Hydrocorallinæ

14. Family Stromatoporidæ

15. Family Milleporidæ

61. Genus Millepora

217. M. tortuosa. Dana

62. Genus Arachnopora

218. A. Argentea. T. Woods

16. Family Stylasteridæ

63. Genus Distichopora

219. D. violacea. Pallas
220. D. rosea. S. Kent
221. D. coccinea. Gray
222. D. gracilis. Dana
223. D. livida. T. Woods

64. Genus Stylaster

224. S. gracilis. M. Edwards
225. S. sanguineus. Valenciennes
226. S. gemmascens. M. Edwards

65. Genus Cryptohelia

227. C. pudica. M. Edwards

IV. Suborder Trachomedusinæ

17. Family Trachomedusidæ

1. Sub-family. Petasinæ
2. Sub-family. Trachineminæ
3. Sub-family. Aglaurinæ

66. Genus Staaraglaura

228. S. tetragonima. Haeckel

4. Sub-family Geryoninæ

67. Genus Geryonia

229. G. dianæa. Haeckel

68. Genus Carmaris

230. C. Giltschii

18. Family Narcomedusidæ

1. Sub-family Cunanthinæ
2. Sub-family Peganthinæ

3. Sub-family Aegininæ

69. Genus Æginura

231. A. myosura. Haeckel.

4. Sub-family Solmarinæ

EXPLANATION OF PLATES.

Plate XX.

Fig. 31.—Sarsia radiata, adult Medusa, 1:20.

Fig. 32.—Two Hydranths of Sarsia radiata, 1:20.

Plate XXI.

Fig. 33.—Euphysa australis, adult Medusa, 1:20.

Fig. 34.—Sarsia minima, young Medusa, 1:30.

Fig. 35.—Sarsia minima, Polyp colony, 1:6.

Plate XXII.

Fig. 36.—Turritopsis lata, the adult Medusa, 1:30.

Plate XXIII.

Fig. 37.—Tiaropsis Macleayi, the adult Medusa, 1:7.

Fig. 38.—Lizusa prolifera, the adult Medusa, 1:10.

Fig. 39.—Lizusa prolifera, mouth, Radial Canal and Tentacle-bunch seen from below, 1:30.

Plate XXIV.

Fig. 40.—Pennaria rosea, a terminal Hydranth, 1:30.

Fig. 41.—Pennaria rosea, Polyp colony, natural size.

Fig. 42.—Pennaria rosea, female Medusostyle, 1:25.

Plate XXV.

Fig. 43.—Pennaria Adamsia, female Medusostyle, 20:1.

Fig. 44.—Pennaria Adamsia, male Medusostyle, 20:1.

Fig. 45.—Pennaria Adamsia, Polyp colony, natural size.

Fig. 46.—Pennaria Adamsia, longitudinal section through the base of a Hydrocaulus, 1:50.

Fig. 47.—Pennaria Adamsia, a pinna, 1:6.

Fig. 48.—Transverse section through a filiform tentacle, T Oc II.

Plate XXVI.

Fig. 49.—Pennaria Adamsia, terminal Hydranth, 1:20.

Fig. 50.—Tubularia spongicola with Medusostyles producing actinulæ, seen from above, 1:10.

Plate XXVII.

Fig. 51.—Tubularia gracilis, producing actinulæ in the Medusostyls, 1:10.

Fig. 52.—Tubularia gracilis, producing actinulæ in the Medusostyls, 1:10.

Plate XXVIII.

Fig. 53.—Eucope annulata, adult Medusa, 1:20.

Fig. 54.—Eucope annulata, a marginal vesicle, C Oc II.

Fig. 55.—Eucope annulata, an irregular Medusa (young) with five Radial Canals as seen from below, 1:20.

Fig. 56.—Eucope annulata, Polyp colony, natural size.

Fig. 57.—Eucope annulata, Polyp colony, 1:15.

Plate XXIX.

Fig. 58.—Mitrocomium Annæ, adult Medusa, 1:15.

Fig. 59.—Mitrocomium Annæ, Medusa, section through a tentacle-bulb, Oc I.

Fig. 60.—Mitrocomium Annæ, adult Medusa seen from below, 1:25.

MUSCULAR TISSUES IN HYDROIDS POLYPES.

By R. von Lendenfeld, Ph.D.

Plate XXX.

The muscular tissue of the Cœlenterata is produced like that of all Metozoa from the two germinal layers of the gastrula embryo. In some of the orders this process is carried out direct; the muscles are epithelial. In others the muscles are produced from the Mesoderm, and therefore do not appear epithelial. The Hydromedusæ, Syphonophora, Schyphomedusæ, and Antozoa belong to the first group. The musculai fibres at first appear as processes of the centripetal part of the epithelial cells (1), with higher development division of labour occurs; some of the epithelcells lose whilst others retain the locomotory function. At the same time the muscular cells retreat from the surface, which is finally exclusively formed by the non-muscular covering cells. The muscular cells and their fibres form a layer between the Mesoderm (Stüzlamelle) and the covering Epithelium (2.) The shape of the muscular lamella obviously depends on the shape of the supporting membrane. As long as the latter remains simple and unfolded, the muscular lamella cannot attain a higher degree of development. This is, however, achieved in many cases in the following manner:—The supporting lamella forms longitudinal ridges, and in this

(1) N. *Kleinenberg*. Hydra, Leipzig, 1872. Seite 15.

(2) *O. und R. Hertwig*. Die Actinien. Jenaische Zeitschrift. Band XIV., Seite 47.

manner the surface is increased. The muscular lamella occupies the sides of these ridges, and so there are many more fibres to the same surface ; the muscle is higher developed and stronger. Such structures have been found in the Medusæ (1) belonging to the Hydromedusæ, in the Syphonophora (2) in the Scyphomedusæ (3), and in the Anthozoa Actiniaria (4), and Pennatulidæ (5.)

At first the muscular lamella covers the whole surface of the folded supporting lamella, but with higher development the ridges of the supporting lamella become very narrow, and the muscles lie only on their sides. The exterior margins of this lamella are continued into processes which are the stalks of the epithelial cells (6.) The centrifugal parts of this lamella may coalesce, and so an apparently Mesodermal muscle is produced. Such structures have been observed in the ring-muscle of the Actiniæ by Hertwig (7), and in the marginal tentacle of Charybdea by Claus (8.) No complication of the muscular tissue which could be compared to the

(1) *O. und R. Hertwig*. Der Organismus der Medusen. Jena. 1878, Seite 8.

(2) *C. Claus* Uber Halistemma tergestinum. Arbeiten aus dem Zoologischen Inststute, Wien, 1878. Seite 7.

(3) *Von Lendenfeld*. Uber Cealenteraten der Südsee, Cyanea Annaskala. Zeitschrift fur wissenschaftliche Zoologie. Band XXXVII., Seite 511-526.

E. Haeckel. Monographie der Medusen, Zweiter Theil. Jena., 1881, Seite 147.

(4) *Von Lendenfeld*. Zur Histologie der Actinien. Zoologischer Anzeiger, Band VI., Seite 189.

O. und R. Hertwig. Die Actinien. Jenaische Zeitschrift, Band XIII., Seite 567, and elsewhere.

Von Heider. Cerianthus membranaceus Haime. Sitzungsberichte der K. Academie der Wissenschaften in Wien. Band LXXIX., Seite 27, and elsewhere.

(5) *A. Kölliker*. Die Pennatuliden. Abhandl. d. Senkenb. Naturf. Gesellschaft. Band VII, VIII., Frankfurt a. M., 1872.

(6) *Von Lendenfeld*. Zur Histologie der Actinien. Zoologischer Anzeiger. Band VI., Seite 189.

(7) *R. Hertwig*. Die Actinien der Challenger expedition. Jena., 1882, Tafel VI.

(8) *C. Claus*. Ueber Charybdea marsupials. Arbeiten aus dem Zoologischen Institute, Wien, 1878.

high development of the muscle in the Cœlenterata mentioned above, has as yet been described of the Hydroid-Polyps. I have however, been enabled to prove that such structures also occur in these least developed forms of all Cnidaria. The Hydroid-Polyps which produce the Sarsia radiata, V. Lendenfeld, have the peculiar habit of bending themselves down at a joint situated at the base of the Hydranth between it and the top of the Perisarc tube which surrounds the Hydrocaulus. This movement is executed with such precision and rapidity, that I was led to believe that there must be a special organ adapted for this purpose.

The Perisarc-tube of the Hydrocaulus terminates obliquly so that the margin has the shape of an oblique ellipse. In longitudinal and transverse sections even with a low power a bundle of longitudinal fibres can be detected, which is 0·5 mm. long and spindle-shaped. It covers that part of the supporting lamella which lays on the side of the Hydranths towards which it bends round. As well by means of osmic acid as by the application of warm solution of corosive sublimate (1) it is easy to kill the Polyps in different positions. If the re-agent does not act quickly, if it is too weak when it reaches the Hydranth, the latter always shuts up entirely and is fixed in this position. Bent down half the Polyps are never fixed, but it is very easy to harden the Polyps in an upright position. This muscle which I name Flexor is peculiar to Sarsia radiata, and no similar structure has, as far as I know, ever been observed in Hydroid-Polyps. We shall see that the histological structure is very different from the ordinary occurrence in the Hydro-Polyps. This structure reminds us of the complicated muscles of the free swimming

(1) *A. Weissman*, Die Entstehung der Sexuazellen bei den Hydromedusen. Iena., 1883, Seite 13.

Polypo-medusæ and Syphonophoræ. In an ordinary transverse-section a radial structure of this muscle can be detected. By means of very fine transverse sections we can obtain an insight into the minute structure.

From the structureless supporting lamelia longitudinal supporting ridges rise up on the sides of which muscular fibres are situated. The free margins of these ridges are continued into the centripedal ends of the epithelial cells, which form the Ectodermal Epithelium. These are at the same time Chitin-gland cells ; near the outer margin they appear slightly striped radially, and are continued into the substance of the cuticle or the Perisarc, according to whether the section has been made in a higher or a lower part.

The section, fig. 1, lies in the same height as that in fig. 4 ; the thin cuticule is cut.

In adult animals these cells are not entirely filled with Protoplasm attached by a broad basal surface to the inner surface of the Cuticle, these cells appear as pyramids with a radially situated axis. Centripetally their width rapidly decreased, and they continue without apparent limit into the margin of the supporting ridges. The space between the basal ends of these cells and between the opposite muscular lamellæ is taken up by a granulose mass in which nuclei can be made visible by coloring. A great many of these nuclei probably belong to the sub-epithelial muscular cells. Whether some of them belong to ganglia-cells appears doubtful, but I consider it nevertheless highly probable. Part of this mass probably also consists of nerve fibres. There are accordingly longitudinal bands of tissue which are vertical on the surface of the Hydranth. Between every pair of muscular bands lies a band, consisting of nervous fibres and ganglia cells. These are enclosed on the outer side by ordinary epithelial-cells.

Similar structures were first observed by Claus (1) in an Aphacella, and Brothers Hertwig (2) have independently described similar muscles in the Craspedote Medusæ. Identical structures are met with in Actiniæ, Acraspedæ and Pennatulidæ, although they vary very much, still we find that in so far they resemble one another, that the muscular cells principally cover the *lateral* surfaces of the supporting ridges, and do not occur on the free margins. Very often they are also wanting in the valley between the supporting ridges.

Although earlier observers did not take any notice of this fact, still it appears from the figures, that there are no muscles on the free margin of the supporting lamella. In all cases observed by me, the supporting ridges are very thin, the margin of them is continued into the epithelial cells, and I suppose that this pertains also in the cases mentioned above. In every case these muscular bands consist of striated band-shaped fibres as they were first described by Brücke (3.)

They are attached to a supporting lamella with a *narrow* side.

By these facts I have been led to the following explanation of these structures :—The epithelial cells are in connection with the supporting lamella by centrepetal processes. These processes are scattered irregularly over the originally plain surface of the supporting lamella. The muscular epithelial cells occupy the spaces between the stalks of the epithelial cells. If the supporting lamella forms folds so that a greater surface is attained to meet the exigencies of the increasing work that has to be done by the

(1) *C. Claus.* Ueber Halëstemma tergestinum. Arbeiten aus dem Zoologisehen Institute. Wien 1878. Seite 8.
(2) *O. R. Hertwig.* Der Organismus der Medusen.
(3) *E. Brücke.* Ueber die mikroskopischen Elemente, welche den Schwimmuskel der Medusa aurita bilden. Sitzngber. A. K. Akademie der Wissenschaft, Wein. Band, XLVIII.

muscular layer, then the stalks of the epithelial cells move upward and finally occupy the ridges which have been formed, whilst the muscular cell adhering closely to the supporting lamella forms a continuous layer on the sides and at the bottom of the valley. The nervous elements which always lie above the muscular layer of course, then fill the part of the valley which has not been occupied by the muscular elements. In the case of the tentacles of some Actinæ indifferent tissue is formed between the muscular and nervous layers (1.)

Such structures, however, appear rare, and have, as far as I know, not been observed anywhere else. A muscle, such as that described above of Sarsia radiata, however, is a structure very similar to that in other Coelenterata; also here the same causes have produced the same effect independently of each other.

Explanation of Plate XXX.

Sarsia radiata.

Fig. 1.—Transverse section through the base of a Hydranth. L. Oc. I.

Fig. 2.—Three Hydranths in different positions.

a.—bent down half.

b.—erect.

c.—bent down quite.

Fig. 3.—Longitudinal section through the basal portion of the Hydranth along the plain in which the Hydranth bends. DD. Oc. I.

S. layer of Chitin in the Perisarc.

Fig. 4.—Transverse section through the base of the Hydranth. DD. Oc. I.

M. Musculus Flexor.

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(1) *Von Lendenfeld.* Zur Histologie der Actinien, Zoologisher Anzeiger. Band VI. Seite 189.

NOTES ON THE FIBRES OF CERTAIN AUSTRALIAN HIRCINIDÆ.

By R. von Lendenfeld, Ph.D.

Among the numerous Sponges of the Australian shores which I am examining at present, there is a series of forms which possess the filaments characterising the Hircinidæ. These filaments are of the same shape as those of Hircina (F. E. Schulze. Zeitschrift für Wissenschaftliche Zoologie. Band XXXIII, pl. IV.), but they do not appear so smooth. With high powers (Zeiss $\frac{1}{12}$) it is possible to detect minute spots on their surface and similar spots also occur on the fibres of the horny skeletons. I am rather inclined to consider the latter as the expression of the Spongoblasts, and I do not think it altogether impossible that Spongoblasts *also form* the filaments and cause in some cases their spotted appearance.

In a few species I have observed filaments apparently growing out from ordinary fibres. It is highly probable, that the filaments get into contact with the fibre and are then fixed there by succeeding layers of Spongiolin. It is however, possible that this occurrence is not so accessory, in which case we would have to suppose that the filaments were parts of the horny fibrous skeleton of the sponge.

Another suggestion has however occurred to me in consequence of the observations of some Oscillarians in Ceraosponges. These Oscillarians are of equal length with the filaments and of similar shape, only much thicker; and it appears not improbable that these may cause the formation of the filaments in the following manner:—The Oscillarians infest the Sponges and have on the Sponge-tissue the same physiological effect as a grain of sand or other foreign body would have. In Sponges as in higher animals foreign bodies are always encrusted by the substance the skeleton is made of. Particles of sand which enter the Sponge are covered by a thin layer of horny substance.

They are consequently soon covered by a thin layer of horny substance, which may suffice to kill them. Their substance is absorbed by the Sponge, and the vacant space filled with horn-substance. In this way a structure could be arrived at, which is similar to an Oscillaria as far as the shape, and similar to the horn-fibres as far as the chemical structure, is concerned.

A series of these Hirsinidæ possesses a horn fibre skeleton, which is very different from the skeleton of the known Hircinidæ, but differs also from any known form of horny fibre.

Numerous minute horny fibres running in various directions and continually anastomosing form a column of reticulate horny-substance which corresponds to an ordinary main fibre. It is hardly thicker than the homologous fibres in other Ceraosponges. A great number of Hircinidæ possess this character.

Fleming described (Würzburger physikalisch-med. Verhandl. II., Seite 1) extraordinary cells in the fibres of Janthella. I have had occasion to study similar highly pigmented cells in some hornsponges which possess filaments. These pigment cells are large and distributed in pretty regular cylindrical layers between the layers of horny substance in the fibres. These cells cause the deep black colour of the fibres, but certainly have nothing whatever to do with the *growth* of the horny fibres as Carter assumes. (On the development of the fibre of the Spongida Ann., Mag. (5) VII., p. 112).

These cells might possibly also turn out to be small algæ, which like the yellow cells in other animals live symbiotic with the Sponge.

Their constant occurrence in certain species cannot influence the hypothesis, as the yellow cells in higher Coelenterata are also always found in the same species.

ON THE MYRTACEÆ OF AUSTRALIA.

By Rev W. Woolls, Ph.D., F.L.S.

The Myrtle family, occurring as it does both within and without the tropics, may be regarded as one of the most useful and extensive families of the Vegetable Kingdom. It is also easily recognised, for the leaves are for the most part opposite, exstipulate, and filled with dots of volatile oil, whilst the venation is marked by a marginal or intramarginal vein. The species are naturally divided into capsular and berried, the former being wholly or chiefly Australian, and the latter widely spread both in the New and Old World. Only one species, *Myrtus communis,* now grows wild in Europe (and that is supposed to have been introduced from Persia), though there is reason to believe, that, during the eocene period when the climate of that division of the globe was much warmer than it now is, Myrtaceous trees flourished there with other plants of an Australian aspect. These trees, which some regard as the last vestiges of the organic creation peculiar to the primitive world, now appear in great abundance in Australia, the *Myrtaceæ* alone, according to Baron F. von Mueller, reckoning between 600 and 700 species and constituting by far the greater portion of the native forests. In the distribution of these trees and shrubs, there is a peculiarity which is somewhat perplexing, for whilst, in some portions of the continent, they occur in undue proportion to the rest of the vegetation, they are limited in others to half the number of genera and a sixth of the species, as will appear from the following estimate of Baron Mueller.

	Genera.		Species.
Western Australia	25	..	379
New South Wales	18	...	145
Queensland	23	...	132
Victoria	13	...	78
South Australia	11	...	70
North Australia	17	...	68

The following genera with one or two exceptions, are limited to Western Australia :—

Actinodium.
Verticorda (except one species in N. Australia).
Pileanthus.
Lhotzkya (except two in S. Australia and one in Victoria).
Wehlia.
Astartea.
Hypocalymma.
Balaustion.
Agonis (except one in Queensland).
Conothamnus.
Beaufortia.
Regelia.
Phymatocarpus.
Calothamnus.
Lamarkea.
Eremæa.

Sir Joseph Hooker, in referring to the primitive character of the Western Flora, remarks :—"That no natural order, but that many Genera, and a whole Flora of species, should be created in the smaller and more isolated area of Western Australia, different from what Eastern Australia presents, seems at first sight favourable to the idea that these derivative Genera and species were formed during the gradual migration of certain orders and Genera of the East towards the West. But, on the other hand, this massing of most of the peculiar features of the Australian Flora in the West, unmixed there with Polynesian, Antarctic, or New Zealand Genera, is an argument for regarding Western Australia as the centrum of Australian Vegetation, whence a migration proceeded eastward ; and the eastward Genera and species must in such a case be regarded as derivative forms." These considerations of a quarter of a century since have received additional illustration from the labours of Mr. Bentham and Baron Mueller, who now show, that, in the great order of the Myrtaceæ alone, Western

Australia is not only rich in species, but that in its Flora generally there is "a singular uniformity, purely Australian without admixture of any other element."

Of the Myrtaceous order not found in Western Australia, but occurring in greater or less abundance along the Eastern and Northern Costs, the following genera may be enumerated :—

CAPSULAR.	BACCATE.
1. *Tristania.*	5. *Rhodomyrtus.*
2. *Metrosideros.*	6. *Myrtus.*
3. *Backhousea.*	7. *Rhodamnia.*
4. *Osbornia.*	8. *Fenzlia*
	9. *Decaspermum.*
	10. *Eugenia.*
	11. *Acicalyptus.*
	12. *Barringtonia.*
	13. *Careya.*
	14. *Sonneratia.*

1. *Tristania* (including *Lophostemon*) has eight species in Australia, of which four belong to N. S. Wales. Besides these, there are two in N. Caledonia, and four in the Indian Archipelago.

2. *Metrosideros* (with which Baron Mueller unites *Syncarpia*) is dispersed over the Islands of the Pacific and Indian Archipelago from New Zealand to the Sandwich Islands.

3. *Backhousea* is a genus confined to Australia, and so far as known, does not extend beyond Queensland and N. S. Wales.

4. *Osbornia*, a genus constituted by F. von Mueller is represented by one species in N. Australia and the Islands adjacent.

5. *Rhodomyrtus* has four species in Eastern Australia, and there is another widely distributed over the Indian Archipelago and extending to China.

6. *Myrtus* is common to the New and Old World, and the Australian species are limited to Queensland and N. S. Wales.

7. *Rhodamnia* is spread over Tropical Asia, and four species are divided between Queensland and N. S. Wales.

8. *Fenzlia* is purely a genus of E. and N. Australia.

9. *Decaspermum* (*Nelitris* of Fl. Aust.) has in Queensland one species only and that is common to the Indian Archipelago and the Philippine Islands.

10. *Eugenia* has 20 species in E. Australia, four of which occur in the East Indies and the Archipelago, *E. jambolana* in particular being very common there and yielding a fruit much eaten.

11. *Acicalyptus* is the "Scaly-bark Tree" of Lord Howe's Island (Frag. Vol. 8, p. 15).

12. *Barringtonia* is a genus confined to the Tropics of the Old World but having two species in Queensland and one in N. Australia.

13. *Careya* has three East Indian species, one of which in Queensland and N. Australia is supposed to be identical with *C. arborea.*

14. *Sonneratia* (placed amongst Lythrarieæ in the Fl. Aust.) has one species common to the Indian Archipelago and W. Australia.

It appears, therefore, that whilst 16 Myrtaceous Genera are peculiar to Western Australia and do not extend beyond it (except in two or three cases), there are 14 Genera in N. and E. Australia, which are common to other regions, and not found near what is termed "the centrum of Australian Vegetation." Mr. Bentham, in the concluding preface to the 7th Vol., of the *Flora Australiensis,* confirms the views of Hooker in the Essay already quoted, and is of opinion, that, although the predominant portion of the Australian Flora is strictly indigenous; yet that a number of genera whose main station is in Tropical Asia extend more or less into Tropical and Eastern Australia, thereby giving to the vegetation of E. Queensland an Asiatic character. In alluding to that part of Australia where some of the Myrtaceous genera, as seen in the foregoing list, are strictly endemic, the same illustrious author speaks of "the remarkable isolation and highly differentiated character of the Flora in the south-west corner." Amongst the genera so isolated, are *Darwinia* and *Verticordia,* the one with 37 and the other with 38 species. These with several other genera are not represented in the south-east extremity of the continent, whilst of the large genus *Melaleuca* with its 100 species only 11 are found in any part of Victoria. Judging from the greater area and the physical geography of the S.E., region, one would imagine that it would present a much richer Flora than that of the S.W., but such is not the case; and the fact remains yet unexplained. If we could adopt the theory of regarding W. Australia as a kind of centrum from which species emigrated to other parts of Australia, it might be argued that a sufficient period of time had not yet elapsed for a more equalised distribution of species; but then, so far as geclogical considerations may be permitted to influence our conclusions, the comparative ages of the rocks lead to an opposite opinion, for, according to the phenomena recorded by geologists, the mountains of the East are far loftier and the rocks of a much greater age than the depressed area of the West (Jukes as quoted by Hooker). The distribution of *Eucalyptus* does not throw much light on the question. This genus with the exception of a few species extending to Timor and New Guinea, is entirely Australian, and, according to Baron Muller's recent estimate, the species occur in the following order:—

Western Australia	46
New South Wales	50
Queensland	37
Victoria........................	35
South Australia	28
North Australia	25

Here again, as in the great majority of the Australian Myrtaceæ many species are endemic in the West and do not extend from it. By Baron Muller's recent investigations, he finds that at least 37 species (and some of these differing very widely from any of the Eastern forms) are peculiar to W. Australia. Of the remainder, one occurs in N. Australia and Queensland, five in Victoria, and N. S. Wales, and eight in South Australia. *E. rostrata*, so far as yet known, is the only species common to all parts of the continent. The number of the Western species will be considerably increased when the Tropical vegetation of W. Australia has been more thoroughly examined and described, for, in the opinion of Baron Mueller, there are probably some thirty species yet to be added to the genus, though many of them are only small trees or shrubs. How many of these may be endemic has to be determined, but it seems tolerably certain, that in *Eucalyptus*, as well as in the Myrtaceæ generally W. Australia will predominate over the other colonies in the number and peculiarity of the species. Other orders of plants, common to W. Australia and South Africa, led Sir Joseph Hooker to offer a speculative theory as to the probability "that the peculiar Australian Flora may have inhabited an area to the westward of the present Australian Continent." Since the publication of Hooker's Essay in 1859, the Flora of Australia has been zealously elucidated by the labours of Mr. Bentham and Baron Mueller, and the former, in the concluding preface to the last volume of the *Flora Australiensis*, gives it as his opinion "that the predominant portion appears to be strictly indigenous. Notwithstanding an evident though very remote ordinal tribual or generic connection with Africa, the great mass of purely Australian species and endemic genera, must have originated or been differentiated in Australia, and never have spread far out of it." *Eucalyptus*, indeed, as already remarked is somewhat exceptional as regards Timor and New Guinea, but so far as the Myrtaceæ are considered generally, the capsular genera, comprehending the vast majority of species in all parts of the continent are almost exclusively Australian. How far the labours of geology may assist in determining the comparative age of our Flora, its connection with forms of vegetation long past, and its distribution in different regions, remains yet to be seen.

THE MARINE ANNELIDES OF THE ORDER *SERPULEA*. SOME OBSERVATIONS ON THEIR ANATOMY, WITH THE CHARACTERISTICS OF THE AUSTRALIAN SPECIES.

By William A. Haswell, M.A., B.Sc.

[Plates XXXI. to XXXV.]

In the following paper are given the results of some observations and researches which I have made during the last few months on the *Serpulea* of Port Jackson. The number of species which I have made the subject of investigation is limited; but it comprises representatives of all the principal sub-divisions of the group. These differ very little from their European allies, and there is nothing specially to characterise the Australian members of the order so far as I have had the opportunity of investigating them. To the notes on the species which I have myself examined I have added the descriptions of others previously described by other writers as found on the Australian Coast.

The researches of Claparède (1) on the minute structure of the sedentary Annelides have left but little to be done by his successors, and I find that the results of a considerable amount of work comprise but few facts which were not previously observed and illustrated by the Genevese *savant*. There are, however, two subjects in which I think I have been enabled to add to our knowledge of the group, and to those I have mainly confined myself in the following notes on the anatomy.

(1) "Recherches sur la Structure des Annélides Sédentaires," Geneva, 1873; "Annélides Chétopodes du Golfe de Naples," Genève et Bâle, 1868, with Supplement, 1870; "Glanures Zootomiques parmi les Annélides de Port Vendres," 1868; "Beobachtungen über Anatomie und Entwickelungsgeschichte wirbelloser Thiere."

The methods of preparation which I have employed are mainly the following:—For dissociation of elements, such as muscular fibres or epithelial cells, I have used immersion in weak alcohol (90% alcohol 1 part, water 2 parts) for two or three days; followed by picrocarmine and Farrant's solution. For hardening I have found the corrosive sublimate and alcohol method preferable to any other. The most perfect stain for the general histology of the tissues is effected by an absolute alcohol solution of eosin, followed by Kleinenberg's hæmatoxylin, both dyes being used very dilute and the process being extended over four or five days. The chloroform-paraffin method of Giesbrecht (1), though a little tedious, is preferable to any other method of embedding for the present group as for most others, and particularly so when employed in conjunction with Caldwell's invaluable ribbon method of cutting sections with the automatic microtome. The series are best fastened to the slide with a weak solution of gum arabic (2), and the paraffin removed with benzol, which should be followed by oil of cloves and Canada balsam dissolved in chloroform. In cases in which sections prepared as above show, on examination before final mounting in balsam, that some part which may be specially required is not adequately stained, the following fluid will be found useful,—

Saturated solution of hæmatoxylin in absolute alcohol, 100 c.c.

Oil of cloves 100 c.c.

Saturated solution of alum in water, 2 c.c.

This fluid mixes with the benzol and does not cause solution of the gum arabic; its action, owing to its clarifying effect on the tissues, can be watched with great ease. It should be removed and replaced by oil of cloves before balsam is added, as, should any of it be allowed to mix with the balsam, a process of slow staining will still go on after the sections are mounted.

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(1) "Zur Schneide Technik," Zool. Anz., 1881, No. 92.

(2) J. H. L. Flögel, Zool. Anz. VI., 565.

PSEUDOHÆMAL SYSTEM.

The vascular system of the *Serpulea* has been treated of by several anatomists—among the number Williams (1), Milne-Edwards (2), Grube (3), Quatrefages (4), and Clarparède (5.) The most detailed account of the course of the circulation is given by the last-named author, who studied it chiefly in *Spirographis Spallanzanii*, but ascertained that the same general arrangement holds good in the *Serpulidæ*. The leading peculiarity of the pseudohæmal system of this family, as of the Sabellidæ, the Ammocharidæ, the Ariciidæ and the Chætopteridæ, consists in the presence of a peri-intestinal vessel or sinus excavated in the muscular wall of the alimentary canal, and extending from the hinder extremity of the body as far as forwards as the œsophagus and stomach. This peri-intestinal sinus takes the place of the dorsal vessel found in other Annelids. It terminates in front, according to Claparède, by breaking up into a network of small vessels, which again further forward are gathered up into several larger trunks, the two most important of these being the branchial vessels. Throughout the greater length of the body the peri-intestinal sinus is accompanied on the ventral side by a ventral vessel. This gives off a pair of branches in each segment, and ends in the thoracic region by breaking up into smaller vessels, which join the capillary plexus.

"Le mode de circulation chez les Sabelliens devient compréhensible par la description qui précède. Les ondes de contraction du sinus intestinal chassent le sang d'arrière en avant, comme il est facile de s'en assurer sur le vivant. Ce sang remplit le plexus œsophagien, et les deux vaisseaux branchiaux ont des parois contractiles grâce à un développement musculaire remarquable. Une onde de contraction, parcourant d'arrière en avant les vaisseaux branchiaux, chasse le sang jusqu'aux dernières

(1) British Association Report, 1851, p 187.
(2) "Recherches pour servir à l' histoire de la circulation du sang chez les Annélides" Ann. Sci. Nat. 2me. sér. X., p. 193.
(3) "Anatomie der Kiemenwürmer."
(4) "Histoire Naturelle des Annelés marins et d'eau douce."
(5) "Recherches sur la structure des Annélides sédentaires."

extremités des rayons branchiaux et vide en grande partie les deux troncs principaux; puis une onde de contraction en sens contraire ramène le sang dans le plexus. Là, le sang oxygéné se mélange avec le sang veineux, le plexus étant un réservoir commun. Il s'engage dans tous les vaisseaux qui naissent du plexus, en particulier, dans le vaisseau ventral qui le porte en arrière jusqu' à l'extremité du corps. On doit remarquer que le jeu alternatif du plexus à la périphérie et de la périphérie au plexus, n'existe pas seulement pour les vaisseaux branchiaux, mais encore pour tous les vaisseaux qui naissent en dessus du plexus. C'est le cas en particulier pour le grand tronc vasculaire de la collarette, tronc unique de chaque côté" (1.)

It is somewhat remarkable that prior to the time of the publication by Claparède of his "Recherches sur la structure des Annélides Sédentaires," the existence of a dorsal vessel was almost invariably postulated by those who studied the pseudohæmal system of the Serpulea. Thus Milne-Edwards (2) in describing the vessels of *Sabella* states. "On y trouve un vaisseau dorsal très grêle accolé au tube digestif et reçevant au niveau de chaque cloison interaunulaire une paire de branches transversales qui viennent des parties laterales du corps."

To M. A. de Quatrefages (3) is due the credit of having first called attention to the existence of a peri-intestinal vessel or sinus; though Grube had already remarked on the absence of a dorsal-vessel proper. The account which the former author gives of the course of the circulation is quoted by Claparède (4), as showing that he was not aware of the absence of a dorsal vessel; but his words may, I think, very well bear a different interpretation. They are—"Chez les Sabelliens, les Terébelliens, les Chlorémiens, *on voit* le sang ariver d'arrère en avant jusqu' à la base des branchies par le grand tronc supérieur, remplir l'espèce de sinus

(1) L. c., p. 81.
(2) "Recherches pour servir à l'histoire de la circulation du sang chez les Annelides," Ann. des Sc. Nat. 2e série, t X., pp. 129 et seq.
(3) Histoire Naturelle des Annelés, tome II., p. 406.
(4) l. c., p. 78.

qui s'y trouve; pénétrer dans l'organe respiratoire, en sortir et suivre une marche inverse d'avant en arrière par le tronc inférieur." Here the "grand tronc supèrieur" must be the peri-intestinal sinus, not the dorsal vessel, and the view of the course of the blood is, on the whole, correct.

In some of the species in which I have specially studied the circulation, the arrangement is somewhat different from that described by Claparède as obtaining in Spirographis, so that there would seem to be considerable variation in this respect even within the limits of a single family.

In all the intestine is surrounded throughout the greater part of its length by a peri-intestinal sinus which gives off numerous branches to the segments. In *Eupomatus elegans*, this sinus ends in front in the œsophageal region of the body and opens into a short wide dorsal sinus or cardiac sac (pl. XXXI., fig. 2, *d. s.* and fig. 3, *h. t.*); passing off from this in front are a pair of trunks (fig. 2, *d. b. v.*) which run forwards and outwards for a short distance to the base of the branchiae where each unites with a similar branch from the ventral vessel to form the common branchial vessel (*c. b. v.*) of the right or the left side as the case may be. The latter runs in an arched manner along the bases of the branchiæ giving off a single branch to each of them, and one to the operculum and the pseudoperculum. The ventral vessel (fig. 1, *a*; fig. 2, *v. v.*) is a distinct wide trunk which is continued along the whole length of the body beneath the peri-intestinal sinus; in front it bifurcates, each of the branches presenting a contractile dilatation (fig. 2, *v'. v'.*) at its base, and in front communicating with the branches from the dorsal sinus to form the common branchial vessels as above described. The rich network of capillaries in the collarette and lateral flaps receives its blood from the ventral vessel, and the circulation is here, as in the branchiae, a to-and-fro one, the same vessels acting both as afferent and efferent trunks for the capillary networks.

The course of the blood in *Eupomatus* is as follows:—

The blood which enters the peri-intestinal sinus by the segmental vessels is carried forward by peristaltic contractions to the cardiac sac; from this it is driven at intervals forwards to the common branchial vessels, from which it passes by the vessels of the branchial stems to the extremity of the branchiae; returning by the same course it enters the lateral ventral trunks and passes thus to the ventral vessel by which it is distributed to the capillary networks of the collarette and lateral flaps and to the body generally. That all the blood constantly and regularly takes this course is not to be supposed; the absence of valves, the constant and irregular contractions of the body of the worm interfere with any such regularity; but the above may be taken as an accurate general account of the course of the circulation in this species.

In *Pomatoceros* the arrangement of the vessels is much more like that described by Claparède as occurring in *Spirographis*. In the abdominal region the principal trunks are the peri-intestinal vessel, an exceedingly minute ventral vessel, situated between the widely separated nerve cords, and several other trunks, mostly longitudinal in direction, which lie in the peri-intestinal space and are covered by a layer of granular cells. In the front of the thoracic region (pl. XXXV., fig. 2) the peri-intestinal vessel becomes divided into a large dorsal vessel or cardiac sac *d. v.*), and a series of about sixteen smaller vessels (*l. v.*), which run along the wall of the alimentary canal. The ventral vessel still retains its position. A little further forward the peri-intestinal vessels join the dorsal trunk, so that we have here two main vessels, a large dorsal and a very small ventral. Very soon the dorsal vessel bifurcates into two branchial vessels. The ventral vessel also bifurcates anteriorly; but whether the two ventral trunks thus formed communicate in front with the dorsal branchial vessels as in *Eupomatus* I am uncertain: it seems probable that they do, as they are traceable into the base of the lophophore.

All the vessels, as observed by Claparède, possess a muscular wall; in the smaller vessels this is only to be detected by the presence at intervals of fusiform nuclei; but in the larger trunks the layer is more distinctly developed. In the structure of the vessels the only remarkable point I have noticed is the great development in the dorsal, opercular, and branchial trunks of *Vermilia* of a relatively very thick layer of circularly arranged muscle with a few elastic fibres. A similar coat has been detected in the principal vessels of several other Annelids, s. g. *Phreoryctes*.

The blood in most of the species of *Serpulidæ* which I have examined is a light green colour. Under the action of alcohol it coagulates to form a clear clot which stains very readily with hæmatoxylin or carmine. Within the lumen of all the vessels, but usually close to the periphery, are to be observed a number of clear oval bodies (pl. XXXIV., fig. 5, *a a.*, *b.b.*) usually of $\frac{1}{7500}$th of an inch in diameter, though smaller ones are to be observed here and there. These bodies never become stained under the action of any staining fluid more intensely than the coagulum of the blood by which they are surrounded. They may be seen to lie free in the cavity of the vessel in the living animal and to move with the motion of the blood, but examination of a number of sections will show now and again one of these bodies connected with the wall of the vessel by a narrow neck which is continuous with the clear substance of the body itself. Corpuscles have been already detected in the pseudohæmal system of several genera of Annelides (1), and doubtless such of the bodies above described as lie free in the cavity of the vessel are of this nature. The occurrence, here and there, of corpuscles connected with the wall of the vessel would seem to point to the derivation of the free corpuscles from the endothelium.

SEGMENTAL ORGANS AND "TUBIPAROUS GLANDS."

The pair of large and conspicuous glands found in the anterior part of the body in the members of this group, have been set down by Claparède as the only equivalents of the "segmental

(1) J. E. Blomfield and A. G. Bourne, Q. J. Micr. Sci. XXI (1881), pp., 500-501; Mau, "Ueber Scoloplos armiger," Zeitschr für Wiss. Zool., XXXVI., p. 389, Rolleston, "Blood Corpuscles of the Annelides," Jour. Anat. Phys. XII., p. 401-419.

organs" of other Annelides (1), and he regards excretory ducts for the generative products as being entirely absent,—the ova and spermatozoa escaping either by rupture or through simple apertures in the body wall (2).

The true "segmental organs," however, which seem hitherto to have escaped notice, are entirely distinct from these large "glandes tubipares," or "organes segmentaires" of Claparède. They are found in pairs in all the segments of the abdomen. They consist of pyriform sacs (pl. XXXIV., fig. 6), densely ciliated internally and with very delicate colourless walls. These sacs open externally on the sides of the segments by slit-like apertures bordered by strong cilia, and, presumably, open also internally into the body cavity, though I have not succeeded in finding the internal opening. A somewhat unusual circumstance in connection with these organs is that, in *Eupomatus elegans* at least, they serve not only as efferent ducts for the generative products, but also as seats of development of the ova. In that species I found *in the cavity of each segmental organ* a little clump of ova in all stages of development, from the transparent immature cell to the perfectly developed ovum, with its granular interior and characteristic reddish pigment. The little group of ova in the interior of each segmental organ were closely adherent together, and rotated round and round under the action of the cilia. Alternating with the segmental organs were the true ovaries consisting of clumps of ova in various stages of development and occupying the ordinary position. In the male specimens examined I have always found the sacs empty.

These segmental organs of *Eupomatus* are of an extremely simple type; but organs of equal simplicity are known to occur in other forms, *e. g. Scoloplos* (3.) The discovery of the ova in their interior places their function beyond a doubt, though at the same time from the mode of their occurrence as a free group of

(1) L.c., p. 132.
(2) "Il est certain qu'il ne se presente nul part chez les Serpuliens d'organes segmentaires de la forme typique." l c, p. 135.
(3) Mau, Zeitscrift fur Wiss. Zool, Band XXXVI., p. 389,

ova in various stages, adding an element of perplexity. It would seem to afford additional evidence in favour of the theory that the ova may be developed from the corpuscles of the perivisceral fluid.

The so-called tubiparous glands were noticed by Huxley in *Protula Dysteri*. They were described by Quatrefages, curiously enough, as hepatic cæca, similar in their relations to the hepatic cæca of the Aphroditea (1.) They were examined more minutely by Clarparède, by whom, as above noticed, they were regarded as the sole equivalents in this family of the segmental organs. Clarparède directs attention to a great difference which he considers to exist in their disposition in the Sabellidæ and in the Serpulidæ. In the former family, he states, each "tubiparous gland" has the form of a tube bent on itself, the two branches being cemented together. These two branches are of very unequal dimensions; the narrower, which is also internal, opening into the perivisceral cavity; the other enlarges into a wide sac which gradually becomes narrowed to form the excretory duct, opening at the base of the first parapodium. In the *Serpulidæ*, on the other hand the tubiparous glands of opposite sides unite to form a common mesial excretory duct which opens in front between the bases of the branchiæ (2.)

I have only examined the tubiparous gland in one species of the Sabellidæ, a species of *Sabella*, and I find that, so far from according with Claparède's description, the gland has exactly the relations which it has in the Serpulidæ. The common duct opens in the usual situation; it early bifurcates, the two branches running close to one another for a short distance. In this situation the efferent ducts are lined by an epithelium which consists of extremely low flat cells with granular contents and with long flagella.

Within the limits of the family Serpulidæ itself I have found considerable variations in the form and structure of these organs. The simplest form is presented by *Eupomatus*, and in *Serpula* the arrangement is closely similar. In these genera each gland

(1) Hist. N. des Annélés, t. I., p. 49.
(2) l.c., p. 133.

(pl. XXXI., fig. 1, *n.*, and pl. XXXIV., fig. 7) presents the form of a somewhat oval brown body situated in the anterior region of thorax and having its long axis directed nearly longitudinally. In this body two parts are distinguishable, a posterior with thinner and clearer walls, and an anterior dark brown and having the walls somewhat folded. I can find no trace of any opening into the perivisceral cavity. In front the gland is continued into the duct, which passes almost directly inwards to meet with its fellow in the middle line. The delicate common duct (*a.*) into which the gland-ducts of opposite sides unite passes straight forwards to open towards the ventral side of the anterior end of the body, between the bases of the branchiae. Each lateral duct is ciliated and its epithelial lining is granular; while I have been unable to find any trace of cilia in the common duct and its epithelium is free from conspicuous granules. The gland itself (pl. XXXIV., figs. 8 & 9) is lined with a layer of very remarkable cells. They are very large, densely granular cells of a form which may be described as that of a cone with an obtuse apex and a polygonal base. The polygonal bases of contiguous cells fit in together so as to form a continuous lining for the sac of the gland; while the apices project freely into the lumen. Each cell possesses a large spherical nucleus situated near the base. The truncate apex of each cell is provided with a leash of extremely long and flamentous cilia or rather flagella, often four or five times the length of the cells themselves, and often much longer than the breadth of the cavity of the sac. In certain positions groups of the cells are elongated so as to form a prominent ridge projecting into the cavity. A very thin fibrous coat invests the gland.

In *Vermilia* the duct is wider than in *Eupomatus*, and dilates before it opens into the gland, which is divided into four parts. The latter are long and wide thin-walled sacs, the inner pair approaching one another in the middle line and encircling about a half of the retractor muscle of the branchiae; the outer placed close to and connected with the body-wall at some distance from one another on the ventral aspect. The inner pair extend further back than the outer.

The wall of the duct is lined by a granular ciliated epithelium. The walls of the gland have an epithelium similar to that already described in the case of *Eupomatus*, with highly granular cells and long cilia; but the cells are very much smaller, being only about $\frac{1}{2500}$th of an inch in long diameter, and the cilia are not so numerous and much more delicate. The epithelium of the outer sac is much thicker and more densely granular than that of the inner; it is richly supplied with pseudohæmal vessels. At intervals among the granular cells lining the sac occur others which are transparent and free from granules. Here and there among the granular cells are opaque mulberry-like or spherical concretions, which are seen on a close examination to be made up of agglomerations of granules.

In *Pomatoceros*, (pl. XXXV., fig. 2, t.g., fig. 3, and fig. 4), as in the other genera, the common excretory duct of the glands opens upon the anterior and ventral aspect of the head between the bases of the branchiæ; it runs backwards along the ventral side of the depression separating the præstomial lobe from the lips of the alimentary canal, forming a conspicuous ridge. In this situation its wall is formed (1st) of a continuation of the cuticle of the surface of the head (2nd), a layer of hypoderm which differs from that around in being composed of short columnar cells (3rd), a layer of fine connective tissue with perhaps muscular fibres, and (4th), the epithelium, which is composed of cubical or polyhedral cells filled with brown granules. In the connective tissue layer are a few pseudohæmal vessels. A little further back the common duct bifurcates, the two branches each forming almost a right angle with it, and each opening into the gland of its side. Each gland consists of a single elongated sac occupying a lateral position close to the body-wall. I can find no opening into the perivisceral cavity. The walls of this sac are much folded and are of considerable thickness and great opacity. They are formed, besides an outer connective and muscular coating with numerous pseudohæmal vessels, of a very thick and dense layer of elongated cylindrical epithelial cells (fig. 4) densely packed with yellowish-brown granules. These cells are much smaller and relatively narrower than the corresponding cells in *Eupomatus*, and are more densely granular; they resemble these, however, in having at their internal extremity a clear conical projection or papilla from which arise one or several long flagelliform cilia. The nuclei, which are rather small, are situated nearer the proximal than the distal end of the cell, and there are no additional nuclei about their bases, the cells constituting a single layer without the "*cellules de remplacement*" found in the hypoderm.

In *Sabella velata* the glands have a low epithelium somewhat similar to those of *Vermilia*, and are deeply lobed posteriorly. In the hinder part of the thorax is a second pair of lobed glands with granular cubical ciliated epithelium, situated on either side between the nerve-cords and the alimentary canal. These disappear in front a little distance behind the posterior termination of the anterior pair of glands, and I have been unable to determine their relations to the latter.

AUSTRALIAN SPECIES.

Eupomatus elegans, Mihi. (1)

[Pl. XXXI., figs. 3 and 4; pl. XXXII., figs. 11 and 12; and pl. XXXIII., figs. 1-6.]

This species is to be found in great abundance adhering to the stems and fronds of certain sea-weeds at a depth of 10 or 12 fathoms in Port Jackson. I have also found it, though very rarely, adhering to the under surface of large blocks of stone a little below low-water mark. The relationship between it and its European congener is extremely close, and with such a variable species it is very difficult to be quite clear as to their distinctions. The probabilities, however, are all in favour of a separation, and doubtless a comparison of a series of each would show certain prevalent distinctive characteristics. Meanwhile I retain the name given when I had only seen a few specimens.

(1) Proc. Linn. Soc., N.S.W. Vol. VII., p. 633.

The tube assumes a variety of shapes according to the form of the object to which it is adherent; it is always thin-walled, with slight, irregularly placed, ring-like thickenings; in transverse section it is almost perfectly circular. The proximal portion of the tube, which is usually the part which is adherent, is very slender, and nearly always much curved and may be coiled into a short spiral. The diameter increases distally till at the mouth it is about $\frac{1}{16}$th of an inch. The free part of the tube is only very gently sinuous. The total length may be as much as an inch and a half, but is usually less.

The ordinary length of the annelid is about half an inch. The thorax, which is considerably shorter than the rest of the body, contains seven segments; it bears very wide lateral flaps and prominent parapodia with long setæ. The setæ of the first segment (pl. XXXIII., figs. 4 and 5) differ from the rest (pl. XXXIII., fig. 6.)

The ventral tori are ·0075 to ·0150 of an inch in length, each is composed of about twenty to thirty-five pectines, about ·001 inch in length and having six or sometimes seven teeth (pl. XXXIII., fig. 3.) The abdomen contains forty to forty-five segments with long setæ, and ends in a pair of short rounded anal processes.

The branchiæ (pl. XXXI., fig. 4), which are twenty in number, have long slender stems beautifully ornamented with lines of white, crimson, red and brown, the arrangement of which is subject to great variation. The operculum (pl. XXXII., figs. 11 and 12 and pl. XXXIII., figs. 1 and 2) has a very long and slender cylindrical stem reaching far beyond the extremity of the branchiæ and more than half the length of the whole body. It is uniform in diameter to near the base of the operculum, where it gradually enlarges to form the basal portion of the latter. The operculum is composed of two segments the proximal formed by the expansion of the extremity of the peduncle to form a wine-glass-shaped body the rim of which is divided into lobes or teeth. The number and size of these lobes or teeth varies to some extent according to the age of the specimen or of the operculum. In young opercula they are few and large; as growth proceeds they become more numerous and smaller, the additional lobes being apparently formed by the longitudinal division of the original broad ones as is shewn by two of them being frequently united below. The lobes themselves are frequently, though not always, armed with minute denticles or spinules, a pair on each. Into the hollow of the cup formed by the proximal portion of the operculum fits the distal part, which is also wine-glass-shaped, with the neck attached to the centre of the proximal segment, and the rim also divided into a series of teeth. These distal teeth are much longer than the proximal set, and taper to a fine point laterally and internally each bears seven or eight acute spines. In number they vary from thirteen to twenty. In the centre of the concavity of this distal segment of the operculum is frequently a strong spine like the teeth of the distal circlet and armed with spinules. Usually only one operculum is developed and this may be either the right or the left. Not unfrequently, however, both opercula are equally developed. When only one operculum is fully developed the other is represented by a club-like process containing a pseudohæmal vessel.

2. Cymospira brachycera.

Cymospira brachycera, Baird, "On some new species of Tubicolous Annelids in the collection of the British Museum," Journ. Linn. Soc. Zool., Vol. VIII., p. 17, pl. II., fig. 2.

"Branchiæ in spiras quinque convolutæ. Operculum magnum, cornibus duobus brevissimis irregulariter dentatis armatum." (Baird.)

"East Coast of Australia." [Brit. Mus.]

3. Cymospira Mörchii.

Cymospira Mörchii, Quatrefages, l.c., pp. 540 and 541.

"Caput indistinctum. Branchiæ cirris numerosis in basi vix quadrispirali. Operculum tricorne. Collare trilobum. Corpus 100 annulis circiter compositum, anterioribus 7. Setæ anteriores late limbatæ. Pro uncinis laminæ læves." (Quatrefages.)

I have not seen this species. The locality given by Quatrefages is "New Holland."

4. Pomatostegus Bowerbanki.

Pomatostegus Bowerbanki, Baird. Journ. Linn. Soc. Zool., Vol. VIII., p. 20, pl. II., figs. 4 and 5.

"Branchiæ curtæ, in spiram unam et dimidiam convolutæ. Opercula quatuor, versus apicem decrescentia, inarmata." (Baird.)

"Seas of Australia. [Brit. Mus.]

5. Pomatoceros elaphus.

[Plate XXXI., fig. 7 and Plate XXXII., figs. 9 and 10.]

? *Pomatoceros tetraceros*, Schmarda, Neue Wirbellose Thiere, I., II., p. 30, pl. XXI., fig. 129.

? *Vermilia tetraceros*, Quatrefages, tom. cit. II., p. 520.

"Char. Operculum quadricorne margine crenulatum."

"Der Körper des Thieres hat die allgemeine Umrisse des Geschlechtes so weit ich es aus dem verstümmelten Exemplare mit Sicherheit beurtheilen kann. Seine Farben sind ziegelroth und blau-grün. Die Länge ist 5 mm. Der Deckel ist umgekehrt kegelförmig, der obere Theil etwas vorspringend, gerippt. Der Saum ist gezähnt. Die Mitte der Fläche ist etwas vertieft. In der Vertiefung stehen vier kurze, geweihartige Fortsätze. Die Farbe ist roth mit Ausnahme der Rippen welche grün sind. Die Zahl der Kiemen ist bei 20 in jedem Büschel. Der untere Theil ist roth, der obere grün. Der Kragen ist auf der Bauchseite gespalten, etwas umgeschlagen und weiss gesaümt; am Rücken trägt sein oberer Rand mehrere spitzige Fortsätze. Ausser den sechs Borstenbündel des Mantels sind wie bei andern *Serpulaceen* zwei Borstenbündel am Kragen."

"Neu-Süd-Wales." [Schmarda.]

The tube of this species is trigonal, sinuous, white with a blush of pink. In length the animal reaches about 1¼ inch, the extreme breadth of the thorax being about $\frac{3}{16}$ths of an inch. The abdomen is more than twice as long as the thorax; the head and branchiæ slightly exceed the thorax in length. The branchiæ are fifty in number with stout stems and rather short pinnules. They are pink at the base, marked with purple and dark green bands distally. The operculum (pl. XXXII., fig. 9.) with its peduncle is rather longer than the branchiæ, being about a quarter of an inch in total length. The peduncle is dorso-ventrally compressed and becomes gradually broader distally; laterally it is fringed with a pair of delicate wing-like expansions which are prolonged at the distal end of the peduncle into short processes having the appearance of branchiæ, with a row of short processes or pinnules. The operculum proper has the form of an irregular cone with the apex towards the peduncle; it presents on each side a low fold in line with the wings of the peduncle; the dorsal surface is flatter than the ventral and is almost smooth; the latter presents a few low ridges radiating from the apex. The distal surface is nearly transverse, almost circular in outline and slightly concave; it possesses three arborescent appendages attached near its centre and diverging slightly from one another, each dividing dichotomously to form a structure very like the horns of a deer; the terminal offshoots have the form of sharp spines. Very often the three processes arise from a common stem; sometimes there is only an elevation of the distal surface of the operculum and from this the three antler-like processes spring without being directly connected with one another. In colour the operculum presents variously arranged markings of green, crimson and white.

There are seven segments in the thoracic region. The collarette is an exceedingly wide and delicate membrane. The setæ of the first segment of the thorax are very much longer than those of the others. They are very indistinctly feathered on one side towards the apex and taper to a very acute point.

The abdominal setæ (pl. XXXII., fig. 10) are quite unlike those of the thorax. They are geniculate near the apex, the part of the seta in the neighbourhood of the genu being slightly expanded; its concave border ornamented with about twenty minute spinules, the apex extremely fine. The pectines of the thorax are extremely numerous; in the abdomen they are fewer—there being about seventy to eighty in each segment; they each possess about fifteen teeth, which are nearly all alike in size and shape.

Schmarda's description does not entirely suit the Port Jackson species; but it is more likely that he described an imperfectly preserved variety than that there are two distinct kinds. It is somewhat nearly related to Grube's *Serpula tricornigera* (1) from the Philippines; among other points, however, I think it may be distinguished by the form of the distal surface of the operculum, which in Grube's species is described as having in the centre a depression surrounded by a calcareous ring and having inserted in it a three-sided stem which gives origin to the three antler-like processes. In the form of the setæ and in the rest of the operculum the resemblance between these two forms is very close.

6. VERMILIA STRIGICEPS.

Pomatoceros strigiceps, *Mörch*.

Vermilia strigiceps, QUATREFAGES, tom. cit., p. 521.

"Operculum orbiculare, planum, impressione dilatatâ-deltoideâ in adultis sensim obliteratâ. Testa agglomerata, repens, triquetra. Carina dorsalis compressa, acuta, laciniata, rostrata, basi utrinque serie punctorum impressorum. Latera convexa. Liræ incrementi sæpe laminatæ, confertæ." (Mörch, as quoted by Quatrefages.)

This species, which is unknown to me, is said to occur in the North of Australia and in New Zealand.

7. VERMILIA CÆSPITOSA.

[Plate XXXI., fig. 5, and Plate XXXII., figs. 1 and 2.]

Galeolaria cæspitosa, LAMK, Hist. Nat. des An. s. vert., t. V., p. 636; BLAINVILLE. Art. Vers, Dict. des Sc. Nat. Atl., pl. I, fig. 4 and 4a.

Vermilia cæspitosa, QUATREF. Hist. Nat. des Ann. t. II., p. 531 (1865.)
Serpula (Galeolaria) cæspitosa, GRUBE, Troschel's Archiv, Band XXI., p. 126, Taf. V., fig. 4 (1855.)

Vermilia insidiosa, QUATREFAGES, t. cit., p. 532.

Galeolaria decumbens BAIRD, l.c. Explanation of Plate.

(1) Annulata Semperiana, p. 273, Taf. XV., fig. 7.

This is the Serpula most abundantly distributed on the Coast of New South Wales and Tasmania. It occurs only between tide-marks, most abundantly about midway between high and low water marks, and it is thus exposed daily to the sun for several hours. The effect of this exposure however, is greatly diminished by the thickness of the tubes, and by the massive mode of growth of the species, forming dense and thick aggregations often an inch or more in depth, encrusting rocks, submerged wood, the shells of mussels and similar objects. The ordinary length of the tube is about an inch, but varies according to the age of the individual. It is ordinarily closely cemented down to the object on which it grows, the under surface being expanded and adapting itself to the inequalities of the surfaces to which it is apposed. The lumen of the tube is cylindrical, but the wall is irregularly thickened, the upper surface, which is sharply marked off from the lateral, being marked by a longitudinal groove, narrow in young tubes, broad and shallow in older ones, and produced anteriorly beyond the rest of the tube as a prominent rounded lobe overhanging the orifice. The lateral surfaces do not quite meet the upper at right angles, but slope slightly outwards.

The branchiæ are about 36 in number. They are rather short and stout, tapering towards the apex. They are characterised, as in many other Serpulidæ, by considerable variety in their colouration and markings. The most constant markings are a white band running transversely across the membrane which unites the bases of the stems, a series of white transverse lines or blotches placed at regular intervals along the stems, and, alternating with the latter, a series of parallel pairs of short green or brown longitudinal bands: these green or brown markings are, however, frequently replaced by crimson or purple.

The operculum has a very short peduncle, the distal extremity not extending beyond the ends of the short branchiæ. In shape it may be compared to an inverted cone, flattened to some extent dorso-ventrally, and with a very oblique base directed towards the dorsal side; the dorsal side is marked by a longitudinal groove, bounded by a low fold of the integument; on each side near the distal end is a prominent triangular flap. The distal surface is oblique, directed towards the dorsal aspect of the animal. It is nearly circular, with a slight bay or indentation in the middle of the dorsal side, and is surrounded by a rim formed by a large number of closely apposed, flattened calcareous spines forming a sort of miniature palisade.

The greater part of the surface is concave and is paved with two or four smooth calcareous plates; towards the dorsal border is a deep pit in which is articulated a large mesial, dorso-ventrally compressed, hollow spine, with a broad base and a rounded apex. Along the dorsal border of the distal surface on either side of this mesial spine is a row of either four, or, more usually, five smaller spines, the size of which increases from the inner towards the outer end of the series. Each, excepting the last (most external), is shaped like an ordinary hand-saw, but tapering towards the extremity, which is slightly curved, and with the teeth few and relatively large; the fourth or fifth (most external) pair, however, have no teeth.

The dorsal setæ are similar to those of *Pomatoceros elaphus*, minutely feathered on one side and with a very fine tapering extremity. The ventral uncini have from twelve to fifteen subequal teeth.

The discrepancies in the descriptions and figures of this species in the memoirs quoted above depend doubtless on their having been for the most part taken from dried specimens. The operculum figured in the paper by Baird quoted above, and described in the explanation of the plate as that of *Galeolaria decumbens*, but not referred to in the text, is the operculum of the present species; the palisade-like structure of the rim has been overlooked.

8. Vermilia rosea.

[Plate, XXXII., figs. 2-5.]

Galeolaria rosea, Val., M.S.
Vermilia rosea, Quatref., l.c, p. 532. pl. XX.. figs. 10 and 11.
? *Eupomatus Boltoni*, Baird, l.c, p. 12, pl. II., fig. 10 (1865.)

"Branchiæ breves, cirris 34. Operculum radiatim striatum, spinis medianis, dentiferis cæspitose dispositis. Corpus 130-140 annulis compositum, anterioribus 7. Setæ inferiores subulatæ, incurvatæ. Laminæ crenulatæ. Tubus angulatus, bicarinatus." (Quatrefages.)

This species, characterised by the numerous spines in the operculum is not uncommon in Port Jackson. It is a solitary species, never being found in clusters like *V. caespitosa*, and always inhabiting a deeper zone. The dorsal setæ are almost identical in form with those of *Pomatoceros*. The pectines are very small; each has from six to nine acute teeth. The branchiæ are marked with bands of red and brown. The operculum is light-red, mottled with brown and dark red. The operculum has a pair of lateral folds with filiform processes as in *Pomatoceros*. This is a larger species than *Vermilia cæspitosa*, being an inch and three-quarters in length.

9. Serpula vasifera. N. sp.

[Plate XXXI., fig. 6, and Plate XXXII., figs. 6-8.]

There are 152 segments in the body of this species. The operculum (pl. XXXII., fig. 6), has a tolerably long cylindrical peduncle; the operculum is vase-shaped with slight dilation where it joins the peduncle; the sides of the vase are formed of about twenty-five ribs, each of which ends at the rim of the vase in a prominent lobe. The distal surface of the vase presents a deep, rounded, central hollow surrounded by a broad margin which is almost transverse to the long axis of the operculum, but slopes slightly upwards towards the lobed margin.

The branchiæ are fifty in number, with stout stems and delicate pinnules. In length they are about equal to the thorax, and extend to a little beyond the extremity of the operculum. The thorax is about one-fourth of the length of the abdomen; it possesses a wide collarette and lateral flaps.

The dorsal setæ of the thorac segments (pl. XXXII., fig. 8), are feathered on one side towards the apex, and taper to a very acute point; the length is about $\frac{1}{16}$th of an inch; there are forty or so in each thoracic notopodium. The dorsal setæ of the abdomen are long and slender hairs. The pectines, which are about $\frac{1}{250}$th of an inch in length, are about fifteen in number in each segment of the thorax; in the abdomen they are much more numerous; they have four or five teeth, one of which is considerably larger than the others.

In colour the anterior or thoracic region is scarlet, specially bright on the lateral flaps and the collarette. The bases of the branchiæ are crimson; the stems are light green and yellow with narrow longitudinal lines of red and transverse lines of white. The operculum is almost colourless, the peduncle light red, the abdomen reddish.

This species occurs along with *Pomatoceros elaphus*, in Port Jackson.

10. Serpula Jukesii.

Surpula Jukesii, Baird, l.c. p. 20, pl. II., fig. 6.

"Branchiæ in spiram unam convolutæ, lacteæ, filamentis dorso canaliculatis. Operculum et filamentum operculigerum alba. Operculum profunde infundibulatum, multicrenatum. Tubus teres, solidus." (Baird.)

"Seas of Australia." [Brit. Mus.]

It is possible that this may be identical with the Port Jackson species described above, but in the figure of the operculum given in Baird's paper the ribs are much more numerous than in the Port Jackson species. and the description of other parts is insufficient for certain identification.

11. Salmacina australis. N. sp.

[Plate, XXXIII., figs. 7-11.]

This extremely minute species is found in little clusters on the under surfaces of large stones between tide-marks in Port Jackson. The tubes are cylindrical and twisted, intertwining with one another to form tolerably dense masses.

The body of the animal is only about a sixteenth of an inch in total length. The abdominal and thoracic regions of the body are more nearly equal than is usual in this family, and, when retracted, the former may appear even decidedly shorter than the latter. The branchiæ, which are eight in number, have short stems with two rows of pinnules, and are devoid of terminal dilatations or pseudopercula. The collarette and the lateral flaps are not very greatly developed. The thorax possesses nine segments, of which the first differs from the rest in the form and size of the setæ, and in the absence of ventral pectines. The abdomen possesses nineteen segments with long acicular setæ; the anal segment presents a a pair of very prominent rounded ciliated anal appendages.

The setæ of the first segment are $\frac{1}{75}$th of an inch in length; they are slightly geniculate near the extremity, the genu being armed with a small number of teeth. The remaining thoracic setæ are very obscurely spathulate, being slightly expanded near the fine tapering point. The abdominal setæ are all extremely fine simple hairs, $\frac{1}{250}$th of an inch in length. In the thorax there are 25-32 pectines in each neuropodium; in the abdomen the number is much smaller, diminishing from ten in the anterior region to five in the posterior—the last two or three segments having none at all. The general colour is very light pink, with a number of minute crimson dots on the head.

This species is closely allied to the *Salmacina aedificatrix* of Claparède, and seems to form a connecting link between it and the *Protula Dysteri* described long ago by Huxley. From the latter it differs in the absence of any pseudopercula or terminal dilatations of the branchiæ; from the former in the form of the thoracic setæ and other minor points.

The slightly spathulate form of the thoracic setæ does not seem to be of sufficient importance to justify a separation of the Australian species from its closely related European allies, though "Setæ spathulatæ vel pectinatæ in abdomine desideratæ" is given by Claparède (1), as a diagnostic peculiarity of the genus.

I was much interested to observe that the Australian species, like *Salmacina Dysteri*, as first noticed by Huxley, is herma-

(1) Ann. Chét. Supp., p. 154.

phrodite, and multiplies by budding (1). The first indication of the phenomenon of budding is the appearance of a slight constriction about the eighth to the tenth segments of the abdomen. The body behind this now usually developes some additional segments, becomes a little dilated, and the coelom in this region becomes filled with granular cells. A slight elevation now appears on one side of the tenth abdominal segment, and this becomes more and more prominent and divides into eight lobes. Each of these eight lobes becomes elongated, and their bases grow round the circumference of the segment till they come to form a whorl round the body of the animal; soon lateral pinnules appear on them, and they assume the form of branchiæ. A few segments have, meanwhile, been added in front of the bud, and, the oesophagus and gizzard of the bud having become developed from the intestine of the parent, a process of fission separates the bud from the parent organism.

12. Sabella velata. N. sp.

[Plate XXXI., fig. 8, and Plate, XXXIV., figs. 1-4.]

This species has about 40 segments in the body, eight belonging to the thorax. There are eighteen long, slender branchiæ set on a narrow lophophore and forming nearly a complete circle. Connected with the inner face of each half of the lophophore is a filiform process. Connecting together the stems of contiguous branchiæ near their bases are a series of gossamer-like membranes, each four-corned, with two of the corners attached to each of the two stems, the lateral borders being deeply concave and unattached.

The thorax is long and slender and cylindrical; it is composed of eight segments, as in others of the genus. The first segment has but a low ridge representing the collarette of the *Serpulæ*: it possesses a narrow oblique band of dorsal setæ which project but slightly from the surface; they have stout stems and a

(1) Claparède, "Beobachtungen über Anatomie und Entwickelungsgeschichte wirbelloser Thiere;" "Annelides Chétopodes du Golfe de Naples," p. 437; Huxley, "On a Hermaphrodite and Fissiparous Species of Annelide," Edinburgh New Philosophical Journal, 1864.

broader but short geniculate blade which rapidly tapers to a fine point. Along the outer side of the blade runs a row of minute denticles. The dorsal setæ of the remaining thoracic segments are much more prominent but not very numerous; they are terminated sometimes by short blades which resemble in form those of the first notopodium, but are devoid of the denticles; sometimes by flattened discs. The ventral uncini are very prominent hooklets.

In colour the body is pinkish; the branchiæ light green with narrow longitudinal lines of brown; the membranes between the branchiæ are white.

The tube is of a soft membranous character.

This species occurs with *Serpula vasifera* and *Pomatoceros elaphus* under large stones, etc., in Port Jackson.

13. Sabella punctulala. N. sp.

The general colour of this species is green, due partly to networks of minute pseudohæmal vessels on the surface, partly to the green ova. The dorsal surface is brownish green. The whole surface of the body is ornamented with minute, irregular, rounded spots of a dark crimson, and still smaller dots of greenish white; similar dots occur in pairs at regular intervals along the stems of the branchiæ; the latter are ornamented also with transverse green and brown bands, here and there one of rose-pink, and occasionally one of Naples yellow. There are about fifty branchiæ, and they are devoid of connecting membranes. The collarette is represented by a low fold on the dorsal side stopping short on the ventral side near the parapodia; between the ventral ends of the fold is a deep, longitudinally-directed depression continuous behind with the narrow dorsal groove. The body contains sixty segments The dorsal setæ are tapering at the extremity and finely feathered on one side near the apex, resembling closely the corresponding structures in *Serpula vasifera*. The ventral uncini are similar to those of the preceding species. The length is nearly an inch.

This species occurs about low-water mark in Port Jackson.

14. Spirographis australiensis. N. sp.

The body of this species is of a general light green colour, slightly tinged with red along the middle dorsal line, a band of blue being external to this. The branchiæ. which are extremely numerous, are ornamented with narrow longitudinal lines of rich brown, the pinnules being almost white with a very faint tinge of green; some of them towards the ventral side have the pinnules lead-colour; the base of the branchial is tinged with brown with narrow longitudinal white lines; the head-lobe is brown; the collarette tinged with brown.

There are eight thoracic and, in a full-sized specimen, about 170 abdominal segments. The low collarette is cleft deeply in the middle ventral line; the ventral lobes have no papillæ. The ventral tentacles are short, slender, and pointed; they are coloured like the stems of the branchiæ. The only representatives of dorsal tentacles are two rounded brown lobes, at the apex of each of which is a pore-like orifice: in a smaller specimen these organs are very much more prominent, and are flattened and leaf-like, resembling those of *Spirographis Spallanzanii.*

The dorsal setæ of the thorax and abdomen are alike; they are scarcely distinguishable from those of *Sabella punctulata.* The uncini are simple hooks on the recurved limb of which are some minute spinules.

The total length of the tube is seven inches; the diameter is about half an inch.

This species occurs about low-water mark on the shores of Port Jackson.

It is possible that the *Sabella grandis* of Baird (l.c., Part II., p. 160), which is described as coming from New Zealand, may be identical with this species, but the description is too inexact to permit of any certainty.

EXPLANATION OF THE PLATES.

Plate 31.

Fig. 1.—Pseudohæmal system of *Eupomatus elegans* from the ventral side enlarged. *a*, ventral vessel; *b*, dilatation of ventral branchial vessel: *c*, common branchial vessel; *d*, head-lobe; *e*, branches of ventral vessel; *f*, plexus in collarette; *g*, plexus in lateral membrane; *n*, tubiparous gland.

Fig. 2.—Anterior relations of the pseudohæmal trunks of *Eupomatus elegans*, seen obliquely from the left side. *r.v.*, ventral vessel; *v.v.*, dilatation of ventral branchial vessel; *d.s.*, dorsal sac; *d.b.v.*, dorsal branchial vessels; *c.b.v.*, common branchial vessel.

Fig. 3.—Body of *Eupomatus elegans*, compressed. *t g.*, tubiparous gland; *h.t.*, contractile dilatation of dorsal vessel.

Fig. 4.—Head of *Eupomatus elegans*.

Fig. 5.—*Vermilia caespitosa*, magnified.

Fig. 6.—Anterior portion of the body of *Serpula vasifera*, magnified.

Fig. 7.—Head of *Pomatoceros elaphus*, magnified.

Fig. 8.—Head of *Sabella velata*, magnified.

Plate 32.

Fig. 1.—Operculum of *Vermilia caespitosa*, × 8.

Fig. 2.—Operculum of *Vermilia rosea*, magnified.

Fig. 3-5.—Spines of the latter, × 44.

Fig. 6.—Operculum of *Serpula vasifera*.

Fig. 7.—Ventral uncinus of *Serpula vasifera*, × 400.

Fig. 8.—Dorsal seta of *Serpula vasifera*, × 325.

Fig. 9.—Operculum of *Pomatoceros elaphus*, magnified.

Fig. 10.—Abdominal dorsal seta of *Pomatoceros elaphus*.

Fig. 11.—Operculum of *Eupomatus elegans*, × 40, slightly compressed.

Fig. 12.—Developing operculum of *Eupomatus elegans*, × 40.

PLATE 33.

Fig. 1-2.—Varietal forms of the operculum of *Eupomatus elegans.*

Fig. 3.—Ventral uncinus of *Eupomatus elegans.*

Fig. 4-5.—Dorsal setæ of the first segment of *Eupomatus elegans,* × 400.

Fig. 6.—Dorsal seta of *Eupomatus elegans,* × 400.

Fig. 7.—*Salmacina australis,* × 70.

Fig. 8.—Budding *Salmacina. a,* developing branchiæ of bud; *b,* anal appendages; *c,* intestine of parent.

Fig. 9.—Thoracic dorsal seta of *Salmacina australis,* × 400.

Fig. 10.—Abdominal dorsal seta of *Salmacina australis,* × 400.

Fig. 11.—Dorsal seta of first thoracic segment of *Salmacina australis,* × 400.

PLATE 34.

Fig. 1.—Dorsal seta of *Sabella velata,* × 325.

Fig. 2.—Dorsal seta of first segment of *Sabella velata,* × 325.

Fig. 3.—Dorsal seta of *Sabella velata,* × 325.

Fig. 4.—Ventral uncinus of *Sabella velata,* × 325,

Fig. 5.—Transverse section of branchial vessel of *Vermilia*; *a.a.,* stalked corpuscles; *b.b.,* free corpuscles.

Fig. 6.—Segmental organ of female *Eupomatus elegans* from the ventral side under slight compression. *a,* external orifice; *b,* clump of ova.

Fig. 7.—Tubiparous gland of *Eupomatus elegans. a,* common excretory duct; *b,* sac of the gland.

Fig. 8.—Oblique section of the tubiparous gland of *Eupomatus elegans,* × 400.

Fig. 9.—Transverse section of the same.

PLATE 35.

Fig. 1.—Transverse section of the thorax of *Eupomatus elegans. t.g.,* tubiparous gland; *n.c.,* nerve cords; *v.v.,* ventral vessel; *d.v.,* dorsal vessel.

Fig. 2.—Transverse section of the thorax of *Pomatoceros elaphus*; letters as in the preceding; *l.v.,* lateral vessels.

Fig. 3.—Transverse section of common duct of tubiparous gland of *Pomatoceros elaphus,* near the external orifice, × 325. *a,* granular epithelium of the interior of the duct; *b,* hypoderm; *c,* cuticle; *d,* pseudohæmal vessel.

Fig. 4.—Epithelium of the tubiparous gland of *Pomatoceros elaphus,* × 325.

ON A NEW CRUSTACEAN FOUND INHABITING THE TUBES OF *VERMILIA* (SERPULIDÆ.)

By William A. Haswell, M.A., B.Sc.

[Plates XXXVI. and XXXVII.]

While examining a stone obtained from about low-water mark at Watson's Bay for living *Serpulæ*, I found inhabiting the tube of a *Vermilia* in several instances an Isopodous Crustacean which is in many respects very remarkable. In some points the animal shows relationships to known families of Isopoda —notably the Anthuridæ; but it has become to some extent specially modified in accordance with its peculiar mode of life. The body is narrow and vermiform, the telson and terminal appendages very wide, the other appendages very small; the sides of the body are ornamented with long setæ. The whole appearance of the animal is singularly like that of a small *Serpula*, the operculum and branchiæ being mimicked by the expanded posterior appendages and telson, and the hairs representing the parapodial setæ, while the smallness of the limbs and the vermiform shape of the body, aid in perfecting the resemblanee. That the presence of these Crustaceans in the *Serpula*-tubes was not a mere accidental occurrence was shewn by the fact that the three which I first found, all of which were females, had each a brood of embryos with them in the tube, and not in any way connected with them. After finding those three in *Serpula*-tubes all quite near one another on the same stone, I found another on the surface of the stone. This I found to differ in several respects from the others, not possessing the long hairs, and being white instead of red; it is probable it had escaped from one of the tubes that was broken open. On another occasion I found in the same spot three more individuals of the same species, two of which were females like those I had previously found, while the third differed from them very remarkably in shape, being extremely elongated and filiform. Each of these, including the last, which I conclude to be a male, was found in a separate tube. All of them seemed almost incapable of motion, the utmost movement to be observed being very feeble flexions and extensions of the limbs.

The embryos on examination showed two principal stages. In the first of these (pl. XXXVII., fig. 4) the ventral plate has become segmented, but there are no appendages; in the second (fig. 5) the appendages are all represented; the larva at this stage having very much the appearance of that of *Asellus*; and it is specially noteworthy that the flexure of the larva, as in the genus just named and other "normal" Isopoda, is towards the dorsal side. The dorsal organ (*d.*) is a small lobed body not projecting beyond the outer larval membrane. On either side of it is a remarkable jointed larval appendage (*e.*) arising from the middle of the lateral surface of the larva and directed outwards and dorsad. No similar appendages are known to exist in any other Edriophthalm; but whether they point to the former existence in the Edriophthalm larva of embryonic locomotive appendages of which the ordinary paired "dorsal organ" may be a still further reduced remnant, or whether they are simply developed for the attachment of the larva to the pinnate hairs of the abdomen of the female a further study of their structure and relations will be necessary to decide. They are still present in a rather later stage of development than that represented in figure 5, after the alimentary canal and hepatic lobes have become clearly distinguishable.

Eisothistos vermiformis.

The general form of the body is narrow, almost cylindrical, with a slight amount of dorso-ventral compression. The head is very small, broader in front than behind, with prominent eyes, each with three or four bright red spots. The antennæ are very short, nearly equal in length, the upper pair with eight joints in the flagellum, the lower with six. In the female the first and the seventh segments of the thorax are the shortest, the former being not much larger than the head: the second, third, fourth and fifth are nearly equal in length, the sixth rather shorter. In breadth the segments gradually increase from before backwards, the first being little broader than the head, the last nearly three times as broad. There are some slight differences between different individuals in the form and size of the segments, but they are too slight to require particularisation. In one female all the thoracic segments are densely bordered laterally with long pinnate hairs, in another hairs are almost entirely absent. The abdominal segments, though short, are distinctly separated from one another; the first and the last are larger than the others. The appendages of the last segment are on a type similar to those of *Anthura*, with a dorso-ventrally compressed peduncle, a ramus, which is serrated and obtusely pointed; and an appendage which is directly articulated with the posterior border of the segment. This appendage is a curved plate with a strong acute spine on its distal border, which is minutely serrated. The telson is a broad, somewhat quadrate structure with a serrated distal border. The arrangement of these parts is such that the caudal appendages and telson form an irregular shallow cup with the opening directed towards the dorsal side, and this forms a very efficient operculum for the closure of the tube. The abdominal appendages are very much like those of *Idotea*, the first pair forming a pair of valves closing over the rest, which are very delicate and membranaceous All the thoracic appendages are very similar in character, none of them being subchelate. The first three pairs are turned forwards, the last four backwards; the posterior are rather the smaller, and have the spines less prominent, but otherwise there is little difference between them. The basal joint is narrow ovate, with a deep excavation at its distal end. The ischium is of similar shape but smaller, it bears externally a row of about twenty short conical spines and on its internal border a few small hairs. The meros is small, with four conical spines externally: the carpus is still smaller than the meros, with a row of minute spinules and a longer spine on its outer border. The propodos is longer than the meros and carpus together, nearly parallel-sided, with an oblique distal border: on its inner border is a row of minute spinules, with at the angle a stouter spine; towards the dorsal border are a few short spines. The dactylos is stout, with an acute accessory spine near its apex.

The male (pl. XXXVI., fig. 2) differs greatly in appearance from the female. It is extremely attenuated, the length being half an inch and the breadth only $\frac{1}{50}$th of an inch, the thoracic segments being extremely elongated and slender. The limbs are very small and feeble, but are similar in structure to those of the female.

In the form of the body and of the pleonal appendages this curious genus presents a very marked approximation to the *Anthuridæ*; it is distinguished from these, however, not only by the anterior pereiopoda being simple, but also, is would seem, by the position of the embryo in the egg, the flexure in the present form being towards the *dorsal* side, as in the "normal" Isopoda of Spence Bate and Westwood, whereas in the *Anthuridæ* the flexure of the embryo is towards the *ventral* side. I am inclined, however, especially as the development of so few of the *Anthuridæ* has been studied, to attribute less weight to the latter point, and am disposed to think that the structure of the appendages and the form of the body ally *Eisothistos* most nearly with the *Anthuridæ*, though with some points of resemblance to the *Ægidæ*.

EXPLANATION OF THE PLATES.

Plate 36.

Fig. 1.—Female of *Eisothistos vermiformis*, x12.

Fig. 2.—Male (?) of the same, x12.

Fig. 3.—Posterior extremity of the same from above with the terminal appendages opened. *p*, ramus of posterior appendages ; *t*, telson.

Fig. 4.—Anterior antennæ.

Fig. 5.—Posterior antennæ.

Fig. 6.—Second pair of pereiopoda.

Fig. 7.—Apex of one of the more highly magnified.

Plate 37.

Fig. 1.—Posterior extremity from below. *t*, telson ; *p*, ramus of posterisr pleopoda ; *p'*, appendage ; *a*, anterior pleopoda.

Fig. 2.—Dorsal plate of the first segment.

Fig. 3.—Ventral plate of one of the middle segments.

Fig. 4. —Early stage in the development of the larva before the appearance of the larval appendages. *a*, outer larval membrane ; *b*, inner larval membrane ; *c*, blastoderm with indications of segments ; *d*, yolk ; *e*, rudiment of dorsal organ.

Fig. 5.—Later stage. *a*, outer membrane ; *b*, inner membrane ; *c*, yolk : *d*, dorsal organ ; *e*, larval appendage : *f*, eye ; *g*, and *h*, antennæ ; *i*, pereiopoda ; *k*, pleopoda ; *l*, telson.

NOTE ON THE YOUNG OF THE SAW-FISH SHARK (*PRISTIOPHORUS CIRRATUS*).

By William A. Haswell, M.A., B Sc.

About 18 months ago female specimens of *Pristiophorus* with young, were obtained with the trawl off Port Jackson. The young were fully formed, resembling the parent in everything except size, so that this peculiar genus of Sharks, like many others is viviparous. More recently I obtained from specimens received by the Australian Museum from the Fisheries Commissioners a series of fœtuses which exhibited a very much earlier stage of the development, the yolk-sac being still very large and the external gills being still conspicuous. In this stage the fœtuses (1) which were from seven to nine in number in each female, are particularly interesting from their possessing a rudimentary shell, which, though for the most part extremely delicate, presents at one point a spiral rudiment proving unmistakably its true nature. In one case this rudimentary shell was found detached and lying free in the cavity of the uterus. In the advanced stage first examined it had entirely disappeared. A similar rudimentary shell has been shewn to exist in several other viviparous genera, *Mustelus*, *Sphyrna* and others (1), but nothing has hitherto been known of the development of this peculiar Australian genus. On comparing the weights of the early stage *plus* the yolk sac, with the later stage, I found, as was to be expected from their relative size, that the latter was considerably

(1) See Balfour's Embryology, Vol. II.

heavier than the former. Nutrient matter must, therefore, be supplied to the fœtus from the uterine wall, and, as there is no placental connection, this must take the form of secretion from the walls of the uterus, which contains close-set, long, vascular villi, of a nutrient fluid, and its reception by endosmosis into the yolk-sac.

NOTES AND EXHIBITS.

Mr. Haswell exhibited specimens of intra-uterine fœtuses of a wallaby received through the *Town and Country Journal*, from a correspondent in the interior. The fœtuses were well-advanced, nearly as large as mammary fœtuses, and the chorion extended over the whole surface, but there was still no trace of concrescence with the wall of the uterus.

The Hon. J. Norton, M.L.C., exhibited a portion of Hawkesbury Sandstone, from Springwood, Blue Mountains, which had been perforated in all directions and to a considerable depth by some hymenopterous insect. Such perforations are common enough, but it is believed that the particular bee which forms them has not yet been determined.

Mrs. Masters exhibited an egg of the *Paradisea raggiana* from New Guinea. Very few of them have ever been seen.

Mr. J. J. Fletcher, M A , B.Sc., exhibited several specimens cf a Giant Earthworm from Burrawang, N. S. Wales, which is closely allied to the *Megascolides australis* from Gippsland, Victoria, described by Professor McCoy, in 1878. Mr Fletcher stated his intention of giving a further account of this worm at a future meeting.

Mr. Ratte exhibited fossils of the genera *Rostellaria, Fusus, Pleurotomaria? Belemnites, Venus, Nautilus*, from the interior of New Caledonia, together with a fragment of bone. He observed that these fossils were characteristic of the upper cretaceous formation, and were likely to identify these New Caledonian beds with some already known in New Zealand. He also exhibited an *Inoceramus* from the Neocomian of Noumea.

Mr. F. Ratte also exhibited *Calcareous Shells* of insects allied to those exhibited at the last meeting, by Mr. C. S. Wilkinson, but elongated and conical, instead of helix-shaped. Of these, at least two different shapes can be distinguished. (1.) One ornamented with two longitudinal ribs and irregular tubercles formed by some foldings or denticulations of the outside layers of growth of the shell. (2.) One smooth, with only circular lines of growth, longer than the first, being about 2 centimeters in length; and another smooth, one much smaller. The larva is growing at the present time on some species of Eucalyptus. It is provided with an elongated forehead, very dark eyes, and a thin tongue working in a tube or sheath reflected downwards. The tarsi are two-jointed, as far as can be seen in the state of larva. He believed, that it derives the calcareous matter for building the shell from the sap of the tree. It constantly emits water like some species of Aphrophora. This larva is provided at the hind part of its body with a chitinous operculum which is removed after it has undergone one of its last changes. He also exhibited females of *Monophlebus* attacked by a red fungus. One of these was growing on the living insect.

Dr. Cox exhibited a sample of a very rare shell, *Latiaxis Mawæ* of Gray. *Latiaxis* is a sub-genus of *Rapana* of Klein, characterized by the whorls being more or less detached, and carinated, the aperture small, trigonal, the canal narrow, rather long and curved. The operculum has been hitherto unknown, but the specimen exhibited showed the operculum perfect. It is a very distorted shell of a rare occurrence, found on Coral Reefs and supposed to live on the coral polyps. It is closely connected with the common American Tertiary fossil *Fusus quadricostatus.*

Mr Macleay exhibited specimens of *Dipsas Boydii* and *Diemenia atra*, the two snakes described in his paper. Also a specimen of a new species of *Furina*, received by Mr. Ramsay from the Barrier Ranges, which he said he would describe on a future occasion.

Dr. R. von Lendenfeld directed the attention of the meeting to the recently reported death of Dr. Hochstetter, the well-known Austrian traveller and geologist. and gave a brief sketch of his life and work.

WEDNESDAY, 27TH AUGUST, 1884.

The President, C. S. Wilkinson, Esq., F.G.S., F.L.S., in the chair.

Dr. Otto Finsch was introduced as a visitor.

The President announced that, at the last Meeting of the Council, F. Jeffrey Bell, Esq., M.A., Professor of Comparative Anatomy at King's College, London, had been elected a Corresponding Member of the Society; and that the following gentlemen had been elected to decide upon the merits of the Essays on the Life History of the Bacillus of Typhoid Fever, for which a prize had been offered by the Society:—Dr. H. N. MacLaurin, Dr. C. K. Mackellar, W. A. Haswell, Esq., M.A., B.Sc., J. J. Fletcher, Esq., M.A., B.Sc., and the Honorary Secretaries, Professor W. J. Stephens, M.A., F.G.S., and the Hon. William Macleay, F.L.S.

DONATIONS.

"Revision of the North American Poriferæ." By Alpheus Hyatt. Parts I. and II., 4to, 1875 and 1877. "Proceedings of the Academy of Natural Sciences of Philadelphia." Part I., 1882. "Bulletin de la Société Impériale des Naturalistes de Moscow." Tome LIII., No. 4, 1878; Tome LIV., Nos. 3 and 4, 1879. "Proceedings of the Second Congress of Russian Naturalists at Moscow from 20th to 30th August, 1863. Parts 1 and 2, 4to, 1871. From Dr. R. von Lendenfeld.

"Proceedings of the Academy of Natural Sciences of Philadelphia." Part I., January—April, 1884. From the Society.

"Science." Vol. III., Nos. 70—73, June 6th to 27th, 1884. From the Editor.

"Journal of the Royal Microscopical Society." Vol. IV., Part 3, June, 1884. From the Society.

"Annales de la Société Geologique de Belgique." Tome IX., 1881-1882. From the Society.

"Bulletin de la Société Royale de Géographie d'Anvers." Tome VIII., 6e Fasc., 1884. From the Society.

"Zoologischer Anzeiger." Nos. 170 and 171, 23rd June, and 17th July, 1884. From the Editor.

"Archives Neerlandaises." Tome XVIII., Livr. 2, 3, 4 and 5, Tome XIX., Livr. 1, 8vo, 1883-4. From "la Société Hollandaise des Sciences à Harlem."

"Results of Rain and River observations during 1883," "New South Wales Physical Geography and Climate." By H. C. Russell, B.A., 1884. "New Double Stars." By H. C. Russell, B.A., 1883. From the Author.

"Medical Press and Circular." No. 2357. July 2nd, 1884. From the Editor.

"Feuille des Jeunes Naturalistes." No. 165, July, 1884. From the Editor.

"Proceedings of the Zoological Society of London." Part 1, for 1884. From the Society.

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NEW FISHES IN THE QUEENSLAND MUSEUM.

By Chas. W. De Vis, M.A. No. 4.

Gobius princeps.

D. 6/11. A. 10. Lat. 40-50. Tr. 13-14.

The height of the body is 9, the length of the head $4\frac{1}{5}$ in the total length. The height of the head is $\frac{2}{5}$, the breadth $\frac{1}{2}$, of its length. The orbit, interorbit and snout are about $4\frac{1}{2}$ in the length of the head. Caudal pointed, sub-elongate. Teeth long, the middle lateral of the lower jaw almost a canine. Head broad behind, tapering to the snout. Lower jaw prominent. Pectorals long, pointed, without silky rays. Dorsal and anal much higher than the body. Head naked. Anterior scales much smaller than the posterior. No crest nor barbels, preopercle unarmed. Pale yellow with five broad nearly black bands across the back and base of caudal, sending confluent lateral processes along the mid-line of the body and vertical processes towards the abdomen. A dark band across the head behind the eyes descends obliquely over the pre-operculum. The 2nd, 3rd and 4th cross bands rise on the dorsals above them. Caudal spotted with dark brown.

Locality, Cape York. Collected by Mr. K. Broadbent.

Gobius Watkinsoni.

D. 6, 1 11. A. 1 10. Lat 32. Tr. 10.

The height of the body is 7, the length of the head $4\frac{2}{3}$ in the total length. Orbit $1\frac{1}{3}$ in the snout, interorbit $\frac{1}{2}$ of orbit. Caudal $\frac{1}{5}$ of the total length, pointed. Outer row of teeth enlarged but without canines. Head broader than high, $\frac{1}{3}$ longer than broad. Mouth nearly horizontal, cheeks swollen. Maxillary reaching the posterior third of the eye. No nuchal crest. Pectoral with silk-like rays. Dorsal spines produced into short filaments. No barbels. Uniform smokey grey, lighter on the hinder portion of the trunk. Fins black. A broad dark curved streak across the base of the pectoral having a pale one distad of it. A fine black line from the angle of the mouth over the opercles.

Locality, Moreton Bay. Collected by Mr. G. Watkins, Dunwich.

Gobius stigmaticus

D. 6, 1/8. A. 8. Lat. 37. Tr. 12.

The height of the body is $5\frac{1}{2}$, the length of the head $4\frac{1}{4}$ in the total length. Snout and interorbit each $2\frac{1}{2}$ in the length of the head. Caudal short rounded. No canine teeth. Head longer than high and longer than broad. Interorbit broad and flat. Snout short. Preopercle not armed. Jaws equal. Scales smaller anteriorly than posteriorly. No silk-like pectoral rays. Yellowish brown with a median line of dark spots posteriorly, or in addition to them blotches beneath the base of the soft dorsal. A dark curved line on each side of the occiput, touching the orbit and descending on the operculum to join a line descending from the lower edge of the orbit. A third line from the front edge of the orbit to the maxillary is continued thence on the preopercle from the angle of the mouth. These lines are sometimes confused into a brown patch on the cheek. The occipital arch may also be absent. First dorsal black, second pale with a median row of black spots on the webs. Anal pale. All these with white edges.

Locality, Moreton Bay. Collected by Mr. G. Watkins.

Gobius marginalis.

D. 6, 1/9. A. 9. L. 35. Tr. 11.

The height of the body is 6, the length of the head $4\frac{1}{4}$ in the total length. Orbit 4, snout $3\frac{3}{4}$, interorbit 5 in the length of the head. Breadth of the head $\frac{1}{4}$, and depth $\frac{1}{3}$ less than its length.

Teeth small without canines. Upper pectoral rays free, silky. Head broad behind, obtusely pointed in front. Mouth rather oblique. Jaws equal. Caudal a little pointed. Dorsal and anal elongate, pointed ; ventral with basal membrane well developed and reaching the vent. Maxillary reaching to or a little beyond the fore edge of the eye. Pale to dark brown, preoperculum in dark specimens light brown. Both opercles and base of pectoral with white spots which may extend on the chest and rarely on the body as simple or ocellated spots. Pale examples with broad zig-zag markings across the body, one beneath the first dorsal extending upwards across the fin and with faint bars across the head. Dark specimens nearly uniform or with three or four bands across the back leaving oval interspaces. The dorsals always broadly edged with white.

Locality, Cape York. Collected by Mr. K. Broadbent.

Gobius pauper.

D. 6, 1/11. A. 1/11. Lat. 30 (circa) Tr. 10.

The height of the body is $6\frac{1}{4}$, the length of the head $4\frac{2}{3}$ in the total length. Orbit 3, snout $4\frac{1}{2}$ in the length of the head. Inter-orbit very narrow. Head narrower and lower than long. Snout obtuse, rounded. Pectorals without silk-like rays. No canines. Mouth horizontal. Ventral reaching the vent. Caudal obtusely pointed. Nape scaly. Scales deciduous. Yellowish. A black bar descends from the orbit to behind the angle of the mouth. Two or three broad faint cross bars on the body. Vertical fins marked with light, and on the spines spotted with dark chestnut. A dark spot at the base of the caudal.

Locality, Moreton Bay. Collected by Mr. A. Macpherson.

Gobius festivus.

D. 6 1/9. A. 1/9. Lat. 32-34. Tr. 12.

The height of the body is $5\frac{1}{2}$, the length of the head $4\frac{1}{3}$ in the total length. Orbit 3, snout 5, interorbit 9, in the length of the head. The breadth of the head nearly equals its height, and is $\frac{3}{4}$

of its length. Caudal rounded. No distinct canines. First upper pectoral rays free, silky. Head and nape naked above but a strip of rudimentary scales runs forward to the orbit. Upper profile of head very convex. Maxillary reaches nearly to the middle of the orbit. Jaws equal. First dorsal lower than the second, ventral reaching beyond the vent. Grey, a dark bar from the orbit to the upper lip. A second over the eyes to the end of the maxillary, two over the nape becoming confluent on the operculum ; one behind each of the dorsals, each terminating in a large spot on the sides ; a third bar or spot on the root of the caudal. The dorsal cross bands are frequently obsolete, the three large lateral spots becoming more conspicuous. First dorsal with a submesial brown band, the second with large brown spots. Anal with a dark edged hyaline band at the base. Caudal finely spotted, ventral white, immaculate.

Locality, Cape York. Collected by Mr. K. Broadbent

GOBIUS ANNULATUS.

D. 6/15. A. 15. Lat. 57. Tr. 20.

The height of the body and the length of the head each $4\frac{1}{3}$ in the total length. Orbit $4\frac{2}{3}$, snout 3 in the length of the head. Interorbit $\frac{2}{3}$ of the orbit. A distinct canine on each side of the lower jaw. Head much higher than broad. Jaws equal, maxillary not reaching the fore edge of the orbit. Head naked, nuchal scales small. Spines of first dorsal filamentose, but lower than body. The distance of the first dorsal from the eye equals that of the snout from the preoperculum. Violet green, with five dark cross bands on the body, about as wide as the interspaces. The bands are edged with a black within a silver streak ; the first descends between the root of the pectoral and the vent, the last on the root of the caudal. Three rows of oblong and round dark edged silvery spots on the cheeks, opercles and base of pectoral. A large black spot on the first dorsal, between the 4th to 6th spines. Second dorsal black edged with a pale infra-marginal line. Caudal yellow at base, black edged with a small spot on the upper part of the base. Pectoral yellow, ventral dark. A large black spot on the shoulder.

Locality, Cape York. Collected by Mr. K. Broadbent.

A near relation and perhaps local representative of *G. semicinctus* Ben. a Mauritian species.

Gobius concolor.

D. 6, 1/11. A. 1/10. Lat. 26. Tr. 8.

The height of the body and length of the head are equal and $\frac{1}{4}$ of the body s c. Orbit and snout equal and $\frac{1}{4}$ of the length of the head, interorbit $\frac{1}{2}$ of the orbit, and preorbital $2\frac{2}{3}$ in the length of the head. Head over the operculum as high as long, its breadth $\frac{2}{3}$ of its length. Upper profile from the end of the second dorsal to the snout regularly convex. A small canine on each mandible, lower jaw the longer. Ventral reaching the anal with its basal membrane but slightly developed. Upper rays of pectoral detached, silky. Nuchal scales nearly as large as those of the body. Uniform brown, abdomen paler with some irregular traces of narrow vertical bands. First dorsal with two longitudinal rows of brown spots. Pectoral and ventral dark brown.

Locality, Cape York. Collected by Mr. K. Broadbent.

Gobius flavescens.

D. 6, 1/10 A. 1/9. Lat. 30. Tr. 7.

The height of the body is $6\frac{3}{4}$, the length of the head $3\frac{2}{3}$ in the total length. The orbit equals the interorbit, and the snout is $\frac{1}{4}$ of the length of the head. Head longer than high and longer than broad. Snout rounded, obtuse. Physiognomy of *Mugil dobula*. Teeth moderate. No canines. No loose rays to the pectoral. Jaws sub-equal, the lower rather the shorter. Scales of the nape and occiput large. Caudal short pointed, occasionally enveloped for the most part in mucous tissue, ventral short, rounded. Pale grey with a yellow tinge, irregularly freckled with black and with more or less obsolete traces of a lateral series of spots of which the last on the base of the caudal is more constant. Ventral with a dark intramarginal line.

Locality, Moreton Bay. Collected by Mr. G. Watkins. Nearly allied to *G. ornatus*, Rüpp, but with smaller scales, the upper pectoral rays attached and the eyes further apart.

ELEOTRIS MIMUS.

D. 7-8, 1/12. A. 1/9. Lat. 34. Tr. 11.

Height of the body 5-5$\frac{1}{2}$, length of the $3\frac{3}{4}$ $4\frac{1}{4}$ in the total length. Orbit $4\frac{1}{2}$ snout $3\frac{1}{2}$-$4\frac{1}{2}$, interorbit 3-$2\frac{1}{3}$ in the length of the head. Head scaly to the front of the eyes. The maxillary reaches beyond the fore edge of the orbit. Teeth cardiform with minute ones intermediate. Scales equal.

Colour pale to dark brown. A line of dark brown blotches on the posterior part of the sides, the interspaces including sometimes darker brown spots, similar spots continue the line of blotches forwards and are scattered on the caudal and dorsals. They also form a regular line below the lateral blotches. A line of small spots on the anal near the base. Two oblique lines from the orbit to the edge of the opercle, another above them across the opercle, and a fourth above all across the base of the pectoral where it forms a blotch. 1st. dorsal immaculate with a broad yellow edge. 2nd. dorsal with a narrow yellow edge. Anal immaculate, except the basal line of spots, or with a diaphonous white band below them, and the rest yellow. Least height of caudal peduncle = post-orbit. In spirits becomes dingy pale to dark brown.

Length to 3 inches. Locality, Brisbane. Creeks and pools. In life a very handsome fish. *E. mogurnda*, Rich, approaches it somewhat nearly but the differences between the two are readily appreciable.

ELEOTRIS HUMILIS.

D. 5-6, 1/9-10. A. 1/9-10. Lat. 28. Tr. 8.

The height of the body is $4\frac{1}{4}$-5, the length of the head $4\frac{1}{2}$-5 in the total length. Orbit and snout each $\frac{1}{4}$ of the length of the head. Interorbit $3\frac{1}{4}$-4. Head scaly to the interorbit, rather compressed, attenuated, lower jaw prominent. Teeth viliform. Maxillary not reaching beyond the fore edge of the orbit, except in the young. Profile concave over the eye. Fins pointed, ventrals reaching the vent.

Colour in spirits yellowish brown, thickly punctated with black dots, or yellow without punctations. A black blotch above the axilla. Caudal more or less dark, with white spots. Spinous dorsal dark with a white or hyaline sub-marginal band. Soft dorsal with a series (3-6) of white spots at the base and on the hinder rays, and with an intermarginal white band. Anal with a similar mesial band.

Length, to 4 inches. Locality, Brisbane; creeks and pools; common.

This species comes very near to *E. compressus*, Krefft, but is distinguishable by means of its narrow body, longer head, and axillary blotch.

ELEOTRIS LONGICAUDA.

D. 6, 1/8-9. A. 1/8. Lat. 29. Tr. 10.

Height of the body $5\frac{2}{3}$-$5\frac{1}{2}$, the length of the head $3\frac{2}{3}$ in the total length. Orbit $7\frac{1}{2}$-8, interorbit $3\frac{1}{4}$-4, snout $2\frac{1}{3}$-$2\frac{2}{3}$ in the length of the head, caudal peduncle $4\frac{2}{3}$ in the length of the head. Head narrow, depressed, scaly to the muzzle. Interorbit flatly excavated. Muzzle obtusely pointed. Lower jaw very prominent. Soft dorsal and anal pointed, last rays somewhat prolonged. Caudal obtusely pointed. Pectoral pointed, reaching the level of the anal papilla which is also pointed, and reaches the base of the anal. Maxillary not reaching the orbit.

Colour (recent) dark yellowish brown with a darker longitudinal stripe between each scale row. First dorsal marked with black and broadly pinky-white edged, the anterior spines tipped with bright red. Soft dorsal black at the base, posteriorly with large white spots, broadly edged with pinky-white. Caudal black, white edged above. Anal black with a broad ill-defined white mesial bar anteriorly, all but the last rays broadly white tipped. Pectoral with a large black spot at the base enclosing 2 or 3 bright red pointed spots; ventrals black, red edged. Abdomen and post-abdomen ruddy with broad bars of the body colour descending upon them.

In spirits fades to pale brown. The red markings to pale dingy yellow.

Length, to $6\frac{1}{2}$ inches. Locality, Brisbane River.

ELEOTRIS CONCOLOR.

D. 9, 1/10. A. 1/10. Tr. 12.

The height of the body and length of the head are each $3\frac{1}{2}$ in the length s.c., or $4\frac{1}{2}$ in the total. Orbit 5, snout 4, interorbit $3\frac{2}{3}$ in the length of the head. The dorsal and anal pointed, posterior spines of first dorsal filamentous and the last ray of the soft dorsal elongated. Caudal rounded. Head scaly to the muzzle.

Colour uniform, reddish brown. End of the spinous dorsal and base of the pectoral dark.

Length, 4 inches. Locality, Queensland Coast.

ELEOTRIS ROBUSTUS.

D. 6, 1/8. A. 1/8. Tr. 15.

The height of the body and length of the head are each $3\frac{1}{2}$ in the length s.c., or $4\frac{1}{2}$ in the total. Orbit $5\frac{1}{2}$, snout $4\frac{3}{4}$, interorbit 3 in the length of the head. Dorsals pointed. Caudal rounded. The maxillary reaches the middle of the orbit Head scaly to the interorbit.

Colour reddish brown. First dorsal with a mesial pale band, and above it large pale spots. Second dorsal with six pale bands. Anal and caudal with pale marks on the rays forming indistinct bars.

Length, $4\frac{1}{2}$ inches. Locality, Queensland Coast.

ELEOTRIS LATICEPS.

D. 6, 1/9. A. 1/7. Lat. 30. Tr. 10.

The height of the body is 6, the length of the head 4 nearly, in the total length. Orbit $5\frac{1}{2}$, interorbit $7\frac{1}{2}$, snout 3 in the length of the head. The breadth of the head is $1\frac{1}{5}$ in its length. The eyes are approximate and directed upwards, the bony interorbit about $\frac{1}{3}$ of their vertical diameter. Scales enlarging posteriorly, with striæ converging from the base to the tip. The lower jaw is much the longer. Teeth of the outer row in both jaws strong and sharp. Yellowish brown. A series of dark blotches on the sides terminating as many obscure cross bands. Soft dorsal with four series of brown spots. Caudal brown spotted. A broad faint band from the side of the snout along the cheek terminating in a triangular dark spot on the operculum.

Length, 6½ inches. Locality, Queensland Coast.

ELEOTRIS CAVIFRONS.

D. 6, 1 8. A. 1 9. Lat. 28. Tr. 9.

The height of the body and the length of the head each 4_5 in the total length. Orbit and snout $\frac{1}{4}$, interorbit $\frac{1}{5}$ of the length of the head. Head broad, flat, with a concave profile. The maxillary does not reach the fore edge of the orbit. Dorsal pointed. Caudal rounded at the tip. Teeth minute. Head scaly to the interorbit. Caudal peduncle long. Reddish brown, the scales broadly pale edged, giving the side a reticulated appearance. An obscure axillary blotch. First dorsal black with a mesial white line Second dorsal with a similar line of contiguous oval spots and a row of round white spots at the base. Caudal rays conspicuously but irregularly barred with dark brown near the base. Anal broadly dark edged. Pectoral and ventral immaculate.

Length, 3 inches. Locality, North-east Coast.

ELEOTRIS CYANOSTIGMA. Bleek.

Three examples which appear to be of this species have been collected at Cape York (Somerset), by Mr. Broadbent; certainly the discrepancies between them and Dr. Bleeker's types are somewhat formidable, but their similarity is on the whole too strong to allow much doubt about their identity. The Cape York specimens exhibit the following differences.

D. 6, 1 10. A. 9. Lat. 22-23.

Height of the body equal to the length of the head and 4¼ in the total. The maxillary reaching just to the fore edge of the orbit. No spots on the verticle fins. The first and second dorsal spines, as well as the third, elongated, but not to the like extent.

ARISTEUS PERPOROSUS.

D. 1/5, 1/13. A. 1/19. Lat. 35. Tr. 10.

The height of the body is 3, the length of the head $4\frac{3}{4}$ in the total length. Orbit and snout each $3\frac{3}{4}$, interorbit $2\frac{1}{2}$ in the length of the head. Spine of the first dorsal short and straight, of the second and of the anal rather longer, equal and curved; rays of the first dorsal produced, last rays of the second dorsal and of the anal produced beyond the base of the caudal; rays of pectoral produced beyond the origin of the anal. The anal rises opposite the middle of the first dorsal, the latter rises its own length from the snout and much nearer to it than to the caudal. A horse-shoe shaped series of conspicuous open pores from the vertex to the snout; another series round the orbit above and continued posteriorly on the upper limb of the operculum and edge of the pre-operculum, anteriorly to and along the lower mandible. Lower jaw thick, slightly protuberant.

Colour red, paler on the middle of the trunk and yellowish on the fins. Anal black edged. Outer rays of pectoral black, with or without a broad dusky band from near the base of the caudal, fading near the origin of the anal.

Locality, Maryborough.

SALARIAS DECIPIENS.

D. 34. A. 23.

Height of the body and length of the head $6\frac{1}{3}$ in the total length. Dorsal slightly emarginate, continued on the caudal. Anterior portion lower than the posterior; canines in both jaws; the lower one very large, received into the upper jaw. No crest nor tentacles on the head. Profile of head rounded.

Colour grey, posteriorly yellowish. Dorsal and anal fins (recently dry) lilac.

Length, 2 inches. Locality, Cardwell.

SALARIAS PAUPER.

D. 32. A. 20.

The height is $\frac{1}{5}$, the length of the head $\frac{1}{6}$ of the total length. Anterior profile of the head oblique. On the nape a pair of fringed transverse crests, over the orbit a bi-or-tripartite tentacle. At the nostril a short trifid tentacle. A lower canine. Dorsal slightly emarginate and continuous with the caudal.

Colour uniform brown. A few small dark spots on the soft dorsal and caudal.

Length, 3½ inches. Locality, Queensland Coast, Cardwell.

SALARIAS SUBLINEATUS.

D. 12/19. A. 20.

The height is 4½, the length of the head 6, in the total length. Anterior profile of the head vertical. Nape with a short transverse fringe. Orbital and nasal tentacles very small. A short lower canine. Dorsal scarcely emarginate, nearly equal in height, extending on the base of the caudal.

Colour light brown. Throat and chest crossed by 4 or 5 dark bars, the posterior ones descending from the opercles. First dorsal with two rows of pale oval spots. Pectoral spotted and ventral barred with dark brown. Anal with a black edge.

Length, 4 inches. Locality, Queensland Coast, Cardwell.

SALARIAS BELEMNITES.

D. 12/21. A. 23. V. 4.

The height of the body is 10, the length of the head is 8½ in the total length. A sharp ridge but no crest on the head. Orbital tentacles very small, simple. Dorsal deeply notched, the first spine of the second dorsal short. A lower canine. Profile of head rectangular. The first dorsal rises in advance of the pectoral and in half the height of the body. The second does not quite extend to the caudal and is $\frac{4}{5}$ of the height. Caudal truncate.

Colour blackish brown. The soft dorsal edged with white. Spinous dorsal obscurely spotted. Pectoral rays regularly spotted with a few spots on the web.

Length, 6½ inches. Locality, Queensland Coast.

In proportions similar to *S. tridactylus*, Bl. Schn.

SALARIAS FURVUS.

D. 12/20. A. 21.

The height of the body and the length of the head are 7 in the total length. Nape with a transverse fringe. Orbital and nasal tentacles long, simple. Dorsal not notched, No canines. The web of the soft dorsal extends on the caudal. The spinous dorsal rises over the opercle and equals the anal in height. The soft dorsal is much higher. Anterior profile rather oblique. Caudal rather rounded.

Colour dark brown Dorsal with oblique bands of elongated black spots. Pectoral with elongated spots on the rays.

Length, 5½ inches. Locality, Queensland Coast.

SALARIAS FURCATUS.

D. 32. A. 23.

The height of the body is 6, the length of the head 5 in the total length. Canines. No crest nor orbital filament. A minute nasal tentacle. Caudal deeply forked with the lower lobe largest. Dorsal not notched, the anterior (spinous) portion the lower. Yellowish. Head above spotted. A dark band from the orbit through the mouth and over the chin, two strongly curved narrow pearly lines on the opercles, the anterior behind the eye enclosing a dark space which becomes a black spot posteriorly, the hinder from the orbit above the former to the operculum where it furcates and encloses likewise a dark space. Lower part of head with dark streaks and spots. Body with short oblique bars anteriorly breaking up into spots posteriorly. Dorsal with dark spots at the base. Ventrals yellow.

Locality, St. Helena, Moreton Bay. Collected by Mr. D. Macpherson.

Salarias Helenæ.

D. 34. A. 23.

The height of the body is $6\frac{1}{3}$, the length of the head nearly the same in the total length. Canines large in both jaws. No crest nor filaments on the head. Dorsal without notch, extending on the base of the caudal. Caudal short, rounded. Profile of head rounded. Yellowish green. The fore upper part of the body with about six undulating lines decreasing in size inferiorly. Head surrounded by a ring behind the eye and by another over the nape. Dorsal with a central longitudinal band.

Found in Teredo burrows in wood. Very active and vicious.

Locality, St. Helena, Moreton Bay. Collected by Captain Townley.

Salarias viperidens.

D. 29. A. 18.

The height of the body is 6 nearly, the length of the head 5 in the total length. Dorsal not notched, not extending to the caudal. No crest on the nape nor tentacles on the head. Lower canines very long, a pair of small ones in the upper jaw. Profile of head very oblique. Brown. A series of large, more or less, confluent blotches on the back and a dark spot on the base of the caudal. Dorsal spotted with dark brown on each spine and stained with same on some of the webs.

Locality, Somerset. Collected by Mr. K. Broadbent.

Salarias calvus.

D. 12/18. A. 18.

The height of the body is $5\frac{1}{4}$, the length of the head 5 in the total length. Dorsal notched, extending to the caudal. No crest on the nape nor tentacles on the head. No canines. Profile prominent before the eye. Eye large. Light brown, speckled with dark, the specks forming obscure vertical bands on the fore part of the trunk and forming a ground colour between white spots on the upper edge of the belly. Head with small white spots. Chest with two large ones on each side. A series of double bars below the dorsals.

Locality, Murray Island, Torres Straits. Collected by Mr. K. Broadbent.

Petroscirtes lineatus.

D. 30. A. 17.

The height of the body is 6, the length of the head 5 in the total length. Orbit 3 in the length of the head, interorbit $\frac{2}{3}$ of the orbit, and longer than the snout. Lower canines more than $\frac{1}{2}$ of the orbit. Upper canines very small. Profile of head regularly convex. Yellowish white with equi-distant black longitudinal bands, the upper meeting on the interorbit, the middle before the eyes, the lower from the angle of the mouth. Dorsals edged with black. Anal pectoral and ventral uniform yellowish.

Locality, Murray Island, Torres Straits. Collected by Mr. K. Broadbent.

Leme purpurascens.

D. 5/37. A 31. P. 10. V. 15-16.

The height of the body is $\frac{1}{14}$ of the total length. The length of the head $\frac{1}{6}$ of the same. That of the tail $1\frac{4}{5}$ of the length of the head and trunk. No rudimentary scales visible. Radiating groups of muciferous ridges round each eye speck, on the snout and cheeks. Teeth $\frac{9}{6}$ in front. Dorsal and anal distinctly divided from the caudal.

Colour in life deep purple red with a series of pale spots down the middle line of the body. Fins dark with pale edges.

Length, 3 to 5 inches. Locality, Brisbane.

Habitat.—Mud of river banks.

Amblyopus niger.

This name is proposed for an *Amblyopus* of which a single example which has been allowed to dry up after maceration in spirit occurs in the collection of Queensland fish. Its fin formula cannot be confidently given but it seems to have five spines in the first dorsal and none intermediate between the two fins. The height of the head is 12, its length $6\frac{3}{4}$ in the total length The colour uniform deep black.

NOTE ON THE EYES OF DEEP SEA FISHES.

By R. von Lendenfeld, Ph.D.

In a short note which I published some time ago (1), concerning the life history of the New Zealand Frost fish, Lepidopus caudatus, I mentioned the fact, that Lepidopus caudatus had very large eyes, and deduced from this, that it was a Deep Sea Fish.

Referring to this note, Mr. Arthur (2) points out that large eyes cannot be a criterion of deep sea fish, because many deep sea fishes have small eyes, or no eyes at all. There is no doubt that numerous deep sea animals have lost their eyes in the same manner as the blind mole, but at the same time I would like to point out that very large eyes are certainly a proof that the animal which possesses them lives in a dark place in the case of this animal, being marine, in deep water.

The progeny of an ordinary surface fish, which may have quitted the shallow water and taken up its abode in the dark abyss could not have migrated to a greater depth very quickly, but must necessarily have been many generations doing it.

If the eyes of the fish originally were good and the migration was effected very slowly, there is no doubt, that the species may have adapted itself in the ordinary manner to the slowly changing amount of light, by its eyes becoming continually enlarged. On the other hand if the eyes of a species originally were not very good and the migration was a rapid one, there was not sufficient time for adaptation, and the eyes were of less use the deeper the species migrated, so that they finally became rudimentary, because they were useless.

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(1) *R. v. Lendenfeld.* Ueber Lepidopus caudatus. Zoologischer Anzeiger. Band VII. Seite 1883. Translated into English. New Zealand Science Journal. Vol. II., p. 108.

(2) *Arthur.* Notes on the occurrence of the Frost Fish. New Zealand, Journal of Science. Vol. II., p. 157.

For the hypothesis concerning the appearance of Lepidopus caudatus set forth in my paper, I do of course not claim anything more than the merit of a *possibility;* and I will be very well satisfied if I have thereby induced any one to take up the subject and discover the secret, whether his discovery prove my hypothesis to be correct or false.

THE INSECTS OF THE MACLAY-COAST, NEW GUINEA.

By William Macleay, F.L.S., &c.

During a nearly three years residence at Astrolabe Bay on the North Coast of New Guinea, about 10 years ago, Baron Maclay picked up, as occasion offered, a few insects, which he placed in spirits, where they have remained undisturbed and unexamined until the present time. The collection is of the scantiest nature, the number of species of all Orders of the Insecta, not exceeding 50, and many of them I regret to find, from their lengthened immersion in spirits, in anything but a good state for examination. It must not however, be supposed that the smallness of the collection in any way indicates poverty of the insect fauna in that portion of New Guinea, the reason is simply that the Baron at that time was so deeply interested in Anthropological investigations, that he scarcely noticed the other animals of the country, and only collected what actually came in his way. It is much to be regretted that he did not make better use of his opportunities in this respect, for the Maclay Coast—so named after the distinguished traveller himself—is about the only portion of the coast line which has never been visited by collectors.

Port Dorey. Triton Bay, and indeed many places on the West and North-west Coast. have been frequently visited by naturalists, and many species of the Invertebrata of these regions were described long ago by M. M. Garnot and Lesson, Quoy, Gaimard, Boisduval and others, and in later times by Gestro, Wallace, Bates, Baly, &c. The Archipelago of large Islands, New Ireland, &c., lying on the North-East side of New Guinea, was visited by the Coquille, in 1823, and large collections were made at that time, and of late years it has been a favourite resort of numerous professional collectors. The South Coast also has become of late years pretty well known, from the Delta of the Fly on the West to the extreme South-east point of the Louisiade Archipelago, and the labours of D'Albertis, Goldie, and others have enabled us to form a tolerably accurate estimate of the Fauna of that portion of the Island. But the country in or near Astrolobe Bay, has never hitherto been submitted to even the most cursory search for its zoological productions.

I give, in the following list, under each species, all its known localities, as by this means the collection, small though it be, may throw some light on the subject of the geographical distribution of species.

Ordo. COLEOPTERA.

Family. CICINDELIDÆ.

1. Cicindela D'Urvillei. Dej.

Guer. Voy. Coq. Zool. Pl. I., fig. 2.

Hab.—Dorey ; Maclay Coast.

FAM. SCARABÆIDÆ.

2. Lepidiota quinquelineata. nov. sp.

Oblong-oval, dark reddish brown, opake. Head densely variolose-punctate, each puncture with a minute whitish scale; the clypeus slightly emarginate and considerably reflexed. Thorax nearly twice as broad as long, the anterior angles advanced, the sides widening towards the base, the base itself a little sinuate, and the whole coarsely and rather distantly punctate, each puncture with a short yellowish or whitish seta-looking scale.

Scutellum triangular, rounded behind, sparsely punctured. Elytra of the width of the thorax at the base, and nearly four times the length, widening a little towards the apex, the puncturation irregular and denser than on the thorax, and the scales rather longer. Each elytron has five longitudinal lines or costæ; the first close to the suture distinctly marked, the others at equal distances apart and scarcely costate, excepting the fifth, which is distinctly raised. The pygidium is triangular with rounded angles, and is densely variolose-punctate. The legs and entire under surface are of a nitid pitchy brown; the pro-meso and metasternum clothed in the middle with yellow pile. Fore tibiæ with three strong teeth towards the apex externally; the middle and hind tibiæ with three short nearly equidistant teeth on the outer margin. Long. 16 lin.

One specimen. Maclay Coast.

3. Lepidiota scutellata. nov. sp.

Oblong-oval, brown, opake, very densely minutely punctate, and densely clothed with minute silky grayish scales. Head rugosely marked in front on the clypeus, which is emarginate and reflexed. Thorax transverse, a little emarginate in front and sinuate behind, the anterior angles rather rounded, and the sides rounded in the middle and narrowed slightly towards the posterior angles. Scutellum rounded behind, its width at the base more than thrice its vertical length. Elytra about the width of the thorax and about three times the length, the callus on the hinder part very conspicuous.

Under surface dark piceous, the abdominal segments densely clothed with scales, and the mouth pro- and mesosternum with red hair. Fore tibiæ strongly tridentate, the other tibiæ slight, and minutely armed; the posterior thighs narrow at the base, swelling and rounded towards the apex. Long. 18 lin.

One specimen, Maclay Coast.

4. Dipelicus nasutus. Bates.

Pro. Zool. Soc., 1877, p. 153, pl. XXIV., fig. 4.

Hab.—Duke of York Island; Maclay Coast.

5. Scapanes politus. nov. sp.

This is a very distinct species, but from its general resemblance I have no doubt it has been frequently taken for *S. australis*.

Boisduval describes *S. australis* from Port Dorey, and I have specimens of it in my Museum from Aru, New Ireland, Duke of York Island, and the Solomon Islands. The species I now name I have from the Maclay Coast, the East side of the Gulf of Papua, and the South Eastern extremity of New Guinea. The size and general appearance of the two species are much the same, but the difference in sculpture is very remarkable throughout, but especially on the elytra. In *S. australis* the elytra are covered with large variolose looking punctures, with a few distinct semi-costate longitudinal lines ; in *S. politus* they are smooth and nitid, the puncturation such as it is being minute and thin.

Several specimens, male and female.

6. Lomaptera adelpha. Thoms.

Archiv. Ent. 1., p. 428, tab. 16, fig. 3.

Hab.—Aru Islands ; Fly River ; Maclay Coast.

FAM. BUPRESTIDÆ.

7. Cyphogastra mniszeckii. Deyr.

Ann. Belg., 1864, p. 40.

Hab.—Amboina ; Maclay Coast.

FAM. EUCNEMIDÆ.

8. Arisus atripennis. nov. sp.

Elongate, parallel-sided. Antennæ and palpi as in *A. Wicardi* Casteln, and of a light pitchy-red. Head and thorax red, densely punctate, and thickly covered with short velvety pubescence ; there are two small round depressions on the head between the eyes : the thorax is a little longer than the width, very convex above, and with the posterior angles acute. Scutellum small, square, and of an opake reddish hue. Elytra of the width of the thorax and about three times the length, black, punctate-striate, (10 striæ on each elytron) and densely and finely punctate on the interstices. Body beneath and legs light red, with a very short golden pile. The fourth joint of the tarsi is bilobed.

Long. 6 lin. One specimen.

It is with considerable doubt that I place this handsome species in Bonvouloir's genus *Arisus*, it should probably form a new genus. The species is undoubtedly new.

FAM. MALACODERMIDÆ.

Metriorhynchus papuensis nov. sp.

Sooty black, with the base of the elytra, margins of the thorax, the meso and metasternum and the base of the thighs yellow. The cavities on the thorax are deep but not very distinctly defined. The elytra are punctate in ten striæ, towards the base the alternate interstices are elevated.

Length, 3½ lines.

10. Luciola ruficollis. Guer.

Voy. Coq. Ent., p. 75.

Hab.—Dorey ; Maclay Coast.

FAM. CURCULIONIDÆ.

11. Eupholus azureus. nov. sp.

Of a uniform azure blue, subopake, under a lens showing an extremely fine puncturation. The antennæ have the joints from the second to the eighth clothed with whitish hair, the club is brown. The thorax has two raised smooth black lines extending diagonally outwards from the apex on each sides of the median sulcus to about the middle. The scutellum is very small and round. The elytra are broader than the thorax at the base, slightly widened behind and pointed at the apex. There are nine rows of large deep punctures on each elytron ; these are regular but not in striæ ; the suture, the scutellar region, a scapular and subapical callus, a short raised vitta on each side of the scutellum, and a raised narrow fascia a little behind the middle and not reaching the suture are black. The knee joints are black, the tarsi reddish beneath, and the abdominal segments are lightly clothed with hair.

Long., 15 lin. One specimen.

12. Rhinoscapha Maclayi. nov. sp.

Black, nitid; head densely punctured in front, lightly behind, covered with a thin ashen pubescence and furnished with a number of strong hairs about the mouth. The extremity of the snout as broad as the head. Thorax scarcely longer than broad, broader at the base than the apex, and also broader than the head, very regularly marked, and with a depression on the anterior part of the median line. A broad depressed space on the side and under surface of the apex of the thorax is densely covered with reddish golden scales, and on each side from the middle to the base there is a broad vitta of the same. The elytra are convex, broader than the thorax, with a prominent humeral callus, and pointed at the apex; on each elytron are nine rows of large oblong punctures, the intervals scarcely raised; the extreme apex is mucronate. A sutural vitta including the scutellum, a broadish fascia behind the shoulder and not reaching the suture, and a narrower rather curved fascia behind the middle and extending to the suture, are densely clothed with golden scales. The metasternum is similarly clothed. The legs are sparingly punctured, each puncture with a short seta.

Length, 14 lines.

Four specimens of this fine species among such a limited collection would lead to the conclusion that it is a common insect on the Maclay coast, and yet among the many species described by various authors I can find nothing like it.

13. Celeuthetes bicristatus. Montr.

Faune del 'Isle Woodlark, p. 49. Lacord. Gen. Col. VI., p. 150. (Note.)

I believe this insect to be the *Otiorhynchus bicristatus* of Montrouzier. The scape of the antennæ is fine at its insertion, but immediately becomes broad, flat, and slightly arcuated, and is much longer than the head ; the elytra are very retuse behind, and prolonged backwards on each side into prominent hair clad protuberances.

Hab.—Woodlark Island ; New Guinea.

14. Psomeles plagiatus. Blanch.

Voy. Pole Sud, IV., p. 229 tab. 15 fig. 18.

Hab.—New Guinea.

15. Lixus Duponti. Schn.

Gen. Curc., VII., p. 478. No. 174.

Syn. L. farinosus, Bois., Voy. Astrol. II., 1835, p. 406.

Hab.—New Guinea.

16. Mecopus bispinosus. Weber.

Schn. Gen. Curc. III., p. 556.

Pasc. Ann. Nat. Hist., 1871, pl. 15, fig. 11.

Hab.—Sumatra ; Java ; Borneo ; New Guinea ; Maclay Coast.

17. Rhyncophorus velutinus. Fairm.

Journ. Mus. Godeff., 1878, p. 33. *Syn. R. Kaupii.* Schauf.

Hab.—Mioko ; Maclay Coast.

FAM. BRENTHIDÆ.

18. Ectocemus pterygorhinus. Gestro.

Ann. del. Mus. Civico di Stor. Nat. Gen. VII., 1876.

Hab.—Cape York, Aust. ; Maclay Coast.

FAM. ANTHRIBIDÆ,

19. Nessiara diplonata. Fairm.

Ann. Soc. Ent. Belgique, tom. 27, p. 45.

Hab.—Wooklark Island; Maclay Coast.

FAM. CERAMBYCIDÆ.

20. Batocera Wallacei. Thomson.

Arch. Ent. 1 p. 447, t. 18 fig. 1. Pasc. Ent. Soc. (3), III., p. 267.

Hab.—Aru ; Key ; Mataballo ; New Guinea.

21. Monohamus variolaris. Pasc.

Trans. Ent. Soc., (3.) Vol. III., p. 295.

Hab.—Dorey ; Mysol ; New Guinea.

22. Dihamus rarus. Thomson.

Arch. Ent I., p. 445. Pase. Ent. Soc., (3.) III., p. 291.

Hab.—Aru ; New Guinea.

23. Agelasta obscura. nov. sp.

This species must I think be undescribed, but it is so denuded by long immersion in spirits of the variegated scaly clothing so usual in the genus that it is difficult to speak with certainty.

The whole insect is of a dull chocolate brown colour, the occiput has a distinct median impression, that of the thorax only shows on the posterior half. The elytra are strongly punctured in about fifteen very irregular rows, the intervals for the most part flat, but three of those in the middle of each elytron are slightly raised and broader. One specimen (a female). Length, 7 lines.

24 Pithomictus irroratus. nov. sp.

Form rather elongate, the length being five times the width. The head is deeply impressed between the antennæ which are not far apart. They are longer than the body and ciliated beneath ; the first joint strong and cylindrical, the third slight but much longer, the fourth little longer than the first. The thorax is longer than broad and almost cylindrical, with a short acute spine on each side behind the middle The scutellum is nearly square. The elytra are a little wider than the thorax, and over three times the length, and are narrowed a little towards the apex, which is truncate and acutely bidentate. Each elytron is strongly punctate-striate, the intervals costate except towards the sides. The legs are rather short, the thighs all subclavate, the anterior tarsi very dilated. The colour is a uniform chocolate brown becoming redder on the legs and antennæ, ornamented with a short white pubescence, disposed in four vittæ on the thorax, and on the elytra in round spots in the lines of the striæ. Long. 3½ lin.

This species should properly form a new genus.

25. Arsysia spilonota. Gestro.

Ann. Mus. Civ. Genoa VIII., 1876, p. 521.

Hab.—Island Jobi; Maclay Coast.

26. Tmesisternus trivittatus. Guer.

Voy. Coq. Ent., pp. 130 t. 7, fig. 12; Blanch. Voy. Pole. Sud. IV., pp. 284 t. 16, fig. 15; Pasc. Trans. Ent. Soc. (3) III., p. 464; Gestro. Mon. Tmes., p. 16.

Hab.—Aru, Dorey; Maclay Coast.

27. Olenocamptus bilobus. Fab.

Pasc. Ent. Soc. (3), Vol. III., p. 316.

Syn.—*O. serratus* Chevr. Mag. Zool., 1835.

Hab.—From India to New Guinea.

28. Glenea picta. Fab.

Pasc. Ent. Soc. (3), Vol. III., p. 373, pl. XVII., fig. 6.

Hab.—The whole Indian Archipelago.

29. Pachydissus ternatensis. Fairm.

Pet. Nouv. Ent., 1879, No. 70; Ann. Soc. Ent. Belgique, tom. 27, p. 51.

Hab.—Duke of York Island, Ternate, Yule Island (New Guinea), and Maclay Coast.

30. Ceresium pachymerum. Pasc.

Diatomocephala pachymera. Pasc. Trans. Ent. Soc. (3), Vol. III., p. 542.

Hab.—Bouru, Ceram, Maclay Coast.

31. Clytanthus luxata. Pasc.

Trans. Ent. Soc. (3), Vōl. III., p. 602.

Hab.—Saylee, Maclay Coast.

32. Pascoea Idæ. White.

Cat. Longic. Brit. Mus., p. 341, pl. 8, fig. 5 ; Pasc. Trans. Ent. Soc. (3), Vol. 3, p. 486, pl. 19, fig. 6.

Hab.—Ceram, Amboyna, Maclay Coast.

FAM. CHRYSOMELIDÆ.

33. Aspidomorpha sanctæ-crucis. Fab.

Ent. Syst. IV., App , p. 446 ; Bohem. Mon. Cassid. II., pp. 287 to 6, fig. B.

Hab.—E. India, Maclay Coast.

34. Rhyparida atrata. nov. sp.

Head emarginate with deep median impression in front terminating behind in a transverse line across the middle of the head, the epistome, which is large, is densely punctured, the rest of the head very slightly ; the eyes are large and prominent. The thorax is transverse, not broader at the apex than the head including the eyes, but widening on the sides which are rounded, and becoming narrower towards the posterior angles which are acute ; the surface, except at the posterior angles, is covered with irregular punctures. The scutellum is smooth. The elytra are a little broader than the thorax at its widest part, and are striate puncta te ; the two striæ on each side of the scutellum are abbreviated, and the eighth from it takes its rise behind the humeral callus and divides near the middle into three distinct punctured striæ. The colour is entirely of a subnitid black, with a piceous tinge on the head, antennæ and legs.

Long. $2\frac{1}{2}$ lin.

35. OIDES LIMBATA. Blanch.

Adolium limbatum., Voy. Pole Sud. IV., p. 339, t. 19, fig. 12.
Hab.—New Guinea.

FAM. COCCINELLIDÆ.

36. EPILACHNA HÆMORRHOA. Boisd.

Voy. Astrol. Col., 1835, p. 599, t. 8, fig. 22. Muls. Spec. Trim. Col. p. 727.
Hab.—Dorey, Maclay Coast.

37. EPILACHNA CONSPUTA. Muls.

Spec. Trim. Col., p. 763.
Hab.—New Guinea.

38. EPILACHNA. Sp. (?)

The specimen injured beyond recognition.

Ordo. ORTHOPTERA.

FAM. MANTIDÆ.

39. HIERODULA TIMORENSIS. De Haan.

Sauss. Melanges Orthopt. 4th fascicle, p. 38, fig 24. *Syn. Polyspilota timorensis* Sauss. Melanges Orthopt. 3rd fascicle, p. 87. fig. 3.

One fine specimen, possibly a new species, the thorax seems to be too long for *H. timorensis.*

FAM. PHASMATIDÆ.

40. CYPHOCRANIA MACLAYI. nov. sp.

There is only one specimen (a female) of this grand insect, which I name after its distinguished discoverer. It is 8 inches in length, and of a very robust form. The colour seems to have been reddish brown all over, darker on the mesothorax, and lighter on the legs.

Its occiput is convex with five lightly marked lines, the median somewhat costate. The prothorax is about 4 lines long, and 3 broad, very slightly wider at the base than at the apex, and divided by a transverse and longitudinal sulcus into four sections, the posterior ones largest ; in the upper half of the thorax there are four tubercles, two close to the head, the others near the transverse sulcus ; in the lower half there are also four tubercles placed two each side of the median line close to the base ; there is also a deep transverse impression across the apex of the prothorax, and there seems to have been a good deal of yellow colouring over the whole of its upper surface. The mesothorax is about 12 lines long, as wide as the prothorax, of equal thickness throughout and armed with strong spines over its whole surface. Beneath both meso and metathorax are similarly armed. The tegmina are almost half the length of the wings and of oval form ; there is an indistinct trace of a lightish coloured band across them behind the middle. The costal area of the wings is broad and of the same reddish-brown hue as the tegmina, the hyaline portion is barred with brown. The legs are all densely spinous. The abdomen is bulky and extends more than an inch beyond the extremity of the wings.

41. Cyphocrania lobiceps. nov. sp.

This should perhaps be placed in a new genus. The specimen (a male) is over six inches in length and appears of a uniform brown colour, excepting on the head, which is yellowish. The form is more slender than in *C. Maclayi.* The head is elevated on the occiput into a bilobed rounded prominence ; the face is rather inflexed like that of a *Blatta ;* the pro-thorax is rather narrower than the head and about 3 lines in length ; the meso-thorax is about 10 lines in length, smooth and cylindrical. The tegmina are about one-third the length of the wings, with an oblique yellow fascia extending from the upper margin near the base to the middle of the inferior margin. The wings are four-fifths of the length of the abdomen, and are of a uniform dingy brown. The legs are moderately spinose ; the anterior tibiæ are singularly contorted and twisted

FAM. GRYLLIDÆ.

42. PHYLLOPHORA SPECIOSA. Thunb.

Mem. tome. V., p. 186, tab. 3 ; Brulli. Hist. Nat. Ins. tome. IX., p. 142, pl. 13, fig. 2 ; Serville Hist. Nat. Orthopt., p. 592.

43. ANOSTOSTOMA. Sp. (?)

This insect is winged, otherwise very like *Anostostoma.*

Ordo. HEMIPTERA.

44. MEGYMENUM DENTATUM. Guer.

Voy. Coq., pl. 12, fig. 1. Boisd, Voy. Astrol., p. 632., pl. 11, fig. 11.

Hab.—Dorey, Maclay Coast.

45. LYGÆUS PACIFICUS. Boisd.

Faune del Oceanie, p. 630, pl. 11, fig. 20.

Hab.—Port Western, Maclay Coast.

46. EULYES. Sp. (?.)

47. NEW GENUS.

48. GALGULA. Sp. (?.)

Ordo. HYMENOPTERA

I am unable to name these, there in all six species, 2 of *Apidæ,* 1 of *Polistes,* 1 *Pelopaeus,* 1 *Chrysis,* and a species of Ant.

Ordo. DIPTERA.

One specimen, an *Anthrax,* very much injured.

Ordo. HOMOPTERA.

One *Cicada* and one *Centrotus.* Species doubtful.

NOTES ON ZOOLOGY OF THE MACLAY-COAST (1) IN NEW GUINEA.

By N. de Miklouho-Maclay.

Leaving the description of anatomical investigations of different animals obtained at the Maclay-Coast (in 1871-72 and 1876-77), to form the comparative-anatomical supplement of my work of travels (1870-1882), which will be published in Europe by-and-bye, I intend to bring before this Society a few remarks concerning the systematical position of some the animals collected.

I.—On a New Sub-Genus of Peramelidæ: Brachymelis.

(Plate XXXVIII.)

In July or August, when the rain-falls are less frequent on the north-east coast of New Guinea than in the other months of the year (2), and when the coarse grass, which covers the valleys and slopes of the hills near the coast becomes nearly dry, the natives of neighbouring villages fix a day for a common sport. On the fixed day they assemble early in the morning, armed with

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(1) To the portion of the north coast of New Guinea, between Cape Croisilles and Cape King William, a coast line of about 150 miles, extending inland for an average distance of 30—50 miles to the highest ranges of the Mountains Mana-boro-boro (or Finisterre Mountains), I have given the name of the *Maclay-Coast*, so far back as 1872 (Natuurkundig Tijdschrift voor Nederlandsch Indie, Batavia, 1872,) for greater convenience of reference in scientific description by avoiding the constant repetition of its geographical position.

(2) N. de Maclay. Notice Météorologique concernant la Côte-Maclay en Nouvelle-Guinée, publisbed in the Natuurkundig Tijdschrift voor Nederlandsch Indie. Batavia, 1873.

spears, bows and arrows. Arrived on the spot, a few boys under the direction of an experienced adult, set fire to the grass in many places in a systematic manner, according to the direction of the wind and the formation of the ground. The armed men surround the burning patches and watch for the animals which try to escape the fire. In this way a great number of wild pigs and small marsupials are killed. I used to follow many such expeditions, not only to have my share of the spoil, but principally to extend my knowledge of the fauna.

Amongst the victims of the slaughter the most numerous at the Maclay Coast is a large bandicoot.

The specimen which has served for this description is not by any means the largest I have seen, because the larger ones are always secured by natives at once on account of their size and spoiled by spear or arrow wounds for zoological or anatomical purposes.

Not having had in New Guinea a superabundance of alcohol, I have kept in my collections, only 3 specimens of this animal.

The examination of the dentition (number of the upper incisors) the bristle-like hair and the proportional shortness of the hind limbs (1), induce me to describe this bandicoot as belonging to a new sub-genus (2) of Peramelidæ: *Brachymelis* (3).

I shall show in this paper, that some bandicoots described as species of Perameles have to be included in the Sub-genus Brachymelis, but before this, I intend to give some details about the species from the Maclay-Coast, which I shall call after the place where I dissected the first specimen of it. (4.)

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(1) "Limbs (of the Peramelidæ) unequal, the posterior legs being considerably longer than the anterior." Waterhouse Mamalia, Vol. I., p. 354.

(2) I am aware that, on the character of possessing 8 upper incisors instead of 10, a Genus *Echimipara* has been established by Lesson. I think however, that this peculiarity alone, is not sufficient to make a new Genus; but I believe, that the above mentioned 3 characters authorise the establishment of a *Sub-genus*.

(3) βραχημελις—Short limbed.

(4) The hut which formed my first residence in New Guinea in 1871, was built on a small Cape called by the natives "Garagassi."

Brachymelis Garagassi. N. sp.

Habitat.—The Maclay-Coast of New Guinea.

Principal Measurements of an adult ♂ and an adult ♀.

	♂ mm.			♂ in.	♀ mm.			♀ in.
From tip of nose to the base of tail ..	432	mm.		17in.	301	mm.		11,9in.
Tail ,, ,, ,, ,,	82	—		3,2	63	—		2,5
From the tip of the nose to the occiput	82	—		3,2	71	—		2,8
Fore limb ,, ,, ,, about	135	—		5,3	105	—		4,2
Hind limb ,, ,, ,, about	172	—	or about	6,7	145	—	or about	5,7
Hand, from the wrist to the end of the nail 3rd finger	39	—		1,5	31	—		1,3
From the head to the end of nail of 4th toe................	65	—		2,5	55	—		2,2
Length of the ear	22	—		0,9	18	—		0,7

The general contour of the body differs according to the state of nourishment. At the time of the year, when the natives, as already mentioned, burn the grass, the Brachymelis Garagassi is very fat, and his short legs appear still shorter in comparison to the heavy body.

Fur.—The yellowish-brown fur of the back consists of short light yellowish-gray under-fur and long flat bristle-like hair, which may prick palpably, if you pass your hand up the reverse way on the back of the animal. The length of the prickly hair varies between 24-16 mm. (O, 9—O, 6 in.) and their breadth between O, 8—O, 5 mm. Both flat sides, the upper as well as the under, are grooved. The groove on the upper side reaches nearly to the end of the hair, but the under side of the hair is grooved not more than half of the length. The base and the lower half of each hair is of light brown colour which gradually darkens towards the upper end, which is dark brown, nearly black. The under side of the hair is in general lighter than the upper. Some of the bristly hairs are darker than others, some on the contrary quite light brown. Inspected from the side, some of the flat hair appears to be divided just on the top in two ends of unequal length and it proves easy to split the flat hair in two bands of different thickness; the thinnest of the two bands corresponds to the layer of the upper side of the flat hair (1). On the underside of the body, from the chin to the

(1) The easy splitting of the hair may also be the result of the remaining of the specimen a long time in alcohol.

arms, the fur is of a yellowish dirty white colour and the hair is not over 9 mm. (0, 4 in.) long. Between this light coloured short hair with nearly circular horizontal sections there are also some light coloured, flat, stiff hairs.

The *head* is elongate and conical, (Fig. 1) *muzzle* and *lips* blackish and naked.

The distance of the eye from the corner of the mouth is equal to the distance from the corner of the mouth to the anterior lower margin of the meatus auditorius, and the distance from the eye to the tip of the nose is equal to three times the above measure. A few long black hairs are to be found on the sides of the upper lips, 3 hairs just behind the corner of the mouth and a few short ones on the throat.

The *eyes* are very small.

The *ear* is elongated, the breadth being $\frac{3}{5}$ of the length. Opposite the meatus is a small, bare, triangular, tragus-like prominence. Parallel to the anterior margin of the auricle, between the margin and the concha runs a longitudinal ridge, while on the opposite posterior border a narrow pouch is to be found. Nearly in the centre of the concha are two very characteristic folds. The lower, which is the longest, stretches horizontally across the whole cavity of the concha, the upper fold projecting forward presents a deep notch. The cavities of both folds open upwards. The adjoining Fig. 1, will facilitate the understanding of the above description. The position of the slight incision of the posterior margin near the upper extremity of the ear, is, as far as I have observed not constant.

The *tail*, is short, stiff and naked. Amongst the great number of Brachymelis I had the opportunity to see on the occasion of burning the grass, I noticed many animals with only the stump left, having a part of the tail lost (bitten off ?) in some way.

Dentition.—(Fig. 2, 3 and 4.)

$$I.\ \frac{4}{3},\quad C.\ \frac{1}{1},\quad P.\ \frac{3}{3},\quad M.\ \frac{4}{4},$$

The absence of the 5th upper incisor is one of the principal characters which distinguishes the Brachymelis from the other Peramelidæ. The incisors of both jaws stand close together; those of the upper are nearly of the same size and a trifle smaller than in the lower jaw. The third mandibular incisor is the broadest and bicuspid.

The *Canines* are small, the maxillary ones of about the same size as the first premolar, the mandibular ones narrower than those of the upper jaw.

The *premolars* are slightly different one from the other in their shape, increasing in size from the front backward. The mandibular premolars are a little larger than these of the maxilla. In both jaws, the premolars stand not close together but leaving a space between each tooth. In the lower jaw there is also a space between each tooth. In the lower jaw there is a space between the third premolars and the first molar.

The *molars* are all very much worn down, so that the cusps can not be well recognised, with the exception of the last mandibular molar, where the 5 cusps are distinct.

The grinding surface of the molars is not horizontal, but in those of the upper jaw, sloping to the internal margin, while in those of the mandibula, the "grinding-down" appears in the opposite direction, *i.e.*, the internal margin is the highest.

On the palate, 10 distinct ridges are to be distinguished. (Fig. 3.)

The *pouch* of the female Brachymelis is very long, with an entrance as usual directed towards the tail. In the ♀ of which I gave the measures, the distance from the anterior margin of the entrance to the bottom of the pouch measured about 50 mm. (2 in.) and 83 mm. (3, 3in.) from the bottom of the posterior fold of the pouch near the anus.

The pouch contained 6 nipples (1) arranged in 2 parallel longitudinal rows. Four of the nipples could be seen through the

(1) Waterhouse (Mammalia, Vol. 1, p. 345,) gives the number of mammæ of the Peramelidæ—8; he mentions, that Prof. Owen found eight nipples in P. nasuta, arranged in two slightly curved longitudinal rows, but adds that possibly this number may not be constant. Peters and e Doria (Enumerazione dei Mammiferi, etc., p. 354) say that P. Doreyanus has a very developed pouch with 8 nipples.

entrance of the pouch, without distending the same. The nipples of this ♀ were of different length, some not longer than 1 mm., 2 about 10 mm. and one, sucked by a young one (1) 18 mm. (over O, 7 in.) long.

Up to the present time 4 species of Perameles have been found in New Guinea and described as :—

P. Doreyanus. Quoy and Gaimard.
P. Moresbyensis. Ramsay.
P. Broadbentii. Ramsay.
P. Longicauda. Peters and Doria.

In the zoological part of the voyage of the Astrolabe (2), Quoy and Gaimard give the description of *Perameles Doreyanus* and the dental formula of the same, in which only 8 upper incisors are indicated (3). Waterhouse referring to the statement of Quoy and Gaimard, expresses the possibility that the two incisors have been lost "whilst the animal was alive" (4). Peters and Doria, who had the opportunity of examining numbers of P. Doreyanus, mention that *P. rufescens* (from Kei Islands) has like *P. Doreyanus*, 8 upper incisors (5.)

I find to my regret that neither the Australian nor the Macleay Museum in Sydney possess a specimen of *P. Doreyanus*, so that I have had only the help of the description and illustrations (6) of Quoy and Gaimard to decide the question, whether the B. Garagassi is identical with P. Doreyanus or not. On the first reflection the number of the upper incisors, the bristle-like hair

(1) Although the mother was dead over 2 or 3 hours, the young one in the pouch, continued to suck holding the nipples with one of the fore-limbs and moving constantly the three other limbs. The young Brachymelis in the pouch was about 30 mm. (about 12 in.) long (from the tip of the nose to the base of the tail) and the eyes were still closed. When I tried to draw away the fore-limbs from the nipple the little animal soon grasped the same again. Sometimes catching hold of another nipple, introduced it in the mouth and sucked two nipples at the same time.

(2) Voyage de decouvertes de l'Astrolobe (1826-29).

(3) Mammalia, Vol. I., p. 102.

(4) "Possibly these teeth have existed in the skull, but have been lost whilst the animal was alive, in which case the sockets would soon become obliterated." Waterhouse. Mammalia, Vol. I., p. 386.

(5) W. Peters e G. Doria Enumerazione dei Mammiferi, etc., etc., p. 11.

(6) Voyage de decouverte de l'Astrolobe. Atlas, pl. 16.

(1) and the general dimensions of the body (2) of both are in favour of this supposition, but closer examination of the illustration of the dentition of P. Doreyanus (3), the 6 nipples in the pouch of B. Garagassi, instead of the 8 of P. Doreyanus, and other minor differences have induced me to consider B. Garagassi as a new species.

The other three above-mentioned species of Perameles are all very distinct from B. Garagassi; P. Moresbiensis (4) on account of the dentition (5 upper incisors and very large canines), (fig. 8), and in comparison with B. Garagassi soft fur; P. Broadbentii (5) and P. longicauda (6) on account of the general habitus and all details.

Examining the collection of Peramelidæ in the Australian Museum, I found that P. Cockerellii Ramsay, shows a general resemblance to B. Garagassi. Mr. Ramsay mentions in his paper (7.) "I can find no trace of the fifth large posterior incisor" (of the upper jaw.) The absence of this upper incisor, as well as the spiny fur on the back are two characters identical with B. Garagassi, but the examination of the dentition of P. Cockerellii, which was partly possible in the stuffed specimen of the Australian Musesum. (Fig. 7.), brought me to the conclusion that P. Cockerellii is distinct from B. Garagassi (8.)

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(1) Loc. Cit., pl. 16, fig. 4.

(2) Zoolog. part of the Voyage de l'Astrolobe, p. 102.

(3) Loc. Cit. Atlas, pl. 16, fig 2.

(4) E. P. Ramsay. The Mammals of the Chevert Expedition, part I., in Proc. Linn. Soc. of N.S.W., Vol. II., 1878, p. 14.

(5) E. P. Ramsay. Description of a new Marsupial allied to the Genus Perameles. Proc. Linn. Soc. of N.S.W., Vol. III., 1879, p. 402.

(6) Peters e Doria. Enumerazione dei Mammiferi, etc., etc., p. 12, pl. X.

(7) E. P. Ramsay, Descriptions of a New Species of *Perameles*, from New Ireland. Proceed. Linn. Soc. of N. S. W. Vol. I., 1877, p. 310 and 318. Note on P. Cockerellii.

(8) At the Meetiug of the Society when this paper was read, and when I had the opportunity of exhibiting a stuffed specimen of B. Garagassi, Dr. O. Finsch from Bremen, was present as a guest. Knowing that Dr. Finsch has collected, during his visit in New Britain in 1881, about twenty specimens of Perameles, which he obtained in Blanche Bay, it was interesting to me to ask Dr. Finsch, if he thought B. Garagassii identical with one of the species from New Britian, and got a decided answer that his specimen belongs to a different species, which he believed to be P. Doreyanus. The collections of Dr. Finsch were taken by him to Berlin, but Prof. Peters died before he could express his opinion about the species of the Perameles from Blanche Bay.

All the Peramelidæ with 4 upper incisors agree also in some other characters, as the bristle-like hair which is more stiff and prickly than in the other species with 5 other incisors, and as far as I can judge from illustrations and stuffed specimens, in the relative shortness of the hind limbs. I would therefore propose to include the above mentioned 3 species P. Doreyanus, P. rufescens **(1)**, P. Coquerellii in the subgenus *Brachymelis.*

Before the conclusion of this paper I must express my best thanks to Mr. E. P. Ramsay, at having given me an opportunity of examining carefully the Peramelidæ of the Australian Museum, and of making the sketches of the dentition of P. Moresbyensis and P. Cockerellii.

Explanation of Plate XXXVIII.

Fig. 1.—Outline of the lateral view of the Head of *Brachymelis Garagassi Mcl.* ♀, a short time ($1\frac{1}{2}$ or 2 hours) after death to show the relative position, shape, and size of the ears, eyes, etc., etc. (Nat. size.)

Fig. 2.—Lateral view of the teeth of both jaws. (*Twice* the nat. size.)

Fig. 3.—Teeth of the upper jaw and the ten ridges of the palate. (*Twice* the nat. size.)

Fig. 4.—Teeth of the lower jaw. (*Twice* the nat. size)

Fig. 5.—Under surface of the hand of a large Brachymelis Garagassi ♂. (Nat. size.)

Fig. 6.—Under surface of the corresponding foot of the same. (Nat. size.)

Fig. 7.—End of the snout, in profile, of *Brachymelis Cockerelli* Rms., to show a part of the dentition of the same. (Nat. size.)

Fig. 8.—End of the snout in profile ot *Perameles Moresbiensis* Rms. (Nat. size.)

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(1) *Peters e Doria.* Emerazione dei Mammiferi etc., etc., p. 11.

DESCRIPTIONS OF AUSTRALIAN MICRO-LEPIDOPTERA.

By E. Meyrick, B.A.

XI. Oecophoridæ—(*Continued.*)

(39. Thyrsopala, Meyr.

This genus may be struck out as non-existent ; it was based on a single specimen, on the ground of the separation of veins 3 and 4 of hind-wings, an unusual character which has turned out to be apparently an accidental feature in the individual in question since other specimens since obtained have these veins placed as usual in the family.)

40. Philonympha, Meyr.

Head smooth, sidetufts large, spreading, meeting above. Antennæ moderate, in ♂ serrate, moderately and evenly ciliated (1) ; basal joint stout, with strong pecten. Palpi long, second joint much exceeding base of antennæ, densely scaled, somewhat loosely beneath, terminal joint considerably shorter than second slender, recurved. Thorax smooth. Forewings elongate, moderate, hindmargin rounded or slightly concave. Hindwings almost as broad as forewings, elongate-ovate, hindmargin rounded, cilia $\frac{1}{3}$. Abdomen moderate. Posterior tibiæ clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from before angle of cell. Hindwings normal.

Only separated from *Philobota* by the greater comparative length of the second joint of palpi, which much exceeds base of antennæ ; the discovery of additional species might render the genus untenable, but at present it is useful genealogically, since it appears to mark the transition from *Philobota* to *Protomacha*.

1a. Lower half of second joint of palpi dark fuscous..249. *aparthena*.
1b. „ „ „ „ white. ....250. *pura*.

249. *Phil. aparthena*, n. sp.

Media, alis ant. niveis, costæ basi punctisque disci tribus minimis nigris; post. albidis; palpis basim versus saturate fuscis.

♂. 22 mm. Head, palpi, antennæ, thorax, abdomen, and legs white; lower half of second joint of palpi, sometimes also apex of terminal joint obliquely dark fuscous; anterior and middle legs infuscated. Forewings elongate, moderate, costa moderately arched, apex almost acute, hindmargin rather concave, rather strongly oblique; white; costal edge slenderly blackish towards base; a fine black dot in disc before middle, a second beneath it on fold, and a third in disc beyond middle: cilia white. Hindwings whitish; cilia white.

Blackheath (3000 to 3500 feet), New South Wales, in November and January; two specimens.

250. *Phil. pura*, n. sp.

Media, alis ant. niveis, ♂ costæ basi punctisque disci duobus nigrescentibus; post. ♂ albidis, ♀ niveis; palpis omnino niveis.

♂ ♀. 17-21 mm. Head, palpi, antennæ, thorax, abdomen, and legs white; anterior and middle legs infuscated. Forewings elongate, costa moderately arched, apex almost acute, hindmargin very obliquely rounded; white; extreme base of costa blackish in ♂; an indistinct grey or blackish dot in disc before middle, and another beyond middle, in ♀ both imperceptible: cilia white. Hindwings in ♂ whitish, in ♀ white; cilia white.

Very like the preceding, but especially distinguished by the rounded (not concave) hindmargin of forewings, and the wholly white palpi.

Deloraine and Hobart, Tasmania, in November and December; three specimens.

41. Peltophora, Meyr.

Head smooth or loosely haired, sidetufts moderate, spreading, generally meeting above. Antennæ moderate, in ♂ with long fine cilia (2-5), basal joint moderate, with strong pecten. Palpi long or very long, second joint exceeding or much exceeding base of antennæ, with appressed scales, hardly loose beneath, terminal joint shorter than second, slender, recurved. Thorax smooth. Forewings elongate, moderate, hindmargin somewhat concave or rounded. Hingwings slightly narrower than forewings, elongate-ovate, hindmargin rounded, cilia $\frac{2}{5}$ to $\frac{1}{2}$. Abdomen moderate. Posterior tibiæ clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from or somewhat before angle of cell, often stalked with 3. Hindwings normal.

The length of the palpi and of the ciliations of the antennæ differs considerably in different species, and the former also in the sexes of the same species in some cases; the stalking of veins 2 and 3 of the forewings is usually confined to the ♀. The genus may always be separated readily from *Philobota* by the long antennal ciliations, and from *Compsotropha* by the strong basal pecten: it is probably a development of *Philobota* through *Philonympha.* The species are mostly handsome and striking, often with yellow or white blotches, or yellow hindwings. The larva of one Australian species feeds in a sort of nest amongst spun-together leaves; that of the European species is said to live in decayed wood.

The genus is rather extensively represented in Australia; outside this region the only known species is the European *P. forficella*, Sc., classed by European authors with *Harpella*, but in my judgment necessarily to be removed thence on account of the different termination of vein 7 of the forewings, and also different palpi; according to a specimen which I possess, it is decidedly referable to this genus. But it is very probable that the genus may be found of more general distribution than is at present known. *Hypercallia* Stph., a European genus, is also closely allied to *Peltophora* in all respects, differing principally by the absence of the antennal pecten.

1a. Hindwings yellow.
2a. Forewings with white or yellow blotches.
3a. Thorax dark fuscous.
4a. Forewings with nine white spots ....256. *marionella.*

4b. Forewings with a yellow blotch ....264. *helias.*
3b. Thorax white or yellow.
4a. Forewings with large yellow blotches ......258. *theorica.*
4b. „ with white blotches ....259. *thermochroa.*
2b. Forewings without blotches.
3a. Forewings dark fuscous...... ....263. *fulvia.*
3b. „ whitish-ochreous ....269. *conjunctella.*
1b. Hindwings not yellow.
2a. Forewings yellow or with yellow blotches.
3a. Thorax wholly yellow.......... ....252. *coniortia.*
3b. „ not wholly yellow.
4a. Thorax partially yellow.
5a. Forewings with nine yellow blotches ....255. *gloriosella.*
5b. „ with seven yellow blotches ......254. *argutella.*
5c. „ with basal half yellow ....251. *orthogramma.*
4b. Thorax wholly dark fuscous.
5a. Basal yellow blotch narrow, transverse .....267. *psilopla.*
5b. „ „ „ broad.
6a. Basal blotch broadest on inner margin......266. *basiplaga.*
6b. „ „ „ towards costa.........265. *proximella.*
2b. Forewings without yellow markings.
3a. Forewings with white blotches.
4a. With a dark fuscous streak along costa towards base...............................260. *niphias.*
4b. Costa white towards base.
5a. White fascia beyond middle entire.
6a. Base of forewings yellowish-white ....253. *atricollis.*
6b. „ „ dark fuscous ....261. *carphalea.*
5b. White fascia beyond middle not reaching costa ....257. *incomposita.*
3b. Forewings without white blotches.
4a. Forewings ochreous-whitish ....272. *ceratina.*
4b. „ not whitish.
5a. Forewings with three discal dots.
6a. Hindwings grey.................................270. *cataxera.*
6b. „ ochreous-whitish ....271. *privatella.*

5b. Forewings with one discal dot or none.
6a. Hindwings rather dark grey..................268. *glaphyropla.*
6b. „ whitish, dark-margined ....262. *crypsileuca.*

251. *Pelt. orthogramma*, n. sp.

Minor, alis ant. luteis, linea post medium transversa sinuata saturate purpurea, area apicali omnino griseo-purpurea; post. griseis.

♂. 15-16 mm. Head whitish-yellow. Palpi long, whitish-yellow, anteriorly dark fuscous. Antennæ grey, ciliations $3\frac{1}{2}$. Thorax dark purple-fuscous, becoming pale yellowish posteriorly. Abdomen whitish-ochreous, towards the base greyish. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin straight, very oblique; whitish-yellow, extreme costal edge blackish at base; apical $\frac{2}{5}$ of wing greyish-purple, bounded by a deep bluish-purple sinuate line from $\frac{3}{5}$ of costa to inner margin before anal angle; cilia light grey. Hind wings grey; cilia light grey.

Superficially recalls some forms of *Coesyra.*

Sydney, New South Wales; Mount Lofty, South Australia; in November; three specimens.

252. *Pelt. coniortia*, n. sp.

Minor, alis anticis flavis, dimidio posteriori ochreo-flavo, fascia media sinuata obscure fusca margines non attingente; post. griseis, basi flavido-tincta.

♂ ♀. 16-17 mm. Head, palpi, and thorax light yellow; palpi rather long. Antennæ grey, ciliations 5. Abdomen and legs whitish-yellow, anterior and middle legs suffused with grey. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin sinuate, very oblique; bright yellow, apical half deeper and more ochreous-yellow, separated by a narrow sinuate central cloudy fuscous fascia, becoming obsolete towards margins; in one specimen this fascia is obselete, only somewhat deeper ochreous-yellow; costal edge dark fuscous towards base; cilia ochreous-yellow. Hindwings grey, base somewhat suffused with whitish-yellowish: cilia whitish-yellowish.

Sydney, New South Wales; in December and January; three specimens.

253. *Pelt. atricollis*, n. sp.

Media, alis ant. niveis, basi partim sulfurea, fascia antica recta. altera postica maculam mediam canam continente, macula subapicali magna laete ochreo-fuscis; post. saturatius fuscis.

♂ ♀. 16-18 mm. Head white. Palpi long, white, anteriorly dark fuscous. Antennæ dark fuscous, ciliations 3. Thorax white, anterior margin rather broadly dark fuscous. Abdomen ochreous-whitish, irrorated with fuscous. Legs dark fuscous, posterior pair yellow-whitish. Forewings moderate, costa rather strongly arched, apex almost acute, hindmargin somewhat sinuate, oblique; white, base and costal edge somewhat suffused with pale ochreous-yellowish; extreme base of costa dark fuscous; two straight moderately broad perpendicular reddish-ochreous-brown fasciæ; first before middle, slightly narrowed beneath; second beyond middle, irregularly dilated towards disc, containing a small cloudy white spot in middle near posterior margin; an irregular reddish-ochreous-brown blotch on hindmargin, extending from apex to below middle, and anteriorly only separated from second fascia by a slender line; cilia light ochreous-yellowish, with a dark grey apical bar, beneath anal angle fuscous. Hindwings rather dark fuscous-grey, lighter towards base; cilia pale whitish-ochreous, at apex dark grey.

Superficially resembles some species of *Zonopetala.*

Sydney, Blackheath (3,500 feet), and Shoalhaven, New South Wales; Mount Lofty, South Australia; from November to February, rather common.

254. *Pelt. argutella*, Z.

(*Oecophora argutella, Z.*, Hor. Ross. 1877, 391.)

Media, alis ant. purpureo-nigris, maculis septem luteis aurantiaco-suffusis; post. saturate fuscis.

♂ ♀. 17-22. Head bright orange. Palpi long, dark fuscous, terminal joint posteriorly whitish-yellow. Antennæ black, ciliations $3\frac{1}{2}$. Thorax orange, anterior margin rather broadly black.

Abdomen grey, segmental margins orange. Legs blackish, posterior tibiæ ochreous-yellow. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, very oblique; purplish-black, with seven whitish-yellow spots mixed with orange; first basal, transverse, outer edge oblique; second rather broad, transverse, not quite reaching costa or inner margin, narrowed beneath; third from middle of costa, inwardly oblique, reaching half across wing; fourth small, roundish, on middle of inner margin; fifth transverse, rather narrow, in disc above anal angle, not nearly reaching costa or inner margin; sixth on costa at $\frac{4}{5}$, rather inwardly oblique; seventh small, on hindmargin below middle, sometimes produced at apex to meet sixth; cilia deep yellow, at apex and anal angle broadly dark grey. Hindwings dark fuscous; cilia dark grey, towards inner angle and on apical half between middle of hindmargin and apex whitish-yellowish.

A very handsome species when fresh.

Larva undescribed; feeds on *Monotoca elliptica* (*Epacrideæ*), several together in a small dense nest or shelter of silk and refuse amongst the twigs, in August.

Sydney, New South Wales; Mount Lofty, Wirrabara Forest, Ardrossan, and Port Lincoln, South Australia; from October to December, flying in the sunshine, tolerably common where its food plant occurs.

255. *Pelt. gloriosella*, Walk.

(*Oecophora gloriosella*, Walk. 697.)

Media, alis ant. saturate purpureo-fuscis, maculis novem flavis; post. saturate fuscis.

24 mm. Head orange. Palpi blackish, second joint yellow at base. Thorax dark purple-fuscous, anteriorly yellow. Forewings dark purple-fuscous, with nine yellow spots, placed much as in *P. marionella*. Hindwings dark fuscous (?.)

I have not met with this species, which I noted in the British Museum as apparently near *P. marionella*, but without describing it; the above short description is abstracted from that of Walker, and may not be accurate. Notwithstanding, the species seems to differ notably from *P. argutella* by the increased number and quite different position of the spots, from *P. marionella* by their yellow colour, and the dark fuscous hindwings.

Said to be from Tasmania.

256. *Pelt. marionella,* Newm.

(*Oecophora marionella,* Newm., Trans. Ent. Soc. Lond. III., (n. s.), 294, Pl. XVIII., 7.)

Media, alis ant. saturate fuscis, maculis novem canis, vix luteo-tinctis; post. flavis, margine postico saturate fusco.

♂ ♀. 20-23 mm. Head bright yellow, face greyish. Palpi very long, dark fuscous, posteriorly whitish-yellowish. Antennæ dark fuscous, ciliations 3. Thorax dark fuscous, with a small lateral pale yellowish spot. Abdomen dark fuscous, segmental margins banded with ochreous-yellow and whitish-yellowish. Legs dark fuscous, posterior tibiæ ochreous-yellow. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, very oblique; dark fuscous, with nine white spots, faintly yellowish-tinged, especially towards base; first elongate, along costa near base; second similar, along inner margin near base, suffused with yellow on inner margin; third broadly cruciform, in disc at $\frac{1}{3}$; fourth rather irregular, inwardly oblique, beneath middle of costa; fifth small, triangular, above middle of inner margin; sixth transverse, in disc above anal angle, not nearly reaching costa or inner margin; seventh narrow, from costa at $\frac{4}{5}$, inwardly oblique, sometimes coalescing with apex of sixth; eighth small, irregular, on hindmargin below middle; ninth very narrow, along upper half of hindmargin: cilia fuscous-grey. Hind-wings ochreous-yellow, with a rather narrow dark fuscous hindmarginal border, broadly dilated and suffused at apex; cilia fuscous-grey.

Allied to the two preceding, but with yellow hindwings.

Melbourne, Victoria; several specimens taken by Mr. G. H. Raynor in October.

257. *Pelt incomposita,* n. sp.

Minor, alis ant. saturate fuscis, maculis elongatis quinque ochreo-albis; post. saturatius fuscis.

♂ ♀. 14-19 mm. Head ochreous-white. Palpi very long, dark fuscous, terminal joint above, and apex of second joint white. Antennæ dark fuscous, ciliations 2½. Thorax dark fuscous, with a lateral ochreous-white spot. Abdomen pale greyish-ochreous. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin hardly sinuate, oblique; dark fuscous, with five elongate ochreous-white spots; first elongate-triangular, extending along costa from near base to near middle; second extending along inner margin from base to near middle; third extending from middle of disc to inner margin before anal angle, slightly curved; fourth from costa before apex, inwardly oblique, reaching half across wing; fifth small, cloudy, indistinct, on hindmargin above anal angle; cilia ochreous-white, on apex and anal angle broadly dark grey. Hindwings rather dark fuscous; cilia fuscous-grey, more ochreous towards inner angle, and on a space beneath apex, with a dark grey basal line.

Sydney and Mittagong (2000 feet), New South Wales; in March and April, appearing to frequent *Acacia decurrens*, rather common.

258. *Pelt theorica*, n. sp.

Media, alis ant ochreo-flavis, macula ad basim, fasciis duabus in costa confluentibus, macula etiam apicis in angulum analem producta saturate fuscis; post. saturate flavis, macula apicis in angulum analem anguste producta saturate fusca.

♀. 20. Head ochreous-yellow, sides and back of crown dark fuscous. Palpi long, yellowish-white, terminal joint anteriorly blackish. Antennæ yellow-whitish, sharply annulated with black. Thorax ochreous-yellow. Abdomen ochreous-yellow, base of segments dark fuscous. Legs ochreous yellow, anterior tibiæ dark fuscous except at apex. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; ochreous-yellow; markings dark fuscous; a basal patch extending on costa to $\frac{1}{4}$, and on inner magin to $\frac{1}{5}$, outer edge straight; a somewhat irregular straight fascia from middle of costa to middle of inner margin; a second similar fascia from costal origin of first to anal angle; an apical blotch, narrowly produced along hindmargin to anal angle: cilia light ochreous-yellow, at apex and anal angle broadly dark fuscous. Hindwings deep orange-yellow; hindmargin slenderly dark fuscous, dilated into a moderate irregular band from middle to apex; cilia dark fuscous.

A very handsome species, probably flying by day.

Murrurundi, New South Wales, in November; one specimen.

259. *Pelt. thermochroa*, n. sp.

Minor, alis ant. saturatius ochreo-fuscis, basi laete ochreo-suffusa, maculis quinque niveis; post. flavis, apice saturate griseo.

♀. 16 mm. Head dark fuscous-grey, face white. Palpi very long, white, second joint with a black subapical ring; terminal joint anteriorly blackish. Antennæ white, sharply annulated with dark fuscous. Thorax snow-white. Abdomen ochreous-yellow. Legs ochreous-yellow, anterior tibiæ dark fuscous. Forewings elongate, moderate, costa moderately arched, apex round-pointed, hindmargin almost straight, oblique; rather dark ochreous-fuscous, suffused with reddish-ochreous towards base, with five snow-white spots; first very small, basal; second fascia-like, from costa at $\frac{1}{3}$ almost to inner margin at $\frac{2}{5}$, rather broad above, gradually attenuated to apex beneath; third semicircular, on inner margin beyond middle; fourth irregularly triangular, on costa at $\frac{4}{5}$, reaching half across wing; fifth elongate, narrow, along hindmargin from below apex to middle: cilia dark fuscous, opposite hindmarginal spot snow-white. Hindwings ochreous-yellow, apex rather broadly suffused with dark grey; cilia ochreous-yellow, with a dark grey apical bar.

Certainly allied to *P. theorica*, yet very distinct.

Sydney, New South Wales, in December and February; two specimens.

260. *Pelt. niphias*, n. sp.

Media, alis ant. niveis, costa basim versus, striga costæ alteraque dorsi obliquis confluentibus, puncto disci, linea transversa sinuata, fascia etiam postica sub costa indentata saturate fuscis; post. albido-griseis.

♂. 17-18 mm. Head and antennæ white, ciliations 5. Palpi rather long, white, basal half of second joint dark fuscous. Thorax white, with a dark fuscous lateral spot. Abdomen whitish-grey. Legs grey-whitish, anterior and middle pair suffused with grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, oblique; snow-white, with a few scattered dark fuscous scales; markings dark fuscous; a streak along costa from base to $\frac{1}{3}$: an irregular cloudy suffusion towards inner margin at $\frac{1}{4}$; a bent inwardly oblique narrow streak from middle of costa, touching apex of a suffused inwardly oblique streak from $\frac{2}{3}$ of inner margin; a blackish dot above middle of disc; a sinuate line from middle of costa to anal angle; a thick cloudy transverse streak from $\frac{4}{5}$ of costa to anal angle, very sharply indented inwards beneath costa, thence moderately outwards-curved; a row of partially confluent blackish hindmarginal dots: cilia fuscous-grey, whitish at base, and white on anal angle Hindwings and cilia whitish-grey.

Allows the normal family type of markings to be seen, recalling some species of *Phloeopola*.

Hobart, Tasmania, in December and January; two specimens.

261. *Pelt. carphalea*, n. sp.

Media, alis ant. canis, basi, fascia antica lata costam non attingente, altera postica integra, macula etiam apicis in angulum analem producta saturatius ochreo-fuscis; post. saturatius fuscis.

♂. 19 mm. Head white. Palpi long, white, basal two-thirds of second joint dark fuscous. Antennæ whitish, annulated with dark fuscous. Thorax dark fuscous, with small white anterior and posterior spots. Abdomen dark fuscous. Legs ochreous-yellow, anterior pair suffused with grey. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin straight, oblique; white; markings rather dark ochreous-fuscous; a narrow basal spot; some ochreous and brown scales towards costa on basal half; a broad straight fascia before middle, obsolete towards costa; a broad straight fascia beyond middle, posterior edge indented above middle; an apical spot, continued along hindmargin narrowly to anal angle: cilia dark fuscous, whitish towards tips on hindmargin. Hindwings and cilia dark fuscous.

Brisbane, Queensland, in September; one specimen.

262. *Pelt. crypsileuca*, n. sp.

Minor, alis ant. rufogriseis, puncto disci cum angulo anali per strigulam connexo saturate fusco; post. albidis, margine postico saturate griseo-suffuso.

♂. 16-17 mm. Head, palpi, antennæ, and thorax rather dark ochreous-fuscous; palpi rather long; antennal ciliations 4. Abdomen grey. Legs dark fuscous, posterior pair whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; grey, thickly strewn with light reddish-fuscous scales; generally a dark fuscous dot in disc beyond middle, connected with anal angle by a cloudy dark streak: cilia grey mixed with light reddish-fuscous, beneath anal angle ochreous-whitish. Hindwings whitish, apex and hindmargin more or less widely suffused with dark grey; cilia light grey, base darker.

This species is another instance of the tendency of the Tasmanian mountains to develop whitish dark-margined hindwings.

Mount Wellington, Tasmania, in December, from 2500 to 3000 feet, common.

263. *Pelt. fulvia*, Butl.

(*Cryptopeges fulvia*, Butl., Ann. Mag. Nat. Hist. 1882, 101.)

Minor, alis ant. saturate fuscis, puncto disci nigro; post. læte aurantiacis, margine postico latius nigro.

♂. 15 mm. Head and thorax dark ochreous-fuscous. Palpi rather long, ochreous, anterior edge fuscous. Antennæ dark fuscous; ciliations 3. Abdomen dark fuscous. Legs ochreous-yellow, banded with blackish. Forewings elongate, costa gently arched, apex rounded, hindmargin straight, oblique; black, densely strewn with reddish-ochreous-brown scales; an obscure black dot in disc beyond middle : cilia black mixed with reddish-brown, tips yellowish-white from apex to above anal angle. Hindwings bright orange, with a moderately broad black hind-marginal border, dilated at apex ; cilia dark grey, base blackish, tips beneath apex yellowish.

Allied to *P. crypsileuca*, but widely distinct.

Fernshaw and Warragul, Victoria, in December and January ; two specimens.

264. *Pelt. helias*, n. sp.

Minor, alis ant. saturate fuscis, macula dorsi ad basim subquadrata lutea cano-marginata ; post. læte aurantiacis, dimidio apicali saturate fusco.

♂. 17 mm. Head light ochreous-yellow. Palpi extremely long, dark fuscous, apex of second joint white. Antennæ dark fuscous ; ciliations $2\frac{1}{2}$. Thorax and abdomen dark purplish-fuscous. Legs ochreous-yellow, anterior and middle pair suffused with grey. Forewings elongate, costa gently arched, apex round-pointed, hind-margin hardly rounded, very oblique ; dark fuscous ; a large sub-quadrate pale yellow, white-margined spot on inner margin near base, upper side near and parallel to costa, posterior side perpendicular to inner margin , some scattered whitish scales in disc beyond middle and towards hindmargin : cilia dark fuscous, beneath anal angle whitish-yellow. Hindwings bright orange, apical half dark fuscous ; cilia dark fuscous.

Allied to the three following, but differing from all by the orange anterior half of hindwings.

Sydney, New South Wales in October ; one specimen.

265. *Pelt. proximella*, Walk.

(*Incurvaria proximella*, Walk. 490.)

Minor, alis ant. saturate purpureo-fuscis, macula dorsi ad basim subquadrata flava inferius coarctata ; post. saturate fuscis.

♂ ♀. 14-19 mm. Head ochreous-yellow. Palpi extremely long, dark fuscous, apex of second joint yellowish. Antennæ, thorax, and abdomen dark fuscous ; antennal ciliations $3\frac{1}{2}$. Legs ochreous-yellow, anterior pair suffused with grey. Forewings elongate, costa hardly arched, apex round-pointed, hindmargin very oblique, in ♂ slightly rounded, in ♀ somewhat sinuate; dark purplish-fuscous; a large subquadrate yellow spot on inner margin near base, upper side near and parallel to costa, posterior side somewhat curved, lower side shorter than upper; extreme costal edge pale yellow posteriorly; some whitish-yellow scales on costa at $\frac{3}{4}$, and on inner margin before anal angle, in ♀ forming distinct spots; cilia dark fuscous, tips on hindmargin ochreous-whitish. Hindwings dark fuscous; cilia ochreous-yellowish, with a dark fuscous basal line, round apex becoming wholly dark fuscous.

Distinguished by the form of the yellow spot, which is contracted below, with the posterior edge curved.

Newcastle and Sydney, New South Wales; Melbourne, Victoria; three specimens in October and January.

266. *Pelt. basiplaga*, Walk.

(*Incurvaria basiplaga*, Walk. 490; *Oecophora quadratella*, ib. 1029.)

Minor, alis ant. saturate purpureo-fuscis, macula dorsi ad basim subquadrata magna flava inferius dilatata, macula costæ media parva fasciaque postica angusta albido-ochreis; post. saturatusi fuscis.

♂ ♀. 14-16 mm. Head bright yellow. Palpi in ♂ long, in ♀ extremely long, yellowish, second joint with basal half and subapical ring dark fuscous, in ♂ anterior edge dark fuscous. Antennæ, thorax, and abdomen dark fuscous, thorax with a few yellowish scales anteriorly; antennal ciliations 2. Legs ochreous-yellow, anterior and middle pair banded with dark fuscous. Forewings elongate, costa moderately arched, apex rounded, hindmargin almost straight, oblique; dark purplish-fuscous; a large subquadrate bright yellow blotch on inner margin near base, upper side near and parallel to costa, posterior side straight, lower side rather longer than upper; a small cloudy whitish-ochreous spot on middle of costa; a slender whitish-ochreous fascia from $\frac{2}{3}$ of costa to $\frac{3}{4}$ of inner margin, dilated on margins, slightly inwards-curved, sometimes interrupted in middle; a few yellowish scales towards middle of hindmargin: cilia dark fuscous, apical half whitish-ochreous between apex and anal angle, and with a whitish-yellow spot below anal angle. Hindwings rather dark fuscous, reddish-tinged; cilia dark fuscous.

Very like *P. proximella*, but with the yellow blotch larger, broadest below, and with the posterior edge straight.

Brisbane, Queensland; Sydney and Mittagong (2000 feet), New South Wales; rather common from October to March, apparently frequenting *Acacia decurrens.*

267. *Pelt. psilopla*, n. sp.

Minor, alis ant. saturate purpureo-fuscis, macula dorsi ad basim angusta flava costam non attingente, fascia postica angusta albido-ochrea; post. saturatius fuscis.

♂ ♀. 13-15 mm. Head bright yellow. Palpi in ♂ rather long, in ♀ long, yellow, second joint with basal third and a subapical ring dark fuscous. Antennæ, thorax, and abdomen dark fuscous; antennal ciliations 2. Legs ochreous-yellow, anterior and middle pair banded with dark fuscous. Forewings elongate, costa moderately arched, apex rounded, hindmargin straight, oblique; dark purplish-fuscous; a rather narrow transverse yellow fascia-like spot from inner margin near base, not reaching costa: a slender whitish-ochreous fascia from $\frac{2}{3}$ of costa to $\frac{3}{4}$ of inner margin, dilated on margins, slightly inwards-curved: cilia dark fuscous, apical half whitish-ochreous between apex and anal angle, with a whitish-ochreous spot beneath anal angle. Hindwings rather dark fuscous, reddish-tinged; cilia dark fuscous.

Allied to *P. basiplaga* and *P. proximella*, but with the yellow spot very much narrower proportionately.

Sydney, New South Wales, from September to November and in March, locally rather common amongst *Acacia decurrens.*

268. *Pelt. glaphyropla*, n. sp.

Media, alis ant. sericeis, griseis, margine costali angustissime albo; post. saturatius griseis

♂. 19 mm. Head, palpi, antennæ, thorax, abdomen, and legs grey: posterior legs grey-whitish; palpi long; antennal ciliations 3. Forewings elongate, costa slightly arched, apex rounded, hindmargin almost straight, very oblique; shining grey, slightly ochreous-tinged; costal edge slenderly white from $\frac{1}{5}$ to near apex: cilia shining grey. Hindwings rather dark grey, apex darker; cilia grey, with a darker line.

Hobart, Tasmania, in January; one specimen.

269. *Pelt. conjunctella*, Walk.

(*Œcophora conjunctella*, Walk. 686.)

Media, alis ant. dilute albido-ochreis, interdum punctis disci duobus saturate fuscis; post. dilute ochreo-flavis, apice fusco.

♂ ♀. 20-26 mm. Head, palpi, antennæ, thorax, and legs pale whitish-ochreous; palpi very long; antennal ciliations 4; anterior legs internally dark fuscous. Abdomen light ochreous-yellow. Forewings elongate, moderate, posteriorly somewhat dilated, costa moderately arched, apex round-pointed, hindmargin sinuate, oblique; pale whitish-ochreous, sometimes fuscous-tinged; extreme base of costa dark fuscous; sometimes a dark fuscous dot on fold before middle, and another in disc beyond middle, but these are often absent: cilia pale whitish-ochreous. Hindwings light ochreous-yellow, apex and upper part of hindmargin very narrowly suffused with fuscous-grey; cilia whitish-yellowish.

Brisbane and Toowoomba (2000 feet), Queensland; Newcastle and Sydney, New South Wales; rather common in September and October, especially on fences.

270. *Pelt. cataxera*, n. sp.

Media, alis ant. dilutius ochreo-griseis, punctis disci tribus serieque postica flexuosa nigrescentibus; post. griseis.

♂. 22-24 mm. Head, palpi, and thorax light ochreous-grey; palpi long. Antennæ grey-whitish, annulated with dark fuscous; ciliations 4. Abdomen grey. Legs dark grey, posterior pair grey-whitish. Forewings elongate, moderate, posteriorly somewhat dilated, costa moderately arched, apex round-pointed, hindmargin almost straight, oblique; light grey irrorated with whitish-ochreous; extreme costal edge ochreous-whitish, near base black; a black dot in disc before middle, a second slightly beyond it on fold, and a third in disc beyond middle; a transverse line of cloudy blackish dots from $\frac{3}{4}$ of costa to anal angle, irregularly sinuate inwards beneath costa, obtusely angulated above middle: cilia light grey, irrorated with whitish-ochreous. Hindwings and cilia grey.

Separable from the following by the grey hindwings.

Deloraine, Tasmania, in November; two specimens.

271. *Pelt. pricatella*, Walk.

(*Crytolechia pricatella*, Walk. 753; *Cryptolechia latiorella* ib. 755; *Chezala allatella* ib. 788.)

Major, alis ant. dilute albido-fuscis, punctis disci tribus serieque postica flexuosa nigrescentibus; post. ochreo-albidis.

♂ ♀. 25-28 mm. Head and thorax pale whitish-fuscous. Palpi long, white, second joint dark fuscous except at apex. Antennæ ochreous-whitish, ciliations $3\frac{1}{2}$. Abdomen pale whitish-ochreous. Legs dark fuscous, posterior pair ochreous-whitish. Forewings elongate, moderate, somewhat dilated posteriorly, costa moderately arched, apex obtuse, hindmargin straight, hardly oblique; pale whitish-fuscous, with a few black scales; extreme costal edge pale whitish-ochreous, at base black; a black dot in disc before middle, a second rather beyond it on fold, and a third in disc beyond middle; a transverse row of indistinct blackish dots from $\frac{2}{3}$ of costa to before anal angle, obtusely angulated above middle, thence curved to inner margin: cilia whitish-grey, with rows of whitish points. Hindwings and cilia ochreous-whitish.

Recognisable by its large size, whitish-fuscous forewings, and ochreous-whitish hindwings.

Sydney, New South Wales; Melbourne, Victoria; locally rather common in September and October.

272. *Pelt. ceratina*, n. sp.

Media, alis ant. ochreo-albidis, squamis dispersis nigris; post. ochreo-albidis.

♂. 21 mm. Head, palpi, antennæ, thorax, abdomen, and legs ochreous-whitish; palpi rather long; antennal ciliations 4; anterior legs dark fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin almost straight, rather strongly oblique; ochreous-whitish, with some quite irregularly scattered black scales, partially coalescing to form small dots; cilia ochreous-whitish. Hindwings and cilia ochreous-whitish.

Mount Wellington (2500 feet), Tasmania, at the end of January; one specimen.

42. Orophia, Meyr.

Head loosely haired, sidetufts large, meeting above, projecting between antennæ. Antennæ moderate, in ♂ serrate, rather strongly ciliated (2), basal joint rather stout, with strong pecten. Palpi long, second joint exceeding base of antennæ, densely scaled, beneath roughly towards apex, terminal joint considerably shorter than second, slender, curved. Thorax smooth. Forewings elongate, moderate, hindmargin sinuate, oblique. Hindwings as broad as forewings, elongate-ovate, hindmargin rounded, cilia $\frac{2}{3}$. Abdomen moderate Posterior tibiæ clothed with very long fine hairs. Forewings with vein 7 to hindmargin, 2 and 3 from considerably before angle of cell. Hindwings normal.

Closely allied to *Peltophora*, from which it is distinguished principally by the position of veins 2 and 3 of the forewings; and also with some apparent affinity to *Pleurota*.

273. *Oroph cinetica*, n. sp.

Media, alis ant. flavidis, interdum dilute griseo-suffusis, saepius punctis disci tribus minimis nigris; post. griseis.

♂ ♀. 17-22 mm. Head and thorax whitish-yellow or ochreous-yellow. Palpi whitish-yellow, sometimes grey anteriorly. Antennæ whitish or grey. Abdomen ochreous-whitish or grey-whitish. Legs ochreous-whitish, anterior pair suffused with grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, very oblique; whitish-yellow or light ochreous-yellow, sometimes suffused with very light grey except costa, a discal streak, and submedian fold; generally a minute black dot in disc before middle, a larger one rather before it on fold, and another in disc beyond middle, but these are sometimes wholly absent: cilia whitish-yellow, terminal half pale grey. Hindwings grey; cilia whitish-grey.

Varies in respect of the greyish suffusion, depth of ground colour, and presence of the discal dots; Southern specimens are larger and greyer.

Sydney, Blackheath (3500 feet), and Shoalhaven, New South Wales; Warragul, Victoria; Hobart, Tasmania; common from November to January.

43. Protomacha, Meyr.

Head loosely haired, sidetufts large, spreading, meeting above, projecting between antennæ. Antennæ moderate, in ♂ moderately and evenly ciliated (1), basal joint moderate, with strong pecten. Palpi long, second joint considerably exceeding base of antennæ, densely clothed with loose hairscales, roughly projecting above towards apex, and sometimes beneath somewhat beyond middle; terminal joint rather shorter than second, slender, curved. Thorax smooth. Forewings elongate, moderate, hindmargin very oblique. Hindwings as broad as forewings, elongate-ovate, hindmargin rounded, cilia $\frac{1}{2}$ to $\frac{2}{3}$. Abdomen moderate. Posterior tibiæ clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from distinctly before angle of cell. Hindwings normal.

Characterised by the peculiar structure of the second joint of palpi; allied to *Pleurota*, of which it is perhaps an earlier form, indicating origin from *Philonympha*.

1a. Forewings white....................................276. *cara.*
1b. ,, brassy-ochreous.
2a. Sidetufts of head white........................274. *consuetella.*
2b. ,, ,, yellowish-ochreous ....275. *chalcaspis.*

274. *Prot. consuetella*, Walk.

(*Gelechia consuetella*, Walk. 651.)

Minor, alis ant. sericeis, æneo-ochreis, costa anguste nivea ; post. dilute griseis ; capillis niveis.

♂ ♀. 15-17 mm. Head brassy-ochreous, mixed with white, sidetufts snow-white. Palpi dark grey mixed with white, above snow-white. Antennæ grey. Thorax brassy-ochreous. Abdomen light grey. Legs dark grey, posterior pair grey-whitish. Forewings elongate, slightly dilated, costa almost straight, apex round-pointed, hindmargin slightly sinuate, very oblique ; shining brassy-ochreous ; costa narrowly snow-white from near base to $\frac{4}{5}$: cilia shining brassy whitish-ochreous. Hindwings light grey ; cilia grey-whitish.

Sydney and Blackheath (3500 feet), New South Wales, from September to November, and in January ; common.

275. *Prot. chalcaspis*, n. sp.

Media, alis ant. sericeis, aeneo-ochreis, costa anguste nivea ; post. dilute griseis ; capillis saturatius ochreis.

♂. 19-20 mm. Head and thorax deep yellowish-ochreous. Palpi dark fuscous, above white. Antennæ grey. Abdomen ochreous-whitish. Legs dark grey, posterior pair whitish. Forewings elongate, costa hardly arched, apex round-pointed, hindmargin straight, very oblique ; shining brassy-ochreous ; costa narrowly white from near base to $\frac{3}{4}$: cilia shining brassy whitish-ochreous. Hindwings light grey ; cilia grey-whitish.

Separable from *P. consuetella* by the wholly ochreous head ; otherwise very similar, but a larger and somewhat duller insect.

Sydney and Blackheath (3500 feet), New South Wales, in November ; very common in the mountain locality, but rare lower down.

276. *Prot. cara*, Butl.

(*Zacorus carus*, Butl., Ann. Mag. Nat. Hist. 1882, 103.)

Major, alis ant. sericeis, candidis ; post. dilute griseis.

♂. 24-26 mm. Head, palpi, antennæ, and thorax snow-white ; face and anterior side of palpi dark grey. Abdomen light grey. Legs dark grey, posterior pair grey-whitish. Forewings elongate, slightly dilated, costa gently arched, apex round-pointed, hindmargin straight, rather strongly oblique; shining snow-white; extreme base of costa black: cilia shining snow-white. Hindwings light grey; cilia whitish-grey.

Melbourne, Victoria; taken rather commonly by Mr. G. H. Raynor.

44. Thalerotricha, Meyr.

Head smooth in front, sidetufts large, roughly spreading, directed forwards. Antennæ moderate, in ♂ with long fine cilia (3), basal joint rather stout, without pecten. Palpi moderate, second joint reaching base of antennæ, densely scaled, beneath with rough loose projecting hair-scales throughout, not forming a tuft; terminal joint as long as second, slender, curved. Thorax smooth. Forewings elongate, moderate, hindmargin oblique. Hindwings hardly narrower than forewings, elongate-ovate, hindmargin rounded, cilia $\frac{2}{3}$. Abdomen moderate. Posterior tibiæ clothed with long hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Not very close to any other known genus, though certainly to be placed in this neighbourhood; perhaps nearest to *Saropla*, but at present of doubtful origin.

277. *Thal. mylicella*, n. sp.

Minor, alis ant. ochreo-albidis, ad dorsum niveo-suffusis, postice griseo-tinctis, punctis disci quattuor serieque marginis postici nigris, linea ciliorum subapicali saturate fusca; post. albido-griseis.

♂ ♀. 14-17 mm. Head, palpi, and thorax snow-white. Antennæ grey, towards base white. Abdomen and legs grey-whitish, anterior and middle pair internally dark fuscous. Forewings elongate, moderate, rather strongly dilated, costa gently arched, apex round-pointed, hindmargin almost straight, rather strongly oblique; ochreous-whitish, becoming white towards inner margin, apical half greyish-tinged; a small black dot in disc before middle, a second rather below it on fold, a third in disc beyond middle, and a fourth a little below third: a very faintly darker curved posterior line; sometimes a few black scales posteriorly; a hindmarginal row of minute black dots: cilia light ochreous-grey irrorated with whitish, with a dark fuscous subapical line. Hindwings whitish-grey; cilia grey-whitish.

Sydney and Blackheath (3500 feet), New South Wales; Deloraine, Tasmania; common in October and November.

44.* Phryganeutis, n. g.

Head with loosely appressed scales, sidetufts rather large, meeting above. Antennæ in ♂ moderate, with fine long cilia (3), basal joint moderate, with strong pecten. Palpi long, second joint much exceeding base of antennæ, clothed anteriorly with long scales which expand above and beneath to form a rough apical tuft, terminal joint shorter than second, slender, obliquely ascending, partially concealed in apical tuft. Thorax smooth. Forewings elongate, apex pointed, hindmargin very oblique. Hindwings as broad as forewings, elongate-ovate, hindmargin rounded, cilia $\frac{3}{4}$. Abdomen moderate. Posterior tibiæ clothed with long hairs. Forewings with vein 7 to hindmargin, 2 from before angle of cell. Hindwings normal.

Not included in the analytical table, having been discovered since; it will fall under the same head with *Palparia*, but be separated by the hairs of second joint of palpi expanding above at apex. Intermediate in characters and development between *Protomacha* and *Pleurota*.

278. *Phryg. cinerea*, n. sp.

Media, alis ant. griseis, cano nigroque conspersis, punctis disci elongatis tribus nigrescentibus; post. dilute griseis.

♂. 23 mm. Head and antennæ grey-whitish. Palpi dark grey, suffused with white above. Thorax dark fuscous mixed with white. Abdomen grey-whitish. Legs whitish, anterior pair internally dark fuscous. Forewings elongate, costa slightly arched, apex round-pointed, hindmargin straight, very oblique; grey, densely irrorated with white and dark fuscous; a small linear dark fuscous mark in disc before middle, a second directly beneath it on fold, and a third less elongate in disc beyond middle: cilia pale grey mixed with white, with two cloudy darker lines. Hindwings pale grey; cilia grey-whitish.

Mount Lofty, South Australia; one specimen received from Mr. E. Guest, who states that it is not scarce.

45. Saropla, Meyr.

Head loosely scaled, sidetufts large, spreading, somewhat projecting between antennæ. Antennæ moderate, in ♂ moderately and evenly ciliated (1), basal joint moderate, with strong pecten. Palpi moderate or long, second joint reaching or considerably exceeding base of antennæ, densely scaled, beneath with a short loose spreading tuft towards apex; terminal joint shorter or much shorter than second, slender, oblique, often partially concealed. Thorax smooth. Forewings elongate, hindmargin more or less concave, oblique. Hindwings narrower than forewings, elongate-ovate or broadly lanceolate, cilia $\frac{3}{5}$ to $1\frac{1}{4}$. Abdomen moderate. Posterior tibiæ clothed with very long hairs. Forewings with vein 7 to hindmargin, 2 from distinctly before angle of cell. Hindwing normal, cell sometimes elongate.

It seems unnecessary to divide this genus, although there is some range of structural variation in the different species. *S. hyperocha* is the nearest to the ancestral form; *S. cleronoma* represents an extreme of retrograde development. The genus is nearly allied to *Pleurota*, and may probably be regarded as an offshoot from an early form of that genus. It is further interesting as having considerable direct affinity with the European genera *Holoscolia* and *Topeutis* (most visible in *S. melanoneura*) which are probably offshoots from it.

1a. Hindwings lanceolate........................283. *cleronoma.*
1b. „ elongate-ovate
2a. Apex of forewings strongly produced ......279. *melanoneura.*
2b. „ „ „ not produced
3a. Markings rather dark fuscous ....280. *hyperocha.*
3b. „ ochreous
4a. Markings sharply defined ....281. *cœlatella.*
4b. „ obscure ....282. *philocala.*

279. *Sar. melanoneura*, n. sp.

Minor, alis ant. fuscis, venis marginibusque latius niveo-lineatis; post. albido-griseis.

♂ ♀. 13-18 mm. Head and antennæ white. Palpi white, second joint greyish-fuscous externally except towards apex. Thorax white, with a narrow pale ochreous stripe on side of back, and broad ochreous-brown lateral stripe. Abdomen and legs white, anterior pair internally fuscous. Forewings elongate, costa moderately arched, apex acutely pointed, strongly produced, hindmargin strongly sinuate, very oblique; ochreous-fuscous; all veins and margins rather strongly marked with snow-white, sometimes partially confluent: cilia white, with a blackish subbasal line, tips dark fuscous, lighter towards anal angle. Hindwings whitish-grey; cilia whitish, with a grey line round apex.

Departs from the rest of the genus in markings and form of forewings.

Sydney and Shoalhaven, New South Wales, in October and January; two specimens.

280. *Sar. hyperocha*, n. sp.

Media, alis ant. niveis, striga subcostali abbreviata, altera subdorsali, punctis disci duobus his adjacentibus, fascia obliqua e striga subcostali in angulum analem percurrente, trianguloque marginis postici magno ochreo-fuscis; post. dilutius griseis.

♂. 19-21 mm. Head white. Palpi white, second joint brownish-ochreous except at base and apex. Antennæ grey. Thorax white, with a lateral brownish-ochreous stripe. Abdomen whitish-grey, anal tuft ochreous-tinged. Legs white, anterior pair internally dark fuscous. Forewings elongate, somewhat dilated posteriorly, costa hardly arched, apex round-pointed, hindmargin somewhat sinuate, rather strongly oblique; snow-white, with ochreous-brown markings; a moderately broad subcostal streak from base of costa to costa again at $\frac{2}{3}$; a similar streak above inner margin from base to inner margin at $\frac{2}{3}$; a moderately broad streak from subcostal streak beyond middle to anal angle, contracted at origin; a rather darker round dot touching lower margin of subcostal streak before middle, and a second rather beyond it touching upper margin of subdorsal streak ; a small cloudy inwardly oblique mark on costa at $\frac{4}{5}$; a triangular blotch on hindmargin, extending from apex to anal angle : cilia white, with broad ochreous-brown bars at apex and anal angle, and lower half ochreous brown from apex to near anal angle. Hindwings rather light fuscous-grey ; cilia grey-whitish.

Much larger and darker than the following species, which it closely resembles in marking.

Blackheath (3500 feet), New South Wales, in November ; common.

281. *Sar. calatella*, n. sp.

Parva, alis ant. niveis, striga e basi in costam ante apicem percurrente, altera subdorsali, fascia subobliqua e striga subcostali in angulum analem perducta, trianguloque marginis postici dilutius ochreis, partim nigro-marginatis ; post. albido-griseis.

♂ ♀. 11-14 mm. Head and antennæ white. Palpi white, second joint suffused with ochreous externally except towards apex. Thorax white, with a bright ochreous lateral stripe. Abdomen whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded ; snow-white, markings rather pale bright ochreous, partially finely blackish-margined ; a moderate streak from middle of base to costa at $\frac{3}{4}$; a straight fascia from this streak beyond middle to anal angle ; a moderate streak from base of inner margin to this fascia above anal angle ; a round black dot on upper margin of subdorsal streak at $\frac{1}{3}$; an elongate-triangular hind-marginal blotch, extending from apex to near anal angle : cilia white, with a broad median and narrow apical line irrorated with black points. Hindwings whitish-grey ; cilia pale whitish-yellowish.

Much smaller than *S. hyperocha*, with the markings pale ochreous, black-margined, the subcostal streak starting from middle of base instead of from costa, the subdorsal streak terminating in the transverse fascia.

Toowoomba (2000 feet), Queensland; Sydney and Blackheath (3500 feet), New South Wales; Port Lincoln, South Australia; common from September to February.

282. *Sar. philocala*, n. sp.

Parva, alis ant. niveis, squamis postice dispersis saturate fuscis, striga subcostali medium discum attingente, altera dorsali, fascia etiam postica incurvata æneo-ochreis, punctis discum versus quattuor nigris; post. ochreo-albidis.

♂ ♀. 11-13 mm. Head white. Palpi white, second joint externally pale ochreous except towards apex. Antennæ grey. Thorax white, with a brownish-ochreous lateral stripe. Abdomen whitish-ochreous. Legs whitish-ochreous, anterior pair dark fuscous. Forewings elongate, costa gently arched, apex rounded, hindmargin very obliquely rounded; white, with some large scattered dark fuscous scales except towards base; a broad brassy-ochreous streak from base of costa to middle of disc, posteriorly suffusedly bifurcate; a broad brassy-ochreous streak along inner margin from base to $\frac{3}{4}$, attenuated to apex, enclosing a small white marginal spot near base; a round black dot on submedian fold before middle, a second in middle of disc, a third more transverse in disc beyond middle, and a fourth at apex of dorsal streak; a suffused moderately broad inwards-curved brassy-ochreous fascia from $\frac{3}{4}$ of costa to anal angle; an indistinct fuscous line on hindmargin: cilia white, apical half whitish-ochreous, tips fuscous. Hindwings ochreous-whitish, slightly greyish-tinged; cilia ochreous-whitish.

Cannot be confused with the preceding.

Sydney and Blackheath (3500 feet), New South Wales; common from October to February.

283. *Sar. cleronoma*, n. sp.

Parva, alis ant. canis, saturate fusco-sparsis, punctis disci tribus fasciaque postica obliqua angusta saturate fuscis; post. griseo-albidis.

♂ ♀. 11 mm. Head, antennæ, and thorax white. Palpi white, second joint whitish-ochreous on basal half. Abdomen and legs ochreous-whitish, anterior pair fuscous. Forewings elongate, narrow, costa gently arched, apex acutely pointed, hindmargin extremely obliquely rounded, merged with inner margin; white, thinly and irregularly sprinkled with ochreous and dark fuscous; a small cloudy dark fuscous spot in disc before middle, a second obliquely beyond it on fold, and a third in disc beyond middle; a cloudy dark fuscous streak from costa at $\frac{3}{5}$ to anal angle: cilia white, with a strong dark fuscous apical line. Hindwings lanceolate, grey-whitish; cilia ochreous-whitish.

Both forewings and hindwings are in fact lanceolate.

Brisbane, Queensland; Sydney, New South Wales; two specimens in September and October.

46. Pleurota, Hb.

Head loosely scaled, sidetufts large, spreading. Antennæ moderate, in ♂ moderately and evenly ciliated (1-2), basal joint stout, usually with strong pecten (rarely absent.) Palpi very long, second joint very long, straight, horizontally porrected or somewhat ascending, clothed with dense rough projecting scales above and beneath, terminal joint much shorter than second, slender, ascending. Thorax smooth. Forewings elongate, moderate, hindmargin oblique. Hindwings as broad as forewings, or slightly narrower, elongate-ovate, hindmargin rounded, cilia $\frac{2}{3}$ to $\frac{4}{5}$. Abdomen moderate. Posterior tibiæ with long fine hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Easily recognised by the peculiar palpi, of which the long second joint is roughly haired above and beneath throughout. The European genus *Topeutis* has similar palpi, but differs in the long fine ciliations of the antennæ. In the first four species the basal pecten of the antennæ is either absent or little developed and fugitive, but it seems quite unnecessary to separate them generically. The genus may probably be regarded as a development from *Protomacha.*

The distribution is interesting, since the genus is represented in Europe and Northern Asia by over twenty species, and I have already sixteen from Australia; but at present none are known from any other region. Doubtless, however, it will be found to occur through Southern Asia and the Malay Archipelago. In America it seems to be probably really absent; New Zealand has also failed to produce this or any nearly allied genus. The Australian species are all more nearly allied together than to the European.

Very few of the larvae of the European species are known; these do not seem to present any peculiarity of habit. I have not met with any of the Australian, but it is very probable that some at least feed on grass.

1a. Head distinctly yellow.
2a. Thorax wholly dark fuscous ....291. *callizona.*
2b. ,, not wholly dark fuscous.
3a. Dorsal streak ochreous-yellow ....292. *peloxantha.*
3b. ,, ,, dark fuscous.
4a. With a dark central fascia parallel to hind-margin ....290. *brevivittella.*
4b. Without such fascia.
5a. Forewings suffused with light ochreous-brown ....293. *pyrosema.*
5b. ,, not suffused with brown .. ..294. *psammoxantha*
1b. Head not yellow.
2a. Forewings light ochreous-yellow ....288 *protogramma.*
2b. ,, not yellow.
3a. Head grey or ochreous.
4a. Forewings with three discal dots ....287. *psephena.*
4b. ,, without discal dots.
5a. Head and thorax grey ....286. *tephrina.*
5b. ,, ,, ,, ochreous ....289. *crassinervis.*
3b. Head white or ochreous-whitish.
4a. Basal third of costa dark fuscous ....298. *stasiastica.*
4b. ,, ,, ,, ,, not dark fuscous.
5a. With an oblique dark streak from anal angle.
6a. Three discal dots distinct ....284. *themeropis.*
6b. ,, ,, ,, obsolete.
7a. Oblique anal streak reaching costa ....295. *endesma.*

7b. Oblique anal streak not reaching costa......297. *chlorochyta.*
5b. Without oblique anal streak.
6a. Second discal dot obliquely beyond first ...299. *argoptera.*
6b. ,, ,, ,, ,, before first.
7a. Forewings ochreous-whitish ....296. *gypsina.*
7b. ,, brownish-ochreous irrorated with white ....285. *zalocoma.*

284. *Pleur. themeropis*, n. sp.

Media, alis ant. canis, striga subcostali discum medium vix attingente, altera dorsi integra, fascia postica retro-angulata, trianguloque marginis postici ochreis fuscisve, punctis disci tribus nigris ; post. dilutius griseis.

♂ ♀. 17-19. Head white. Palpi white, second joint dark fuscous except at base and towards apex above. Antennæ grey. Thorax white, with a pale ochreous lateral stripe. Abdomen whitish-grey. Legs grey-whitish, anterior pair internally dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, very oblique ; white ; markings cloudy, light yellowish-ochreous, in ♀ mixed with dark fuscous ; a subcostal streak from base to middle, posteriorly very indistinct ; a streak along inner margin from base to anal angle, suffused with white on margin towards base ; an inwardly oblique streak from costa at $\frac{3}{4}$, and another from anal angle, meeting in disc ; a black dot in disc before middle, a second more elongate obliquely before it on fold, and a third in disc beyond middle ; a triangular blotch on hindmargin, extending from apex almost to anal angle : cilia white, slightly mixed with ochreous, with an ochreous bar at apex and anal angle. Hindwings light grey ; cilia grey-whitish.

Except in the differently placed discal spots, much resembling a very pale *Sar. hyperocha.*

Deloraine and Hobart, Tasmania ; four specimens in November and December.

285. *Pleur. zalocoma*, n. sp.

Media, alis ant. fusco-ochreis, cano magis minusve irroratis, punctis disci tribus nigris interdum obsoletis ; post. dilutius griseis.

♂. 20-21 mm. Head white. Palpi white, second joint dark fuscous except towards base and apex above. Antennæ grey. Thorax grey, shoulders ochreous-fuscous, centre sometimes white. Abdomen grey. Legs dark fuscous, posterior pair grey-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; brownish-ochreous, densely irrorated with grey-whitish, and sometimes partially with dark fuscous; absence of irroration sometimes produces broad subcostal and dorsal streaks, and hindmarginal blotch; extreme costal edge whitish, towards base blackish; a round black dot in disc before middle, a second more elongate obliquely before it on fold, and a third in disc beyond middle: cilia whitish-ochreous or whitish-grey, irrorated with whitish. Hindwings rather light grey; cilia grey-whitish.

Var. a. White irroration wholly absent, and discal dots hardly perceptible; head grey-whitish.

Nearly allied to *P. themeropis*, but with the ground colour brownish-ochreous, not white as in that species; in other characters variable.

Mount Wellington, Tasmania, at 2500 feet; four specimens beaten from *Leptospermum* in December.

286. *Pleur. tephrina*, n. sp.

Media, alis ant. dilutius fusco-griseis, striga dorsi albido nigroque mixta, venis postice nigro-lineatis; post. griseis.

♂. 20 mm. Head and antennæ grey. Palpi dark grey mixed with white. Thorax grey, with a dark fuscous lateral stripe. Abdomen grey. Legs dark fuscous, posterior pair grey-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, very oblique; light brownish-grey; costal edge whitish, towards base blackish; a streak along inner margin irrorated with white and dark fuscous; veins slightly and obscurely lined with whitish, posterior veins irregularly lined with black: cilia grey, mixed with whitish, with a very obscure darker line. Hindwings grey; cilia whitish-grey.

An obscure-looking but distinct species.

Deloraine, Tasmania ; one specimen in November.

287. *Pleur. pesephena*, n. sp.

Minor, alis ant. ochreo-griseis, saturatiori-irroratis, punctis disci tribus nigris ; post. griseis.

♂ ♀. 14-16 mm. Head pale greyish-ochreous. Palpi whitish-ochreous, second joint dark fuscous externally except at base and apex above. Antennæ grey. Thorax ochreous-grey. Abdomen grey. Legs dark grey, posterior pair grey-whitish. Forewings elongate, costa slightly arched, apex round-pointed, hindmargin almost straight, very oblique ; ochreous-grey, more or less irrorated with darker grey ; costal edge whitish-ochreous, towards base obscurely blackish ; a round blackish dot in disc before middle, a second slightly beyond it on fold, and a third in disc beyond middle : cilia very pale ochreous-grey, with a dark fuscous basal line. Hindwings grey ; cilia whitish-grey.

Smaller, greyer, and darker than *P. zalocoma*, with the discal dots differently placed.

Mount Wellington, Tasmania, at 2500 feet ; eight specimens in December.

288. *Pleur. protogramma*, n. sp.

Minor, alis ant. flavidis, puncto disci nigro ; post. dilutius griseis.

♂. 15 mm. Head ochreous-whitish. Palpi dark fuscous, upper hairs of second joint, and apical $\frac{2}{3}$ of terminal joint whitish. Antennae grey. Thorax light ochreous-yellow. Abdomen and legs grey. Forewings elongate, costa slightly arched, apex round-pointed, hindmargin almost straight, very oblique ; light ochreous-yellow ; extreme base of costa blackish ; a round black dot in disc beyond middle : cilia pale yellowish. Hindwings light grey ; cilia whitish-grey.

Very distinct from any other.

Colac, Victoria ; found by Mr. G. H. Raynor flying commonly in a pasture-field, in October.

289. *Pleur. crassinervis*, n. sp.

Minor, alis ant. saturatius fuscis, venis marginibusque suffusis flavidis; post. griseis.

♂ ♀. 13-15 mm. Head brownish-ochreous, side-tufts ochreous-whitish. Palpi dark-fuscous, upper hairs of second joint, and apical $\frac{2}{3}$ of terminal joint whitish. Antennæ grey. Thorax yellowish-ochreous, back mixed with deep fuscous. Abdomen dark grey. Legs grey, anterior pair dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, very oblique; rather dark fuscous; all veins and margins suffusedly lined with light ochreous-yellow, sometimes partially confluent; cilia fuscous, somewhat mixed with yellowish. Hindwings grey; cilia light grey.

Allied to *P. protogramma*, but suffused with dark fuscous except on veins.

Sydney, New South Wales; locally common in pasture-fields, in August and September.

290. *Pleur. brevivittella*, Walk.

(*Thema brevivitella*, Walk. 802.)

Minor, alis ant. dilute flavis, striga e basi in discum medium percurrente, altera dorsi, fasciis duabus posticis in costa ac subdisco connexis, tertia marginis postici fuscis; post. fulvis saturatiusve fuscis.

♀. 12-13 mm. Head pale yellow. Palpi dark fuscous, upper hairs of second joint and apical $\frac{3}{4}$ of terminal joint above yellowish-whitish. Antennae dark grey. Thorax light yellow, with a dark fuscous central stripe. Abdomen dark grey, apex ochreous-yellow. Legs dark fuscous, posterior pair ochreous-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, very oblique; light ochreous-yellow; markings ochreous-fuscous irrorated with dark fuscous; a moderate streak from base of costa to middle of disc, meeting first fascia, and another along inner margin to $\frac{3}{4}$; a narrow fascia from beyond middle of costa to middle of inner margin, and a second from $\frac{3}{4}$ of costa to anal angle, connected with first on costa, and again by a bar from middle of first to anal angle; a narrow streak along hindmargin: cilia pale yellow, with a fuscous bar at apex and anal angle, basal half on hindmargin reddish-ochreous. Hindwings deep fulvous or rather dark fuscous; cilia fuscous.

Distinguished from all by the two posterior fasciae.

Brisbane, Queensland; Murrurundi and Sydney, New South Wales; Fernshaw, Victoria; in October and November, not uncommon, flying in the sunshine.

291. *Pleur callizona*, n sp.

Minor, alis ant. dilute flavis, costa basim versus, fascia media, altera etiam marginis postici latiore cum prima sub medio connexa saturate fuscis; post. saturate fuscis.

♂. 13 mm. Head light yellow. Palpi light yellow, second joint externally dark fuscous except upper hairs. Antennae, thorax, abdomen, and legs dark fuscous; posterior legs suffused with grey-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; light yellow, markings dark fuscous; a streak along basal third of costa; a moderate fascia from middle of costa to beyond middle of inner margin, attenuated on costa; a moderately broad hindmarginal band, anterior edge near anal angle connected with middle of central fascia by a bar: cilia dark fuscous, beneath anal angle light yellow, terminal half on a space beneath apex yellow-whitish. Hindwings and cilia dark fuscous.

A very distinct and handsome species.

Fernshaw, Victoria, in November; two specimens.

297. *Pleur. peloxantha*, n. sp.

Minor, alis ant. fuscis, striga dorsi attenuata dilute flava; post. fuscis.

♂. 13-14 mm. Head and palpi light ochreous-yellow, second joint externally with basal half and a subapical ring dark fuscous. Antennae fuscous. Thorax pale ochreous-yellow, with a fuscous lateral stripe. Abdomen ochreous-grey. Legs light ochreous-yellow, anterior pair internally dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; fuscous; extreme costal edge light yellow from near base to near apex; a light ochreous yellow moderately broad streak along inner margin almost from base to anal angle, gradually attenuated to extremity, somewhat interrupted near before extremity: cilia fuscous, with a cloudy darker central line, beneath anal angle light yellow. Hindwings fuscous; cilia pale fuscous.

Very distinct.

Brisbane, Queensland, in September; three specimens.

* 293. *Pleur. pyrosema*, n. sp.

Minor, alis ant. saturate flavis, fusco-suffusis, striga dorsi attenuata nigrescente supra læte flavo-marginata, macula anguli analis erecta fusca; post. fulvis.

♂. 13-15 mm. Head yellow-ochreous. Palpi dark fuscous, upper hairs of second joint, and terminal joint above whitish-ochreous. Antennæ fuscous. Thorax ochreous-orange, shoulders narrowly and a broad central stripe dark fuscous. Abdomen and legs dark fuscous, posterior pair ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; ochreous-yellow or orange, suffused with light ochreous-brown; a short very suffused dark fuscous streak from base above middle; a moderately broad blackish streak along inner margin from base to $\frac{2}{3}$, attenuated to extremity, margined above by a clear ochreous-yellow or orange streak; a cloudy fuscous erect spot on anal angle; cilia brownish-ochreous, terminal half dark grey. Hindwings rather deep fulvous; cilia fuscous.

Allied to *P. psammoxantha*, but much more deeply coloured, with the dorsal streak not distinctly toothed.

Murrurundi and Sydney, New South Wales; Melbourne and Fernshaw, Victoria; tolerably common from September to November.

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* I have since satisfied myself that this is the ♂ of *P. brevivittella*.

294. *Pleur. psammoxantha*, n. sp.

Minor, alis ant. ochreo-flavis, striga dorsi attenuata postice bidentata nigrescente, ♂ strigula anguli analis obliqua fusca, ♀ striga curva e costæ basi in angulum analem percurrente cum fascia marginis postici attenuata conjuncta ochreo-fuscis; post. saturate griseis.

♂. 14-16 mm. Head and palpi ochreous-yellow, second joint dark fuscous except upper hairs. Antennae dark fuscous. Thorax ochreous-yellow, edge of shoulders and a broad central stripe dark fuscous. Abdomen grey. Legs whitish-ochreous, anterior pair internally dark grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, rather strongly oblique; ochreous-yellow; a moderately broad blackish streak along inner margin from base to $\frac{3}{4}$, attenuated at extremity, with two short upper projections beyond middle and before apex; a narrow oblique fuscous streak from anal angle, not reaching middle of disc; sometimes a few fuscous scales towards hindmargin: cilia ochreous-yellow, a narrow bar on anal angle mixed with fuscous. Hindwings and cilia dark grey.

♀. Similar to ♂, but more whitish-ochreous, and with a moderately broad upwards-curved ochreous-fuscous streak from base of costa through middle of disc to anal angle, confluent with a moderate hindmarginal band which is attenuated to apex.

The only species in which the sexes differ markedly.

Rosewood, Queensland; Sydney, New South Wales; rather common from September to January.

295. *Pleur. endesma*, n. sp.

Minor, alis ant. dilute albido--ochreis, striga dorsi cum altera e costae basi postice conjuncta, fascia media obliqua, interdum triangulo marginis postici cum hac infra conjuncto ochreis ferrugineisve, partim nigro-mixtis; post. ochreo-albidis.

♂ ♀. 15-16 mm. Head and palpi pale whitish-ochreous, second joint except upper hairs, and apex of terminal joint dark fuscous. Antennae ochreous-whitish, annulated with dark fuscous. Thorax whitish-ochreous, with a central fuscous stripe. Abdomen and legs pale whitish-ochreous, anterior pair internally fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, rather strongly oblique; pale whitish-ochreous, with a few ochreous or ferruginous scales; markings ill-defined, brownish-ochreous or ferruginous, irregularly mixed with dark fuscous; a streak along inner margin from base nearly to anal angle, uniting at apex with an almost straight streak from base of costa; a straight slender fascia from middle of costa to anal angle, uniting beneath with a sometimes almost obsolete triangular hindmarginal blotch; a row of cloudy dark spots along hindmargin and apical part of costa: cilia pale whitish-ochreous, with a bar at apex and anal angle. Hindwings and cilia ochreous-whitish.

Cannot be confused with any other.

Fernshaw and Warragul, Victoria, in November and December; five specimens.

296. *Pleur. gypsina*, n. sp.

Minor, alis ant. ochreo-albidis, striga dorsi angusta suffusa, punctis disci tribus, linea postica obscura squamisque sparsis saturate fuscis; post. dilutius griseis.

♂ ♀. 13-15 mm. Head, palpi, antennae, thorax, abdomen, and legs ochreous-whitish; palpi with second joint externally dark fuscous except towards apex; antennae annulated with dark fuscous; anterior legs banded with dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin slightly sinuate, very oblique; ochreous-whitish, partially suffused with pale whitish-ochreous; a dark fuscous dot in disc rather before middle, a second obliquely before it on fold, and a third in disc beyond middle; a narrow dark fuscous suffusion along inner margin from near base to anal angle; an irregular line of dark fuscous scales from costa before apex to anal angle, sometimes broader and more suffused, with scattered dark fuscous posterior scales, especially on hindmargin: cilia very pale whitish-ochreous, with a fuscous bar at anal angle. Hindwings light grey; cilia grey-whitish.

An obscure-looking species, most allied to *P. endesma*, but widely distinct.

Fernshaw, Victoria, in November; four specimens.

297. *Pleur. chlorochyta*, n. sp.

Minor, alis ant. dilutissime flavidis, strigula e basi flava, striga dorsi postice dentata, strigula anguli analis obliqua, altera etiam marginis postici saturate fuscis; post. griseis.

♂ ♀. 14-16. Head and palpi pale whitish-yellowish, second joint dark fuscous except upper hairs. Antennae grey. Thorax whitish-yellow, collar ochreous-yellow, with a square grey posterior spot. Abdomen grey. Legs ochreous-whitish, anterior pair internally grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, rather strongly oblique; pale whitish-yellow, towards anal angle mixed with ochreous-yellow; extreme costal edge dark fuscous towards base; a short ochreous-yellow streak from base beneath costa; a narrow dark fuscous streak along inner margin from base to $\frac{3}{4}$, posteriorly dilated upwards into a triangular projection; a narrow dark fuscous streak from disc beyond middle to anal angle, posteriorly suffused; a narrow dark fuscous suffused streak along hindmargin from apex, not reaching anal angle: cilia whitish-yellowish, with an obscure fuscous bar at apex and anal angle. Hindwings grey; cilia light grey.

Somewhat resembles the ♂ of *P. psammoxantha*, but much paler, and readily distinguished by the hindmarginal streak, and posterior dilation of dorsal streak.

Blackheath (3500 feet), New South Wales; Launceston and Hobart, Tasmania; five specimens in January.

298. *Pleur. stasiastica*, n. sp.

Minor, alis ant. albis, costa basim versus, fascia media lata interdum incompleta, puncta disci tria continente, striga etiam marginis postici saturate fuscis; post. albido-griseis.

♂. 12-15 mm. Head white. Palpi white, second joint with basal $\frac{2}{3}$ and a subapical ring dark fuscous. Antennae fuscous.

Thorax white, with a dark fuscous lateral stripe. Abdomen and legs grey-whitish, anterior pair internally dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique; white, markings rather dark fuscous; a moderate streak along basal third of costa; a round dot in disc before middle, a second beyond it on fold, and a third in disc beyond middle, all included in a more or less complete broad oblique median band; a moderate irregular streak along hindmargin from apex to anal angle: cilia whitish-ochreous, with a dark fuscous bar at apex and anal angle. Hindwings whitish-grey; cilia pale whitish-ochreous.

Allied to the following, but very distinct.

Sydney and Bulli, New South Wales, in October, January, and February; four specimens.

299. *Pleur. argoptera*, n. sp.

Parva, alis ant. albis, punctis disci tribus serieque punctorum postica saturate fuscis; post. dilutius griseis.

♂. 11-12 mm. Head, palpi, antennae, and thorax ochreous-white, second joint of palpi with basal half and a subapical ring dark fuscous. Abdomen and legs grey-whitish, anterior pair internally dark fuscous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, very oblique; ochreous-white; base of costa dark fuscous; a round dark fuscous dot in disc before middle, a second beyond it on fold, and a third in disc beyond middle; a row of dark fuscous dots from costa before apex to anal angle, and a similar dot on costa between this and apex: cilia whitish-ochreous. Hindwings light fuscous-grey; cilia whitish-ochreous.

Sydney, New South Wales, in December; three specimens.

47. Atheropla, Meyr.

Head smooth, sidetufts appressed. Antennae in ♂ (?). Palpi long, second joint long, porrected, densely scaled, with a rough projecting tuft towards apex beneath; terminal joint rather shorter than second, slender, erect. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings distinctly narrower than forewings, elongate-ovate, hindmargin rounded, cilia $\frac{4}{5}$. Abdomen moderate. Posterior tibiae with short scanty hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Although the ♂ is unknown, I have little doubt that the antennal characters will be much as in Pleurota, to which it is apparently allied, differing especially by the structure of palpi.

300 *Ather. melichlora*, n. sp.

Minor, alis ant. dilutius flavis, punctis disci tribus nigris, fascia submarginali dilute fusca ; post. griseo-albidis, apice griseo.

♀. 14 mm. Head, palpi, antennae, and thorax light ochreous-yellow ; palpi with second joint dark fuscous except towards base and apex ; antennae annulated with dark fuscous. Abdomen and legs ochreous-whitish, anterior pair internally dark fuscous. Forewings elongate, costa gently arched, apex pointed, hindmargin very obliquely rounded ; light ochreous-yellow ; extreme base of costa black ; a black dot in disc before middle, a second directly beneath it on fold, and a third larger in disc beyond middle ; a moderate obscure light fuscous submarginal band from costa before apex to anal angle : cilia light ochreous-yellow. Hindwings grey-whitish, apex suffused with grey ; cilia grey-whitish.

Blackheath (3500 feet), New South Wales, in November ; one specimen.

48. Coeranica, Meyr.

Head loosely haired, sidetufts large, spreading, meeting above. Antennae slender, in ♂ serrate, moderately ciliated ($1\frac{1}{2}$), basal joint stout, with moderate pecten. Palpi short, second joint not reaching base of antennae, densely scaled, beneath with roughly projecting rather long hair scales, terminal joint half as long as second, slender, obliquely ascending. Thorax smooth. Forewings elongate, hindmargin oblique. Hindwings rather narrower than forewings, elongate-ovate, hindmargin rounded, cilia $\frac{5}{6}$. Abdomen moderate.

Posterior tibiae clothed with long fine appressed hairs above. Forewings with vein 7 to hindmargin, 2 from before angle of cell. Hindwings normal.

Allied nearly to *Coesyra*, of which it is a development, differing by the rough projecting scales of the second joint of palpi, which do not however form a definite tuft.

1a. With a dark fuscous costal streak ; cilia yellow ....301. *isabella.*
1b. Without costal streak ; cilia fuscous ......302. *eritima.*

301. *Coer. isabella*, Newm.

(*Oecophora isabella*, Newm., Trans. Ent. Soc. Lond. III. (n. s.), 295, Pl. XVIII.)

Minor, alis ant. flavis, striga costae abbreviata saturate fusca, fascia postica angusta cum altera marginis postici inferius conjuncta purpureis, ciliis flavis ; post. dilutius fuscis.

♂ ♀. 17-19 mm. Head, palpi, and thorax ochreous-yellow ; second joint of palpi externally more or less dark fuscous except at apex. Antennae grey, towards base yellowish. Abdomen grey, sides and apex whitish-ochreous. Legs dark fuscous, posterior tibiae pale yellowish. Forewings elongate, costa gently arched, apex pointed, hindmargin almost straight, very oblique ; ochreous-yellow ; a narrow dark fuscous streak along costa from base to $\frac{2}{3}$, attenuated to both extremities ; a moderate light purple steak, margined with dark fuscous, from $\frac{3}{4}$ of costa to $\frac{3}{4}$ of inner margin, connected on inner margin with a similar streak along hindmargin from apex to anal angle : cilia ochreous-yellow. Hindwings and cilia rather light fuscous.

Brisbane and Toowoomba (2000 feet), Queensland; Murrurundi and Sydney, New South Wales ; Melbourne, Victoria ; common from August to October, in grassy places.

302. *Coer. eritima*, n. sp.

Minor, alis ant. flavis, fascia postica angusta cum altera marginis postici inferius conjuncta purpureis, ciliis fuscis ; post. fuscis.

♂ ♀. 14-18 mm. Head and palpi ochreous-yellow, second joint externally dark fuscous. Thorax ochreous-yellow, with a quadrate dark fuscous anterior spot. Abdomen grey, apex yellow. Legs dark fuscous, posterior tibiæ light yellowish. Forewings elongate, costa gently arched, apex pointed, hindmargin almost straight, very oblique; ochreous-yellow; extreme costal edge dark fuscous towards base; a moderate purple streak, margined with dark fuscous, from $\frac{3}{4}$ of costa to $\frac{3}{4}$ of inner margin, connected on inner margin with a similar streak along hindmargin from apex to anal angle: cilia fuscous. Hindwings and cilia fuscous.

Differs from *C. isabella* by the dark fuscous spot on thorax, fuscous cilia, and absence of costal streak of forewings.

Quorn, Wirrabara Forest, and Port Lincoln, South Australia, in October and November; common.

49. Eulachna, Meyr.

Head quite smooth. Antennæ in ♂ strongly ciliated ($2\frac{1}{4}$), basal joint moderate, without pecten. Palpi short, second joint not reaching base of antennæ, smoothly scaled, terminal joint much shorter than second, moderate, obliquely ascending. Thorax smooth. Forewings elongate, hindmargin extremely oblique. Hindwings much narrower than forewings, ovate-lanceolate, cilia $1\frac{1}{4}$. Abdomen rather stout. Posterior tibiæ clothed with long dense hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before anal angle of cell, 1 not furcate at base. Hindwings normal.

This genus is included here as numbered in the tabulation, but I am now convinced that it should be placed further on in the neighbourhood of *Machaeritis*, of which it appears to be a development. The loss of the basal furcation of vein 1 of the forewings is very unusual in this family, but is a degradational character.

303. *Eul. dasyptera*, n. sp.

Parva, alis ant. fuscis, saturatiori-irroratis, macula dorsi postica parva albido-ochrea; post. saturatius fuscis.

♂ ♀. 9-11 mm. Head, palpi, antennae, thorax, abdomen, and legs fuscous; palpi becoming whitish-ochreous above; apex of tarsal joints whitish. Forewings elongate, costa moderately arched, apex pointed, hindmargin extremely obliquely rounded; light greyish-fuscous irrorated with dark fuscous; a small obscure whitish-ochreous spot on inner margin before anal angle: cilia light greyish-fuscous, irrorated and terminally suffused with dark fuscous. Hindwings rather dark fuscous; cilia fuscous.

One of the smallest and most obscure species of the family.

Sydney, Blackheath (3500 feet), and Wollongong, New South Wales, from September to November, locally not uncommon.

50. Aristeis, Meyr.

Head smooth, sidetufts small, appressed. Antennae in ♂ moderately stout, biciliated with long dense cilia (3), basal joint short, stout, without pecten. Palpi short, second joint not reaching base of antennae, rather slender, with appressed scales, terminal joint less than half second, hardly more slender, oblique. Thorax smooth. Forewings elongate, hindmargin oblique. Hindwings as broad as forewings, elongate-ovate, hindmargin rounded, cilia $\frac{1}{2}$. Abdomen moderate. Posterior tibiae with moderately long hairs above. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

A development of *Casyra*, with some relation to *Ocystola*, but abundantly distinct from either.

304. *Arist. chrysoteuches*, n. sp.

Parva, alis ant. aurantiacis, fascia postica incurvata ciliisque saturatius purpureo-fuscis; post. nigrescentibus.

♂. 12 mm. Head and antennae dark fuscous. Palpi dark fuscous, apex of second, and median ring of terminal joint whitish. Thorax deep orange, with a large central dark fuscous spot. Abdomen and legs dark fuscous, hairs of posterior tibiae yellowish. Forewings rather elongate, costa gently arched, apex round-pointed, hindmargin obliquely rounded; bright deep orange; extreme base of costa dark fuscous; a moderate dark purplish-fuscous fascia from $\frac{3}{4}$ of costa to $\frac{3}{4}$ of inner margin, curved inwards, rather dilated beneath: cilia dark purple-fuscous, basal third reddish-purple. Hindwings blackish-fuscous; cilia dark purplish-grey, with a blackish basal line.

A very handsome and intensely coloured insect.

Sydney, New South Wales, in December; one specimen.

51. Cæsyra, Meyr.

Head smooth, sidetufts small or moderate, spreading or loosely appressed, not projecting. Antennæ moderate, in ♂ moderately and evenly ciliated (1-1$\frac{3}{4}$), basal joint moderate, with strong pecten. Palpi moderate, second joint not exceeding base of antennae, densely scaled, generally rather loosely beneath, terminal joint rather shorter, slender, recurved. Thorax smooth. Forewing elongate, moderate or rather narrow, hindmargin oblique. Hindwings slightly narrower than forewings, elongate ovate, apex rounded, hindmargin rounded, cilia $\frac{1}{2}$ to $\frac{3}{4}$. Abdomen moderate. Posterior tibiae clothed with long fine hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Differs from *Philobota* only by the second joint of the palpi not exceeding base of antennae, but the separation is natural and in fact necessary. The species are almost always smaller, and generally yellow with purple or dark fuscous markings. The genus may be regarded as originating from *Philobota*, and in its turn giving rise to a number of smaller derivative genera, some of which, as *Ocystola* and *Machæritis*, are themselves of not inconsiderable extent. *Cæsyra* itself ranks after *Philobota* and *Eulechria* as the third largest Australian genus of the family, but is not known outside Australia. Only one larva is known, which presents no peculiarity of habit.

1a. Groundcolour ochreous or yellow.

2a. Forewings usually without dark markings.

3a. Head snow-white except on back .. ..330. *ochroptera.*

3b. Head not white.
4a. Forewings moderately broad ....305. *panchrysa.*
4b. „ elongate.
5a. Hindwings whitish-ochreous ....336. *panxantha.*
5b. „ rather dark grey ....337. *amylodes.*
2b. Forewings with dark markings.
3a. Thorax wholly yellow or ochreous.
4a. Forewings with three dark fuscous discal dots ....346. *arenivaga.*
4b. Forewings without three dots.
5a. With a posterior fascia.
6a. Fascia parallel to hindmargin...... ....306. *paragramma.*
6b. „ not parallel to hindmargin
7a. Fascia strongly inwards-curved ....316. *zanclotoma.*
7b. „ nearly straight........................333. *aphanes.*
5b. Without entire fascia.
6a. With an anal blotch, apical space yellow..335. *aspasia.*
6b. Without anal blotch, apical space rosy ...334. *parvula.*
3b. Thorax not wholly yellow.
4a. Thorax wholly dark fuscous.
5a. Forewings with base dark fuscous.
6a. Terminal band very broad, purple ....307. *dichroëlla.*
6b „ „ moderate, dark fuscous ...325. *isogramma.*
5b. Forewings with base not dark fuscous.
6a. With a dark fuscous costal streak ....329. *pyrrhoptera.*
6b. Without costal streak
7a. Terminal band wholly dark fuscous ....327. *acrotropa.*
7b. „ „ containing a yellow blotch..315. *ocellaris.*
4b. Thorax not wholly dark fuscous.
5a. Head dark fuscous ....326. *philoxena.*
5b. „ not dark fuscous.
6a. With a costal streak from base to middle.
7a. With a separate posterior fascia...........312. *triptycha.*
7b. With a terminal band.......................321. *catoptrina.*
6b. Without costal streak, or if present not reaching middle.

7a. With a nearly straight fascia in or before middle.
8a. With a short costal streak from base......311. *basilica.*
8b. Without costal streak.
9a. With a discal dot beyond middle .. ..310. *anthodora.*
9b. Without discal dot.
10a. Anterior fascia terminating on inner margin before middle ....309. *distephana.*
10b. Anterior fascia terminating on inner margin beyond middle .. ..308. *iozona.*
7b. Without straight anterior fascia.
8a. Forewings irrorated with fuscous.
9a. With three distinct discal dots ....339. *ergatis.*
9b. Without discal dots...... ....338. *omichlota.*
8b. Forewings not irrorated with fuscous.
9a. With a separate discal dot.
10a. With two fasciæ uniting on margins ...318. *personata.*
10b. With one fascia.
11a. Discal dot preceding fascia..................317. *annularis.*
11b. ,, ,, following fascia..................319. *ophthalmica.*
9b. Without discal dot.
10a. Markings bright reddish-purple.
11a. With a posterior fascia ....314. *zonostola.*
11b. With a terminal band.
12a. With a purple spot at base of costa ......322. *concisella.*
12b. Without basal spot ....323. *paracycla.*
10b. Markings dull purplish-fuscous or dark fuscous.
11a. With a triangular blotch before anal angle.332. *deltosema.*
11b. Without triangular dorsal blotch.
12a. With a dark fuscous spot at base of costa..313. *cyclotoma.*
12b. Without basal spot.
13a. With a curved fascia beyond middle......320. *ecliptica.*
13b. Without median fascia.
14a. Terminal band moderately broad.
15a. Terminal band attenuated to costa.........324. *seleniaca.*

15b. Terminal band not attenuated above ......328. *stenoptera.*
14b. Terminal band reduced to a short streak...331. *melliflua.*
1b. Groundcolour whitish or grey.
2a. Forewings with a defined dark fascia before middle.
3a. Fascia starting from costa at base ....344. *discincta.*
3b. " " " " at $\frac{1}{3}$ ....343. *gephyrota*
2b. Forewings without anterior fascia.
3a. With a dark posterior line indented beneath costa.
4a. Forewings whitish .... 340. *disema.*
4b. " grey suffused with white.
5a. Cilia of hindwings whitish-ochreous ......341. *amphilyca.*
5b. " " " whitish grey ....342. *apothyma.*
3b. Without posterior indented line.
4a. Costa broadly dark fuscous towards base..345. *austalea.*
4b. " not dark fuscous towards base ... ..347. *vegrandis.*

305. *Coes. panchrysa*, n. sp.

Minor, alis ant. latioribus flavis, basi nonnihil saturatiori ; post. dilute fuscis.

♂ ♀. 14-16 mm. Head and thorax deep yellow. Palpi grey, internally yellowish. Antennae pale grey. Abdomen whitish-ochreous. Legs grey, posterior pair whitish-ochreous. Forewings moderate, costa moderately arched, apex round-pointed, hindmargin sinuate, oblique ; clear yellow, base suffusedly deeper yellow : cilia yellow. Hindwings pale fuscous-grey ; cilia whitish-ochreous.

The broadest-winged species of the genus, not nearly allied to any other.

Sydney, New South Wales, in October and November ; three specimens.

306. *Coes. paragramma*, n. sp.

Minor, alis ant. dilute ochreis, postice leviter purpureo-tinctis, costae dimidio antico saturatius fusco, fascia post medium angusta alteraque marginis postici purpureis ; post. ochreo-albidis.

♂ ♀. 12-15 mm. Head, palpi, antennae, thorax, abdomen, and legs pale yellow-ochreous; second joint of palpi and anterior legs suffused with fuscous. Forewings elongate, narrow at base, posteriorly dilated, costa gently arched, apex pointed, hindmargin slightly sinuate, very oblique; pale yellow-ochreous; basal half of costa narrowly and suffusedly dark fuscous; a pale reddish-purple streak from $\frac{2}{3}$ of costa to $\frac{2}{3}$ of inner margin, anteriorly margined with dark fuscous; an irregular fuscous purple streak along hindmargin from apex to anal angle; between these two streaks the ground colour is slightly purplish-tinged: cilia light ochreous-yellow. Hindwings and cilia ochreous-whitish.

Not apparently allied to any other species.

Sydney, New South Wales, in October and December; three specimens.

307. *Coes. dichroëlla*. Z.

(*Oecophora dichroëlla*, Z., Hor. Soc. Ross. 1877, 389; *Oecophora dicisella*, Walk. 685.)

Minor, alis ant. flavis, basi saturate fusca, fascia marginis postici latissima fusco-purpurea, saturate fusco-marginata; post. saturatius fuscis.

♂ ♀. 14-21 mm. Head and palpi yellow. Antennae dark fuscous, sometimes with pale annulations. Thorax dark purple-fuscous. Abdomen and legs dark fuscous, posterior tibiae yellowish. Forewings somewhat elongate, costa gently arched, apex round-pointed, hindmargin sinuate, oblique; bright yellow; base narrowly dark fuscous; a broad fuscous-purple hindmarginal band, suffusedly margined with dark fuscous, anterior edge extending from $\frac{2}{3}$ of costa to $\frac{2}{3}$ of inner margin, tolerably straight or somewhat curved and indented in middle, central spot of band somewhat lighter: cilia fuscous, on upper half of hindmargin ochreous-yellow, with a dark fuscous line. Hindwings rather dark fuscous, apex darker; cilia fuscous, with a darker line.

Characterised by the unusually broad hindmarginal band.

Larva 16-legged, stout, cylindrical; rather pale brownish-ochreous: dorsal irregular, reddish-ochreous-brown; subdorsal broader, pale greyish-brown; this and whole side densely reticulated with strong irregular ochreous-brown lines; spots rather large, black; anal segment with two black oblong spots; head pale yellowish-brown, reticulated with reddish-ochreous and black; all markings sometimes almost obsolete. Feeds (several together) in a spun-up discoloured cluster of leaves on *Eucalyptus tereticornis* and probably other species, in June; easy to rear.

Sydney, New South Wales; Melbourne, Victoria; Launceston, Tasmania; Mount Lofty, South Australia; common in August, September, and January, but rarely taken in the perfect state. Walker described two species separately, each as *Oecophora divisella*: this (the second) is therefore quashed.

308. *Coes. iozona*, n. sp

Minor, alis ant. flavis, fascia media obliqua angusta, alteraque marginis postici lata saturate purpureo-fuscis; post. saturatius fuscis.

♂ ♀. 13-16 mm. Head and palpi yellow, second joint externally dark fuscous towards base. Antennæ grey. Thorax yellow, anterior margin blackish-fuscous, forming a quadrate central spot. Abdomen and legs dark grey, posterior tibiae whitish-ochreous. Forewings elongate, costa gently arched, apex pointed, hindmargin slightly sinuate, oblique; yellow; costal edge dark fuscous towards base; a slender straight dark purplish-fuscous fascia from before middle of costa to beyond middle of inner margin; a moderately broad dark purplish-fuscous hindmarginal band, slightly narrowed beneath: cilia ochreous-yellowish, toward anal angle broadly fuscous. Hindwings and cilia rather dark fuscous.

This and the three following species form a connected group.

Sydney, New South Wales, in September, October, December, and January; five specimens.

309. *Coes. distephana*, n. sp.

Parva, alis ant. flavis, fascia antica curva angusta, alteraque postica fere recta aream apicalem purpuream excludente saturate purpureo-fuscis; post. griseis.

♂ ♀. 10-12 mm. Head and palpi yellow, second joint dark fuscous towards base. Antennae fuscous. Thorax yellow, anterior margin narrowly dark fuscous except on shoulders. Abdomen grey. Legs whitish-ochreous, irrorated with dark grey. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin almost straight, very oblique; yellow; extreme base of costa blackish; a slender dark purple-fuscous fascia from $\frac{1}{3}$ of costa to $\frac{2}{5}$ of inner margin, slightly outwards-curved; apical area fuscous-purple, bounded by a slender dark purple-fuscous almost straight fascia from before $\frac{3}{4}$ of costa to anal angle: cilia yellow or greyish-ochreous, becoming grey on costa and anal angle. Hindwings and cilia grey.

Nearly allied to *C. iozona*, but smaller, and with the anterior fascia differently placed and somewhat curved.

Sydney, New South Wales; Port Lincoln, South Australia; from October to March, six specimens.

310. *Coes. anthodora*, n. sp.

Minor, alis ant. dilute ochreo-flavis, fascia media obliqua angusta fracta, puncto disci postico, fascia etiam subterminali curva latiore purpureo-fuscis; post. griseis.

♂. 15 mm. Head and palpi pale ochreous-yellow, base of second joint externally dark fuscous. Antennæ grey. Thorax light ochreous-yellow, with an irregular curved dark fuscous transverse median bar. Abdomen whitish ochreous. Legs grey, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex pointed, hindmargin sinuate, oblique; pale ochreous-yellow; costal edge dark fuscous from base to near middle; a slender somewhat irregular purplish-fuscous fascia from before middle of costa to beyond middle of inner margin, broken in middle; a purplish-fuscous dot in disc beyond middle; a moderate purplish-fuscous fascia from costa before apex to anal angle, somewhat inwards-curved, posteriorly ill-defined: cilia pale ochreous-yellow, on anal angle mixed with fuscous. Hindwings grey; cilia whitish-grey.

Allied to the two preceding, but with the anterior fascia broken, a separate dot in disc, and the posterior fascia not touching the hindmargin.

Fernshaw, Victoria, in November; one specimen.

311. *Coes. basilica*, n. sp.

Minor, alis ant. dilutius flavis, costa basim versus, fascia antica angusta subcurva, altera postica inflexa, tertia marginis postici dilute purpureis, saturate fusco-irroratis; post. griseis, interdum albido-ochreo suffusis.

♂. 13-15 mm. Head and palpi ochreous-yellow, basal half and generally a subapical ring of second joint, and one or two rings of terminal joint dark fuscous. Antennæ grey. Thorax yellow, anterior margin fuscous-purple, forming a quadrate spot in centre. Abdomen whitish-ochreous. Legs dark fuscous, posterior pair pale yellowish-ochreous. Forewings elongate, costa moderately arched, apex tolerably rounded, hindmargin almost straight, oblique; light ochreous-yellow; markings pale purple finely irrorated with dark fuscous; a streak along basal fourth of costa; a slender irregular slightly outwards-curved fascia from $\frac{1}{3}$ of costa to $\frac{2}{5}$ of inner margin; a somewhat broader rather inwards-angulated fascia from $\frac{3}{4}$ of costa to inner margin before anal angle; a streak along hindmargin from apex to anal angle, triangularly dilated somewhat above middle: cilia light ochreous-yellow, on anal angle dark grey. Hindwings grey, sometimes suffused with whitish-ochreous except towards hindmargin; cilia pale whitish-ochreous, base sometimes grey.

Allied to the preceding species, but with a distinct hindmarginal fascia besides the posterior fascia, and a well-defined dark streak towards base of costa. It also approaches, and probably marks a real connection with some species of *Machæritis*. The suffusion of the hindwings with whitish-ochreous seems to constitute a local form, being apparently characteristic of the South Australian specimens, but there appears to be no ground for specific separation.

Sydney and Kiama, New South Wales; Hobart, Tasmania; Wallaroo, South Australia; six specimens in November, January, and February, in sandy places.

312. *Coes triptycha*, n. sp.

Minor, alis ant. flavis, basi, dimidio costæ antico, fascia postica recta, (interdum etiam altera angustiori antica,) maculaque marginis postici elongata saturate purpureo-fuscis ; post. saturatius fuscis.

♂ ♀. 15-18 mm. Head and palpi yellow, second joint with lower $\frac{2}{3}$ externally fuscous. Antennæ whitish-ochreous, annulated with dark fuscous. Thorax dark purple-fuscous, with a large anterior yellow spot. Abdomen dark fuscous, segmental margins yellowish. Legs fuscous, posterior pair ochreous-yellowish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin almost straight, very oblique ; ochreous-yellow, markings dark purple-fuscous ; a streak along anterior half of costa, at base extended to inner margin ; sometimes a narrow straight fascia from middle of costa almost to middle of inner margin, but this is generally quite absent ; a moderately broad straight fascia from $\frac{3}{4}$ of costa to anal angle, contracted above ; an elongate blotch along upper half of hindmargin : cilia dark fuscous, beneath anal angle yellowish. Hindwings and cilia dark fuscous.

The variation of this species in the occasional presence of an anterior fascia which is usually wholly absent is quite singular, but I have no doubt that the two forms really constitute a single species ; the difference is not sexual.

Helidon, Queensland ; Sydney, New South Wales ; Melbourne, Victoria ; rather common in September, October, and January, amongst *Acacia decurrens*.

313. *Coes. cyclotoma*, n. sp.

Minor, alis ant. dilutius ochreo-flavis, macula ad costæ basim, fascia postica angusta incurvata, sæpius etiam spatio terminali saturate purpureo-fuscis ; post. saturate griseis.

♂ ♀. 14-17 mm. Head and palpi light ochreous-yellow, second joint externally fuscous on lower half. Antennæ whitish-ochreous, annulated with dark fuscous. Thorax dark purple-fuscous, with an ochreous-yellow anterior spot. Abdomen ochreous, becoming grey towards base. Legs dark grey, posterior pair whitish-ochreous.

Forewings elongate, costa moderately arched, apex round-pointed, hindmargin almost straight, very oblique; rather light ochreous-yellow; a small quadrate dark purple-fuscous spot on base of costa; a rather narrow posteriorly suffused inwards-curved dark purple-fuscous fascia from $\frac{2}{3}$ of costa to anal angle, space towards this, except near costa, generally more or less suffused with dark fuscous, especially along hindmargin: cilia dark fuscous, base mixed with yellowish, sometimes wholly yellow except at anal angle. Hindwings and cilia dark grey.

Near the normal form of *C. triptycha*, but without the costal streak, and with the basal spot not extended to inner margin.

Brisbane, Queensland; Sydney and Shoalhaven, New South Wales; Melbourne, Victoria; rather common from October to January, and in April.

314. *Coes. zonostola*, n. sp.

Minor, alis ant. saturate flavis, fascia postica latiore in marginibus contracta lacte purpurea; post. saturatius griseis.

♂ ♀. 15-20 mm. Head deep yellow. Palpi yellow, anteriorly dark fuscous. Antennæ whitish, sharply annulated with black. Thorax deep yellow, extremity of patagia and posterior margin dark grey. Abdomen and legs grey, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex almost rectangular, hindmargin obliquely rounded; deep yellow; extreme costal edge dark fuscous towards base; a rather broad bright purple fascia from before $\frac{3}{4}$ of costa to anal angle, irregularly margined with dark fuscous, narrowed on inner margin and sharply contracted on costa: cilia yellow, on anal angle dark grey. Hindwings rather dark grey; cilia grey with a darker line, towards apex pale yellowish.

Allied to the two preceding, but much more brightly coloured, and without either basal spot, costal streak, or hindmarginal suffusion.

Sydney, New South Wales, in November and December; three specimens.

315. *Coes. ocellaris*, n. sp.

Minor, alis ant. flavis, fascia postica incurvata in costa usque ad apicem perducta, lineaque marginis postici saturatius fusco-purpureis; post. griseis; thorace saturate fusco-purpureo.

♂ ♀. 15-16 mm. Head deep yellow. Palpi dark grey, above yellowish. Antennæ grey. Thorax dark fuscous-purple. Abdomen pale grey, posteriorly whitish-ochreous. Legs grey, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, rather strongly oblique; yellow; extreme edge of costa dark fuscous near base; a moderate inwards-curved fuscous-purple fascia from $\frac{3}{4}$ of costa to anal angle, continued along costa to apex; a fuscous-purple line along hindmargin from apex to anal angle: cilia grey, tips whitish. Hindwings grey; cilia whitish-grey, with an obscure darker line.

This and the two following species are nearly allied.

Newcastle, Sydney, and Blackheath (3500 feet), New South Wales, from November to January; rather common.

316. *Coes. zanclotoma*, n. sp.

Minor, alis ant. flavis, fascia postica valde incurvata in costa usque ad apicem perducta, lineaque marginis postici saturatius fuscis; post. griseis; thorace flavo.

♂. 17 mm. Head and thorax orange-yellow. Palpi ochreous-yellow, terminal joint dark fuscous anteriorly. Antennæ dark grey. Abdomen grey, anal tuft yellowish. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin straight, very oblique; yellow; a rather narrow, very strongly inwards-curved, dark fuscous fascia from $\frac{3}{4}$ of costa to anal angle, continued along costa to apex; a slender dark fuscous line along hindmargin from apex to anal angle: cilia grey. Hindwings grey; cilia whitish-grey, with a darker line near base.

Differs from *C. ocellaris* in the more strongly curved fascia, and especially the yellow thorax.

Mount Lofty, South Australia; one specimen received from Mr. E. Guest.

317. *Coes. annularis.* n. sp.

Minor, alis ant. flavis, puncto disci medio, fascia postica angusta valde incurvata in costa usque ad apicem perducta, lineaque marginis postici ochreo-fuscis; post. griseis.

♂. 17 mm. Head and palpi ochreous-yellow, second joint externally, and anterior edge of terminal joint dark fuscous. Antennæ grey. Thorax dark fuscous, posterior extremity yellowish. Abdomen grey, anal tuft ochreous-yellow. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, very oblique; yellow; costal edge dark fuscous near base; a small roundish ochreous-fuscous spot in middle of disc; a strongly inwards-curved slender ochreous-fuscous fascia from $\frac{2}{3}$ of costa to anal angle, produced along costa as a moderately broad streak to apex; a slender ochreous-fuscous line along hindmargin from apex to anal angle: cilia pale grey, on costa grey-whitish Hindwings grey; cilia ochreous-grey-whitish.

Separated from both the preceding by the discal spot.

One specimen of uncertain locality, received from Mr. G. H. Raynor.

318. *Coes. personata*, n. sp.

Minor, alis ant. flavis, fascia media angusta valde incurvata cum altera posteriori medium versus in angulum educta in marginibus cohærente, signo etiam disci anguli hujus terminos conjungente ochreo-fuscis; post. griseis.

♂. 16 mm. Head and palpi yellow, second joint externally except at apex, and anterior edge of terminal joint dark fuscous. Antennæ light grey. Thorax yellow, anterior margin dark fuscous, more broadly in middle. Abdomen grey, anal tuft yellow. Legs dark grey, posterior pair pale ochreous-yellowish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, very oblique; yellow; basal third of costa slenderly dark fuscous: a slender ochreous-brown fascia from beyond middle of costa to beyond middle of inner margin, strongly curved inwards and bent in middle, united on costa and inner margin with a similar outwards-curved fascia, of which the middle third is bent out into an angulated projection ; a transverse ochreous-brown mark in disc touching both ends of the base of this projection ; a very small brown spot on costa before apex : cilia whitish-yellow, beneath anal angle grey. Hindwings grey ; cilia whitish-ochreous.

The markings of this species bear a curious resemblance to a human face in profile.

Sydney, New South Wales ; Melbourne, Victoria ; two specimens in October.

319. *Coes. ophthalmica*, n. sp.

Parva, alis ant. dilute ochreo-flavis, basi strigaque marginis postici saturate fuscis, fascia media angustiori incurvata signoque supra angulum analem transverso ochreo-fuscis ; post. griseis.

♀. 12 mm. Head and palpi pale yellow, basal third of second joint externally fuscous. Antennæ grey. Thorax dark fuscous, with irregular pale yellow anterior and posterior spots. Abdomen grey. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, very oblique ; pale ochreous-yellow ; base narrowly dark fuscous, shortly produced along costa ; a rather narrow, strongly inwards-curved, ochreous-brown fascia from beyond middle of costa to beyond middle of inner margin ; a transversely elongate ochreous-brown mark in disc above anal angle ; a dark fuscous streak along hindmargin from apex to below middle : cilia whitish-ochreous, with an apical bar and basal half opposite hindmarginal streak dark fuscous. Hindwings grey ; cilia whitish-grey.

A very distinct species.

Launceston, Tasmania, in January ; one specimen.

320. *Coes. ecliptica*, n. sp.

Minor, alis ant. flavis, fascia post medium angusta valde incurvata subtus dilatata, alteraque marginis postici modica utrimque attenuata ochreo-fuscis ; post. griseis.

♂. 12-15 mm. Head yellow. Palpi yellow, anterior edge dark fuscous. Antennæ grey. Thorax yellow, anterior margin rather broadly dark fuscous. Abdomen grey, anal tuft ochreous-yellow. Legs dark grey, posterior pair ochreous-yellowish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin slightly sinuate, very oblique; yellow; costal edge dark fuscous at base; a strongly inwards-curved or somewhat bent narrow ochreous-fuscous fascia from $\frac{3}{5}$ of costa to $\frac{3}{4}$ of inner margin, dilated beneath into a triangular spot; an ochreous-brown fascia along hindmargin, moderately broad near apex, thence suddenly attenuated to apex and gradually to anal angle, where it touches the other fascia: cilia yellowish-ochreous, becoming fuscous on anal angle and whitish-ochreous on costa. Hindwings grey; cilia light grey.

Allied to *C. ophthalmica*, but without the transverse discal mark above anal angle.

Sydney, New South Wales, in October, December, and March; six specimens.

321. *Coes. catoptrina*, n. sp.

Minor, alis ant. flavis, costæ dimidio antico saturatius fusco, fascia marginis postici lata superius attenuata antice saturatius-marginata dilute purpurea, maculas elongatas duas fuscas continente; post. saturatius fuscis.

♂ ♀. 16-19 mm. Head yellow. Palpi whitish, second joint externally dark fuscous. Antennæ light grey. Thorax dark fuscous, with a large yellow posterior spot. Abdomen grey, anal tuft whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex pointed, hindmargin faintly sinuate, very oblique; yellow; a dark fuscous streak along costa from base to middle, posteriorly attenuated, at base extended to inner margin; a broad pale reddish-purple hindmarginal band, bounded by a strongly inwards-curved, in middle rather irregular dark fuscous line from costa somewhat before apex to inner margin at $\frac{3}{5}$, containing two irregular fuscous blotches somewhat mixed with yellow, the first extending from apex downwards near hindmargin to middle, the second from middle of anterior edge to anal angle: cilia grey, terminal half whitish-ochreous between apex and anal angle, on costa whitish-yellow. Hindwings rather dark fuscous-grey; cilia grey, base darker.

A distinct and very elegant species.

Sydney, New South Wales, in September, October, January, and February; tolerably common amongst *Acacia decurrens.*

322. *Coes. concisella,* Walk.

(*Oecophora concisella,* Walk. 678.)

Minor, alis ant. læte flavis, macula ad costæ basim parva fasciaque marginis postici latiori superius attenuata antice nigro marginata purpureis; post. dilutius griseis.

♂. 18-19 mm. Head bright yellow. Palpi dark fuscous, above whitish. Antennæ grey. Thorax yellow, anterior half bright purple. Abdomen whitish-yellowish. Legs dark fuscous, posterior tibiæ whitish-yellowish. Forewings elongate, costa moderately arched, apex pointed, hindmargin faintly sinuate, rather strongly oblique; bright yellow; costal edge dark grey from base to $\frac{1}{3}$ or beyond; a small purple basal spot, not touching inner margin; a light reddish-purple hindmarginal band, bounded by a dark fuscous unevenly sinuate line from costa rather before apex to inner margin at $\frac{3}{4}$: cilia grey, on hindmargin ochreous-tinged and base mixed with purple, on costa whitish-yellow. Hindwings light grey; cilia whitish-grey, base darker.

This and the two following species are nearly connected.

Blackheath (3500 feet), New South Wales, in January; three specimens.

323. *Coes paracycla,* n. sp.

Minor, alis ant. flavis, fascia marginis postici latiore superius attenuata antice nigro-marginata purpurea; post. griseis.

♂ ♀. 13-16 mm. Head yellow. Palpi dark fuscous, above whitish. Antennæ grey. Thorax yellow, anterior margin narrowly dark fuscous. Abdomen grey, anal tuft whitish-ochreous. Legs dark purplish-fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex pointed, hindmargin slightly sinuate, very oblique; yellow; costal edge blackish near base; a bright reddish-purple hindmarginal band, bounded by a blackish inwards-curved sometimes slightly sinuate line from costa rather before apex to inner margin at $\frac{3}{4}$: cilia ochreous, base mixed with purple, beneath anal angle grey, on costa whitish-yellow. Hindwings grey; cilia whitish-grey, base darker.

Very closely allied to *C. concisella*, but smaller, and without the purple spot at base of costa.

Sydney and Shoalhaven, New South Wales, from November to January, and in March; common.

324. *Coes. seleniaca*, n. sp.

Minor, alis ant. dilutius ochreo-flavis, costæ basi fasciaque marginis postici latiore superius attenuata antice saturatius marginata purpureo-fuscis; post. griseis, antice albido-ochreo-suffusis.

♂. 19 mm. Head ochreous-yellow. (Palpi broken.) Antennæ whitish-ochreous. Thorax pale ochreous-yellowish, anterior half suffused with light purplish-fuscous. Abdomen and posterior legs light ochreous-yellow (other legs broken.) Forewings elongate, costa gently arched, apex round-pointed, hindmargin faintly sinuate, oblique; light ochreous-yellow; costa suffused with fuscous near base; a purple-fuscous hindmarginal band, bounded by a rather strongly inwards-curved dark fuscous line from costa slightly before apex to inner margin at $\frac{3}{4}$: cilia dark grey, tips between apex and anal angle ochreous-whitish, on costa wholly pale yellowish. Hindwings grey, towards base broadly suffused with whitish-ochreous; cilia pale whitish-yellowish, basal half light ochreous.

Differs from the two preceding by the much duller colouring, the dark fuscous suffusion of base of costa, and the whitish-ochreous suffusion of hindwings.

Duaringa, Queensland; one specimen received from Mr. G. Barnard.

325. *Coes. isogramma*, n. sp.

Minor, alis ant. costa subrecta, flavis, basi fasciaque subterminali lata saturate fuscis, ciliis ochreo-flavis ; post. saturate fuscis.

♀. 16-17 mm. Head and palpi yellow. Antennæ yellow-whitish, annulated with dark fuscous. Thorax and abdomen dark fuscous. Legs whitish-ochreous, anterior and middle pair banded with dark fuscous. Forewings elongate, rather narrow, costa hardly arched, apex round-pointed, hindmargin almost straight, very oblique ; yellow ; base very narrowly dark fuscous ; a rather broad dark fuscous subterminal band, leaving hindmargin very narrowly yellow, anterior edge somewhat convex : cilia ochreous-yellow, on ends of band grey. Hindwings and cilia dark fuscous.

Not very near any other.

Sydney, New South Wales, in September and October; two specimens.

326. *Coes. philoxena*, n. sp.

Parva, alis ant. ochreo-flavis, striga costæ medium superante saturate fusca, fascia postica latiore curva antice saturate-marginata fusco-purpurea ; post. dilutius griseis.

♂. $11\frac{1}{2}$ mm. Head, palpi, and antennæ dark fuscous. Thorax yellow, anterior margin dark fuscous. Abdomen and legs grey, posterior tibiæ pale ochreous-yellowish. Forewings elongate, costa slightly arched, apex pointed, hindmargin straight, very oblique ; ochreous-yellow ; a dark fuscous streak along costa from base to beyond middle ; a rather broad inwards-curved fuscous-purple fascia from $\frac{3}{4}$ of costa to anal angle, anteriorly edged with dark fuscous, posteriorly ill-defined : cilia ochreous-yellow, on costa and anal angle grey (imperfect.) Hindwings and cilia light grey.

Distinctly characterised by the dark fuscous head and costal streak.

Sydney, New South Wales, in December ; one specimen.

327. *Coes. acrotropa*, n. sp.

Minor, alis ant. flavis, fascia marginis postici lata inferius attenuata ciliisque saturate fuscis ; post. saturate fuscis.

♀. 15 mm. Head and palpi yellow, second joint fuscous towards base. Antennæ grey. Thorax dark purple-fuscous. Abdomen and legs dark fuscous, posterior pair ochreous-yellowish. Forewings elongate, costa gently arched, apex rounded, hindmargin obliquely rounded; yellow; extreme base of costa dark fuscous; a rather broad dark fuscous hindmarginal band, anteriorly suffusedly darker-margined, bounded by a sinuate line from $\frac{3}{4}$ of costa to close before anal angle: cilia dark fuscous. Hindwings and cilia dark fuscous.

Not very near any other.

Sydney, New South Wales, in December and March; three specimens.

328. *Coes. stenoptera*, n. sp.

Minor, alis ant. angustis, albido-ochreis, fascia marginis postici latiore inferius attenuata ochreo-fusca; post. griseis.

♂ ♀. 14-16 mm. Head and palpi whitish ochreous, basal $\frac{2}{3}$ of second joint dark fuscous. Antennæ grey. Thorax whitish-ochreous, anterior margin dark grey. Abdomen and legs grey, posterior pair whitish-ochreous. Forewings elongate, narrow, costa slightly arched, apex acute, hindmargin hardly rounded, extremely oblique; whitish-ochreous; extreme costal edge dark fuscous at base; an ochreous-fuscous hindmarginal band, bounded by an inwards-curved suffused dark fuscous line from $\frac{3}{4}$ of costa to anal angle: cilia whitish-ochreous, suffused with light fuscous. Hindwings grey; cilia whitish-ochreous.

Considerably narrower-winged and lighter-coloured than the preceding, with the thorax mostly whitish-ochreous.

Sydney, New South Wales; Launceston and Hobart, Tasmania; Mount Lofty, South Australia; five specimens in January and March.

329. *Coes. pyrrhoptera*, n. sp.

Minor, alis ant. ♂ fusco-aurantiacis, ♀ albido-ochreis, costæ dimidio antico, triangulo dorsi medio, fascia postica angusta incurvata, alteraque marginis postici latiore obscuris saturatius fuscis: post. saturate fuscis.

♂ ♀. 14-17 mm. Head and palpi in ♂ orange-yellow, in ♀ whitish-ochreous, palpi dark fuscous anteriorly and on second joint externally except at apex. Antennæ grey. Thorax and abdomen dark fuscous. Legs ochreous-yellow, anterior and middle pair grey above. Forewings elongate, rather narrow, costa gently arched, apex pointed, hindmargin almost straight, very oblique; in ♂ orange-yellow, somewhat mixed with fuscous, in ♀ whitish-ochreous; markings cloudy, suffused, rather dark fuscous; a moderate streak along anterior half of costa; a triangular suffusion on middle of inner margin; a narrow inwards-curved fascia from $\frac{3}{4}$ of costa to anal angle; a moderately broad hind-marginal fascia from apex to anal angle: cilia dark fuscous, base on hindmargin ochreous-yellow. Hindwings and cilia dark fuscous.

A suffusedly marked but distinct species.

Sydney, New South Wales, from December to March; common amongst *Acacia decurrens*, flying in the sunshine.

330. *Coes. ochroptera*, n. sp.

Parva, alis ant. ochreis, dorsum versus saturatioribus; post. saturatius griseis; fronte niveo.

♂ ♀. 11-12 mm. Head palpi, and antennæ snow-white, back of crown dark fuscous. Thorax ochreous, anteriorly fuscous-tinged. Abdomen ochreous. Legs whitish-ochreous, anterior pair fuscous. Forewings elongate, rather narrow, costa slightly arched, apex round-pointed, hindmargin slightly rounded, very oblique; yellow-ochreous, becoming deeper towards inner margin and base: cilia yellow-ochreous. Hindwings rather dark grey; cilia whitish-ochreous, with a grey line.

Specially characterised by the white head, with dark fuscous back.

Newcastle and Sydney, New South Wales, in January; four specimens.

331. *Coes. melliflua*, n. sp.

Minor, alis ant. dilute ochreis, striga marginis postici abbreviata obscura dilute fusca; post. dilute fuscis.

♂. 13 mm. Head and palpi whitish-ochreous, lower half of second joint externally fuscous. Thorax whitish-ochreous, anteriorly suffused with fuscous. Antennæ light grey. Abdomen and legs grey, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex tolerably rounded, hindmargin obliquely rounded; pale yellowish-ochreous; costal edge dark fuscous towards base; an obscure pale fuscous streak along upper half of hindmargin: cilia pale yellowish-ochreous. Hindwings light fuscous; cilia whitish-ochreous, greyish-tinged.

Of uncertain affinity within the genus.

Duaringa, Queensland; one specimen received from Mr. G. Barnard.

332. *Coes. deltosema*, n. sp.

Media, alis ant. ochreo-flavis, basi trianguloque dorsi postico saturate fuscis; post. griseis, antice dilute ochreo-suffusis.

♂. 23 mm. Head light ochreous-yellow. Palpi yellow-whitish, second joint dark fuscous except at apex. Antennæ fuscous. Thorax dark fuscous, with anterior and posterior ochreous-yellow spots. (Abdomen broken.) Legs dark fuscous, posterior pair whitish-yellow. Forewings rather elongate, oblong, costa gently arched, apex round-pointed, hindmargin slightly rounded, rather strongly oblique; ochreous-yellow; base narrowly dark fuscous; basal third of costa very slenderly dark fuscous; a sharply marked dark fuscous triangular blotch on inner margin before anal angle, apex reaching more than half across wing: cilia pale ochreous-yellow, mixed with fuscous on hindmargin. Hindwings fuscous-grey, suffused with pale ochreous-yellowish towards base; cilia pale yellowish.

Adelaide, South Australia; one specimen taken by Professor Tate in a salt marsh in January, now in the collection of the Adelaide University Museum.

333. *Coes. aphanes*, n. sp.

Minor, alis ant. albido-ochreis, fascia postica subrecta ochreo-fusca, area apicali ochreo-fusco suffusa; post. albido-ochreis.

♂ ♀. 12-15 mm. Head, palpi, antennæ, thorax, abdomen and legs whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin very obliquely rounded; whitish-ochreous; a narrow somewhat sinuate ochreous-brown fascia, anteriorly suffusedly darker, from $\frac{2}{3}$ of costa to inner margin before anal angle; apical space beyond this more or less suffused with ochreous-brown, especially towards hindmargin: cilia whitish-ochreous, somewhat suffused with fuscous. Hindwings whitish-grey; cilia whitish-ochreous.

Allied to the two following, but differing from both in the pale colouring and entire fascia; also with considerable general resemblance to *C. stenoptera*, but shorter-winged and with the thorax wholly whitish-ochreous.

Murrurundi, New South Wales, in November; three specimens.

334. *Coes. parvula*, n. sp.

Parva, alis ant. flavis, macula disci postica parva transversa saturate purpurea, area apicali roseo-suffusa; post. griseis.

♂ ♀. 10-13 mm. Head, palpi, and thorax yellow, rarely rosy-tinged, palpi anteriorly grey. Antennæ and abdomen grey, anal tuft whitish-ochreous. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin slightly sinuate, oblique; yellow, rarely suffused with pale rosy; a dark purple transverse spot in disc beyond middle; apical space beyond this more or less strongly suffused with purplish-rosy: cilia whitish-yellow. Hindwings grey; cilia pale grey.

Variable in respect of the rosy suffusion.

Sydney, New South Wales; Melbourne and Warragul, Victoria; Deloraine, Tasmania; Mount Lofty, South Australia; common in November, February, and March.

335. *Coes. aspasia*, n. sp.

Minor, alis ant. flavis, macula disci postica parva transversa alteraque dorsi postica ovali connexis saturate fusco-purpureis; post. griseis.

♂ ♀. 12-15 mm. Head, palpi, and thorax yellow, palpi whitish towards base. Antennæ and abdomen grey, anal tuft pale yellowish. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex pointed, hindmargin sinuate, very oblique; yellow; a dark fuscous-purple transverse spot in disc beyond middle (rarely almost obsolete), connected with a more or less defined oval dark fuscous-purple spot on inner margin before anal angle: cilia light yellowish, towards anal angle grey. Hindwings grey; cilia light grey, towards apex ochreous-whitish with a grey basal line.

Closely allied to *C. parvula*, but quite without rosy suffusion, and with an oval spot before anal angle.

Port Lincoln, South Australia; common in November.

336. *Coes. panxantha*, n. sp.

Minor, alis ant. angustioribus, ochreo-flavis; post. albido-ochreis, basim versus vix griseo-suffusis.

♂. 15-17 mm. Head palpi, and thorax ochreous-yellow; second joint of palpi externally dark fuscous except at apex; shoulders very narrowly dark fuscous. Antennæ grey. Abdomen whitish-ochreous. Legs grey, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; ochreous-yellow; costal edge dark fuscous towards base; rarely two faint fuscous dots in disc beyond middle: cilia whitish-yellow. Hindwings whitish-ochreous, towards base somewhat greyish; cilia whitish-yellow.

Distinguished from the other unicolorous species by the whitish-ochreous hindwings.

Sydney and Bulli, New South Wales; common in September and October.

337. *Coes. amylodes*, n. sp.

Minor, alis ant. stramineis, interdum macula anguli analis obscura fusca; post. griseis; thoracis macula antica saturate fusca.

♂ ♀. 16-19 mm. Head and palpi whitish-ochreous. Antennæ pale grey. Thorax whitish-ochreous, anterior margin dark fuscous, forming a quadrate spot in centre. Abdomen light grey, anal tuft whitish-ochreous. Legs grey, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin obliquely rounded; pale ochreous-yellowish; costal edge dark fuscous at base; sometimes a cloudy fuscous spot on anal angle, usually absent: cilia pale ochreous-yellowish, on anal angle fuscous-tinged. Hindwings grey; cilia light grey, tips round apex whitish-ochreous.

Duller and lighter than *C. panxantha*, with grey hindwings and dark thoracic spot.

Murrurundi, New South Wales, in November; seven specimens.

338. *Coes. omichlota*, n. sp.

Minor, alis ant. albido-ochreis, fusco-sparsis; post. griseis.

♂ ♀. 13-15 mm. Head and palpi pale whitish-ochreous, palpi anteriorly dark fuscous. Antennæ grey-whitish, annulated with dark fuscous. Thorax whitish-ochreous, anterior margin dark-fuscous, forming a quadrate spot in centre. Abdomen light grey, anal tuft whitish-ochreous. Legs grey, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin obliquely rounded; whitish-ochreous, coarsely irrorated with fuscous; costal edge dark fuscous towards base: cilia whitish-ochreous, somewhat irrorated with fuscous. Hindwings grey; cilia whitish-ochreous, greyish-tinged.

Characterised by the fuscous irroration and absence of other markings.

Rosewood, Queensland; seven specimens amongst dense scrub in September.

339. *Coes. ergatis*, n. sp.

Minor, alis ant. albido-ochreis, saturatius fusco-conspersis, punctis disci tribus serieque postica saturate fuscis; post griseis.

♂. 17-19 mm. Head, palpi, and thorax whitish-ochreous, shoulders fuscous. Antennæ whitish-ochreous, annulated with dark fuscous. Abdomen and legs whitish-ochreous, anterior pair fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin straight, oblique; whitish-ochreous, irrorated with rather dark fuscous; costal edge dark fuscous near base; a dark fuscous dot in disc before middle, another somewhat beyond it on fold, and a third in disc beyond middle; an indistinct curved row of dark fuscous dots from $\frac{3}{4}$ of costa to anal angle: cilia whitish-ochreous, somewhat irrorated with dark fuscous. Hindwings grey; cilia grey-whitish, with a grey line.

Allied to *C. omichlota*, but considerably larger, and somewhat broader-winged, with distinct discal dots.

Brisbane, Queensland, in September; three specimens.

340. *Coes. disema*, n. sp.

Media, alis ant. albis, punctis disci tribus (tertio duplici) lineaque postica sub costa valde indentata saturate fuscis; post. dilutius griseis.

♂. 18-20 mm. Head and thorax ochreous-white, shoulders with a dark fuscous spot. Palpi white, second joint dark fuscous except at apex. Antennæ grey. Abdomen grey-whitish, anal tuft ochreous-whitish. Legs dark fuscous, posterior pair ochreous-whitish. Forewings elongate, rather narrow, costa moderately arched, apex rounded, hindmargin extremely obliquely rounded; white, slightly ochreous-tinged; costal edge whitish-ochreous, at base blackish; a dark fuscous dot in disc at $\frac{1}{3}$, a second slightly beyond it on fold, and two others transversely placed and confluent in disc at $\frac{2}{3}$, sometimes connected with anal angle by a dark fuscous streak; a short inwardly oblique cloudy dark fuscous streak from costa at $\frac{5}{6}$, giving rise to an outwards-curved row of cloudy dark fuscous spots running to anal angle; sometimes some dark fuscous dots on hindmargin: cilia whitish-ochreous. Hindwings light grey; cilia pale whitish-ochreous.

Recalls *Eulechria* in general appearance.

Sydney, New South Wales; two specimens in November and January.

341. *Coes. amphilyca*, n. sp.

Minor, alis ant angustis, saturatius griseis, albo-suffusis, punctis disci duobus, nebula anguli analis, lineaque postica sub costa valde indentata saturate fuscis; post. griseis, antice albido-ochreo suffusis

♂. 18 mm. Head whitish. Palpi white, anteriorly grey. Antennæ whitish-grey. Thorax fuscous-grey mixed with whitish. Abdomen whitish-ochreous, anal tuft ochreous-yellowish. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, narrow, costa slightly arched, apex round-pointed, hindmargin straight, extremely oblique; rather dark fuscous-grey, densely irrorated and suffused with white; a dark fuscous dot in disc before middle, and a second more transverse in disc beyond middle, connected with anal angle by a cloudy dark suffusion; a dark fuscous line from costa at $\frac{4}{5}$ to anal angle, sharply indented below costa; a hindmarginal row of cloudy dark fuscous dots: cilia pale whitish-ochreous, greyish-tinged. Hindwings grey, anteriorly suffused with whitish-ochreous; cilia whitish-ochreous.

Apparently allied to the preceding, but differing widely in the dark grey ground-colour and other characters; the single specimen is not very perfect.

Sydney, New South Wales; one specimen in September.

324. *Coes. apothyma*, n. sp.

Minor, alis ant. angustis, albis, macula basali, altera costæ media, tertia dorsi antica, quarta disci, linea postica sinuata, punctisque disci duobus saturate fuscis; post. dilute griseis.

♀. 15-16 mm. Head and palpi white. Antennæ whitish-grey. Thorax white, anterior half fuscous. Abdomen whitish. Legs dark fuscous, posterior pair whitish. Forewings elongate, narrow, costa slightly arched, apex round-pointed, hindmargin extremely obliquely rounded; fuscous-grey, irrorated with dark fuscous and irregularly suffused with white; the dark ground-colour forms a small basal spot, an elongate-triangular spot on middle of costa, a small blotch on inner margin before middle, another in disc below middle, a spot in disc at $\frac{1}{3}$ and another at $\frac{2}{3}$, a sinuate posterior line, and small apical spot: cilia grey-whitish. Hindwings pale grey; cilia whitish-grey.

Allied to *C. amphilyca*, but smaller, with the dark ground-colour forming various distinct markings which are not seen in *C. amphilyca*, and without whitish-ochreous suffusion in the hindwings.

Petersburg, South Australia, in October; two specimens

343. *Coes. gephyrota*, n. sp.

Minor, alis ant. niveis, basi saturate fusca, fasciis duabus angustioribus maculaque costæ anteapicali ochreo-fuscis, in marginibus saturatioribus: post. griseis.

♂ ♀. 14-15 mm. Head white. Palpi white, apex of terminal joint, and second joint except apex dark fuscous. Antennæ fuscous. Thorax dark fuscous, with a white posterior spot. Abdomen fuscous, anal tuft whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin almost straight, rather strongly oblique; white, with some ochreous scales in disc; markings ochreous-brown, becoming dark fuscous on costa and inner margin; base narrowly dark fuscous; a rather narrow slightly outwards-curved fascia from $\frac{1}{3}$ of costa to $\frac{2}{5}$ of inner margin; a similar slightly inwards-curved fascia from $\frac{2}{3}$ of costa to anal angle, dilated on costa; an inwardly oblique spot from costa immediately before apex; an interrupted dark fuscous hindmarginal line: cilia white, with a dark fuscous bar above apex and on anal angle. Hindwings grey; cilia whitish-ochreous-grey.

A very distinct species.

Rosewood, Queensland, amongst dense scrub; two specimens in September.

344. *Coes. discincta*, n. sp.

Parva, alis ant. ochreo-albidis, fascia ad basim perobliqua, macula costæ antica parva, punctis disci duobus anticis, fascia postica angusta recta, maculaque apicis nigrescentibus; post. griseis, basim versus dilutioribus.

♂ ♀. 12 mm. Head and thorax ochreous-white, shoulders narrowly blackish. Palpi white, irregularly mixed with blackish. Antennæ grey. Abdomen ochreous-whitish. Legs ochreous-whitish, anterior and middle pair banded with dark fuscous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; ochreous-whitish; markings blackish, rather ill-defined; a straight rather narrow (in ♀ broken) fascia from base of costa to inner margin at $\frac{1}{3}$; a small spot on costa at $\frac{1}{3}$; a dot in disc before middle, and a second beneath it on fold, touching extremity of first fascia; a narrow straight fascia from $\frac{2}{3}$ of costa to anal angle, dilated on costa, containing a round black spot in disc; a small irregular apical blotch: cilia whitish-ochreous. Hindwings rather dark grey, towards base much paler; cilia whitish-ochreous.

Cannot be confused with any other.

Sydney, New South Wales, in October and January; two specimens.

345. *Coes. austalea*, n. sp.

Parva, alis ant. albido-fuscis, costæ basi, punctis disci quattuor (quarto duplici), maculaque costæ postica parva saturate fuscis; post. griseis, basim versus dilutioribus.

♂. 10 mm. Head light ochreous-yellowish. Palpi whitish, second joint externally dark fuscous. Antennæ grey. Thorax whitish-ochreous, shoulders dark fuscous (partially defaced.) Abdomen grey, anal tuft ochreous-yellowish. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; very pale whitish-fuscous; costal edge pale ochreous-yellowish; markings dark fuscous; a streak along basal $\frac{1}{4}$ of costa, rather broad at base, attenuated to extremity; a round dot in disc before middle, a second beneath it on fold, a third in disc above middle, and two others transversely placed and confluent in disc beyond middle, connected with anal angle by an obscure streak; a small spot on costa beyond middle; some dark fuscous scales towards apex: cilia whitish-ochreous. Hindwings grey, towards base paler; cilia whitish-ochreous-grey

An inconspicuous species, yet very distinct.

Bulli Pass, New South Wales, in January ; one specimen.

346. *Coes. arenivaga*, n. sp.

Parva, alis ant. dilute albido-ochreis, punctis disci tribus saturate fuscis; post. griseo-albidis.

♂. 10 mm. Head, palpi, antennæ, thorax, abdomen, and legs whitish-ochreous ; anterior legs infuscated. Forewings elongate, costa moderately arched, apex pointed, hindmargin very obliquely rounded ; a dark fuscous dot in disc before middle, a second obliquely beyond it on fold, and a third in disc beyond middle ; cilia pale whitish-ochreous. Hindwings and cilia grey-whitish, towards apex ochreous-tinged.

This and the following species are very easily overlooked.

Sydney, New South Wales ; two specimens on coast sandhills in January.

347. *Coes. vegrandis*, n. sp.

Parva, alis ant. dilutissime griseis, punctis disci tribus serieque marginis postici nigris ; post. griseo-albidis.

♂. 10 mm. Head, palpi, antennæ, thorax, abdomen, and legs grey-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded ; very pale whitish-grey, somewhat strewn with white ; a black dot in disc before middle, a second somewhat beyond it on fold, and a third in disc beyond middle ; a row of black dots along hindmargin and apical portion of costa : cilia grey-whitish. Hindwings and cilia grey-whitish.

Allied to *C. arenivaga*, but readily separated by the greyish ground colour and black marginal dots.

Sydney, New South Wales, in January : one specimen.

52. Epipyrga, Meyr.

Head smooth, sidetufts small. Antennæ in ♂ moderately and evenly ciliated ($1\frac{1}{2}$), basal joint moderate, without pecten (?). Palpi moderate, second joint not exceeding base of antennæ, densely scaled, rather rough beneath, terminal joint as long as second, moderate, recurved. Thorax with a dense posterior crest. Forewings elongate, moderate, hindmargin very oblique. Hindwings narrower than forewings, elongate-ovate, hindmargin rounded, cilia 1. Abdomen moderate. Anterior tarsi slightly thickened with scales; middle tibiæ with a projecting median whorl of scales; posterior tibiæ clothed with long dense hairs. Forewings with vein 7 to apex, 2 from somewhat before angle of cell. Hindwings normal.

In the tabulation of genera it is erroneously stated that vein 7 of the forewings terminates in the hindmargin; I have since satisfied myself that it really terminates in the apex, and hence, considering also the characters of the strong thoracic crest, and slight dilation of the anterior tarsi, it is clear that the resemblance to *Cæsyra* is merely superficial, and that the genus should properly be placed next to *Piloprepes*, to which it is certainly nearly related, being perhaps a development from it. It differs from *Piloprepes* in the absence of tufts on the forewing, in the much slighter dilation of the tarsi, and apparently also in the absence of the antennal pecten, but the latter character requires verification on further specimens.

348. *Epip. agaclita*, n. sp.

Minor, alis ant. ochreo-flavis, costæ basi saturate fusca, fascia marginis postici latissima dilute purpurea, antice nigro-marginata, maculas duas fuscas includente; post. saturatius griseis.

♂. 13 mm. Head whitish-yellowish. Palpi yellowish-white, basal half of second, and extreme apex of terminal joint dark fuscous. Antennæ fuscous. Thorax dark fuscous, with a posterior pale ochreous-yellowish spot. Abdomen light ochreous. Legs dark fuscous, posterior pair ochreous-yellowish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; ochreous-yellow; base of costa dark fuscous; apical half of wing very pale purple, bounded by an inwards-curved blackish line from $\frac{2}{5}$ of costa to $\frac{2}{3}$ of inner margin, and containing a fuscous blotch before apex, connected with a smaller one on anal angle; a row of cloudy blackish spots along hindmargin and end of costa: cilia pale whitish-yellowish, basal half pale purplish, finely irrorated with black. Hindwings rather dark fuscous; cilia grey, with a darker line.

Rosewood, Queensland, amongst dense scrub in September; one specimen.

CRITICAL LIST OF MOLLUSCA FROM NORTH-WEST COAST OF AUSTRALIA.

By J. Brazier, C.M.Z.S., &c.

This collection of Mollusca was obtained by a lady at Cossack, Dampier's Land, North-west Coast of Australia, and forwarded by her to Mr. J. F. Bailey of Melbourne, Victoria. Mr. Bailey sent the collection to be exhibited and named at this Society's Meeting held in June last, and at the time I named all the examples sent, and promised to give a list at some future meeting. I herewith append that list with the synonyms and remarks on the geographical range of some of the species. I am sorry to say that Mr. J. F. Bailey died on the 30th of July at the early age of 43 years. It appears he caught a cold while out collecting Palæontological specimens near Melbourne.

1. Murex (Chicoreus) monodon. Sowerby.

Murex monodon, Sowerby. Tankerville Catalogue. p. 19, 1825. Thes. Conch., pl. 6, figs. 55-56. *Murex aranea*, Blainville.

2. Murex (Phyllonotus) Stainforthi. Reeve.

Murex Stainforthi, Reeve. Proc. Zool. Soc., p. 104, 1842. Conch. Icon., sp. 68 ; Sowerby, Thes. Conch. pl. 15, fig. 158.

3. Nassa (Zeuxis) unicorolata. Kiener.

Buccinum unicolorum, Kiener. Coq. Viv., p. 60, pl. 19, fig. 69. *Nassa unicolorata*, Reeve. Conch. Icon., pl. 3, sp. 17.

Nassa rutilans, Reeve. l. c., pl. 22, sp. 147 ; *Nassa* (*Alectrion*)-*rutilans*, Brazier. Proc. Linn. Soc., N.S.W. Vol. 1, p. 180 ; *Nassa unicolor*, Hombron et Jacq. Voyage de l'Astrolabe et Zelee., 5, p. 76, pl. 21, figs. 13-15, 1853.

This species is very common at Port Essington and Port Darwin. During the Chevert Expedition I obtained it at Darnley Island, Torres Straits, in 30 fathoms. This is the species described by Reeve as *Nassa rutilans*, with the locality of New Zealand on the authority of the late Mr. Cuming, who was gifted with the art of inventing localities, and who never visited New Zealand, and who was also in the habit of destroying the habitats sent with specimens, as he said they could be discovered by looking at the work in which they were described.

4. Nassa (Zeuxis) bicallosa. E. A. Smith.

Nassa bicallosa, E. A. Smith. Journal Linn. Soc., Vol, XII., p. 543, pl. 30, fig. 1, 1876; Tryon, Manual of Conchology, Vol. IV., p. 36, pl. 11, fig. 142, 1882.

This species appears to have a wide range. The type specimen came from Nicol Bay, Western Australia *(Brazier)*; Swan River, Western Australia and Cape Natal (British Museum.)

5. Voluta (Amoria) prætexta. Reeve.

Voluta prætexta, Reeve. Conch. Icon., pl. 12, sp. 29, 1849.

Voluta reticulata, Sowerby (non Reeve.) Thes. Conch., Vol. I., p. 197, pl. 49, figs. 47 and 48; *Voluta Reevei*, Sowerby. b. c., Vol. III., p. 269.

6. Oliva Caldania. Duclos.

Oliva Caldania, Duclos. Monograph, pl. 6, figs. 3 and 4, 1835; Sowerby. Thes. Conch., pl. 6, fig. 97; *Olivina Caldania*, Gray. Proc. Zool. Soc., p. 52, 1858; *Olivella Caldania*, Brazier. Proc. Linn. Soc., N.S.W., Vol. 1, p. 203.

I believe that *Oliva australis*, Duclos, figured in his Monograph at pl. 8, figs. 3 and 4 is identical with this species. It is found at King George's Sound; Adelaide, South Australia; and Victoria. *O. Caldania* we obtained it at Mud Bay, Cape York, North Australia, 5 and 11 fathoms; also Torres Straits, in the Chevert Expedition; New Guinea and Solomon Islands. The Polynesian Islanders use the smaller species extensively for the manufacture of ornaments.

They prefer pure white shells for this purpose, and cause the colored markings to disappear by application of heat. *O. Caldania* is treated in this way by the natives of New Guinea. They might readily be mistaken for a distinct species. The plan adopted is to place the shells on good clear red-hot ashes which discharges the colouring, leaving them entirely white. The smaller the shells the better they stand the heat, and do not crack on the surface like the larger species.

7. Ancillaria cingulata. Sowerby.

Ancilaria cingulata, Sowerby. Thes. Conch. Ancillaria, p. 62, pl. 3, fig. 54 ; Reeve, Conch. Icon., pl. 5, sp. 13.

This species extends from Swan River on the west, right round to the north, then on to the east coast of Australia. It is generally found at Port Stephens.

8. Ancillaria elongata. Gray.

Ancillaria elongata, Gray. In Voyage of the Fly, Vol. 2. Appendix, p. 357, pl. 1, fig. 5 ; Sowerby, Thes. Conch., p. 62, pl. 3, fig. 52 ; Reeve, Conch. Icon., pl. 5, sp. 13.

9. Terebra duplicata. Linn.

Buccinum duplicatum, Linne. Syst. Nat., p. 1206, No. 485.

Terebra duplicata, Lam. Anim. sans Vert. Deshayes, ed., Vol. 10, p 243 ; Sowerby, Thes. Conch., Vol. 1, p. 155, pl. 41, figs. 1, 2, 3, 4, and 9 ; *Terebra Lamarcki*, Kiener. Coq. Viv., p. 30, pl. 9, fig. 19 ; *Terebra Reevei*, Deshayes in Journal de Conch., Vol. 6, second series, p. 88, pl. 4, fig. 14 ; Proc. Zool. Soc., p. 277, 1859.

10. Terebra (Haslula) strigilata. Linn.

Buccinum strigilatum, Linn. Syst. Nat., p. 1206, No. 484.

Terebra strigilata, Lam. Anim. sans Vert., 2nd. edition, Vol. 10, p. 248 ; Reeve, Conch Icon., pl. 18, sp. 85, a., b.

11. TEREBRA (MYURELLA) UNDULATA. Gray.

Terebra undulata, Gray. Proc. Zool. Soc., p. 60, 1834.
Sowerby, Thes. Conch., Vol. 1, p. 172, pl. 43, fig. 55.

12. CONUS STILLATUS. Reeve.

Conus stillatus, Reeve. Conch. Icon. Suppl., p. 5, sp. 247.
I believe this is only a variety of Reeve's *Conus conspersus.*

13. CONUS TRIGONUS. Reeve.

Conus trigonus, Reeve. Conch. Icon. Suppl., pl. 3, sp. 286.

14. CONUS VICTORIÆ. Reeve.

Conus Victoriæ, Reeve. Proc. Zool. Soc., p. 172, 1843.
Conch. Icon., pl. 37, sp. 202.
Conus Victoriæ, Sowerby. Thes. Conch., Vol. 3, p. 42, pl. 23, fig. 577.

15. CONUS COMPLANATUS. Sowerby.

Conus complanatus. Sowerby. Thes. Conch. Suppl., p. 330, sp. 441, pl. 28, figs. 250 and 251.
This and *C. Victoriæ* merge into *Conus textile*, Linne. and may prove to be the same.

16. FICULA GRACILIS. Deshayes.

Specimens of this species in Mrs. Brazier's collection from Western Australia are named as above Mr. G. B. Sowerby, jr. H. and A. Adams in their Genera of Recent Mollusca give *Ficula gracilis*, Philippi. I have not been able to find out in what work, it was described, if it ever was I firmly believe that it is only a variety of *Ficula reticulata*, Lam.

17. NATICA GLOBOSA. Chemnitz.

Nerita globosa, Chem. Conch. Cab., Vol. 5, p. 267, pl. 188, figs. 1896 and 1897.
Natica helcacea, Lam. Anim. sans. Vert., 2nd edition, Vol. 8, p. 637.
Natica globosa, Reeve. Conch. Icon., pl. 11, sp. 46.

18. NATICA SOLIDA. Blainville.

Natica solida, Blainv. Malacologie, pl. 36, fig. 8.

Natica solida, Reeve, Conch. Icon., pl. 16, sp. 71.

19. NATICA (MAMMA) JUKESI. Reeve.

Natica candidissima, Reclȗz, non Le Guillou.

Natica Jukesi, Reeve, Conch. Icon., pl. 19, sp. 84.

20. NATICA (MAMMA) GRUNERIANA. Philippi.

Natica Gruneriana, Philippi in Abbild. und Besch. neuer. Conchylien, pl. 2, fig. 13; Conch. Cab., 2nd. edition, p. 47, pl. 7, fig. 6.

21. SCALARIA PHILIPPINARUM. Sowerby.

Scalaria Philippinarum, Sowerby. Proc. Zool. Soc., p. 12, 1844.

Scalaria Philippinarum, Sowerby. Thes. Conch., Vol. 1, p. 86, pl. 32, figs. 1, 2, and 3.

This species extends to the east-coast of Australia.

22. SCALARIA ACUMINATA? Sowerby,

Scalaria acuminata, Sowerby Proc. Zool. Soc., p. 31, 1844

Scalaria acuminata, Sowerby. Thes. Conch., pl. 35, fig. 130.

Three or four of the last whorls, with the aperture, are broken off, which makes me doubtful of the identification.

23. UVANILLA FIMBRIATA. Lam.

Trochus fimbriatus, Lam. Anim. sans Vert., Vol. 7, p. 12, 1822.

Menke. Moll. Novæ Hollandie, p. 16, No. 62, 1843.

Uvanilla fimbriata, H. and A. Adams. Recent Moll., Vol. 1, p. 400; Vol. 3, pl. 44, fig. 6, 1856.

Trochus fimbriatus, Reeve, Conch. Icon., pl. 9, sp. 49, 1861.

Imperator (Uvanilla) fimbriata, Tryon. Structural and Systematic Conchology, Vol. 2, pp. 308-423, pl. 80, fig. 30, 1883.

24. DELPHINULA LACINATA. Lamarck.

Turbo delphinus, Linn. Syst. Nat., p. 1236, No. 626.

Delphinula lacinata, Reeve. Conch. Icon., pl. 2, sp. 9.

25. EUCHELUS ATRATUS. Gmelin.

Turbo atratus, Gmelin, p. 3601, No. 53.

Monodonta canaliculata, Lamarck.

Trochus canaliculatus, Quoy and Gaimard. Voyage de Astrolabe, 3, p. 261, pl. 64, figs. 21-25.

This species was also obtained in the Chevert Expedition at Cape Grenville, north-east coast of Australia, brought up on the ship's cable, from 18 fathoms.

26. EUCHELUS DENIGRATUS. Chem.

Cochlea lunaris trochiformis denigrata, Chem. 5, p. 172, pl. 177, figs. 754 and 755.

Euchelus denigratus, Chem. Chenu. Manuel de Conch., p. 358, fig. 2657.

27. TORNATELLA FLAMMEA. Gmelin.

Voluta flammea, Gmelin. Syst. Nat., p. 3435.

Tornatella flammea, Reeve. Conch. Icon., pl. 1, sp. 2.

Bulimus variegatus, Bruguin.

Tornatella flammea. Lam.

28. SOLIDULA SUTURALIS. A. Adams.

Solidula suturalis, A. Adams. Proc. Zool. Soc., p. 61, 1854.

Tornatella suturalis, Reeve. Conch. Icon., pl. 2, sp. 9.

29. SOLEN TIMORENSIS. Dunker.

Solen Timorensis, Reeve. Conch. Icon., Vol. 19, pl. 6, sp. 27.

This species was found very common at Katow, New Guinea, during the Chevert Expedition.

30. Saxicava australis. Lamarck.

Saxicava australis, Lam. Anim. sans Vert., V., p. 153.

Saxicava australis, Reeve. Conch. Icon., Vol. 20, pl. 2, sp. 8.

Mactra crassa, Péron.

This species appears to be found all round the coast of Australia.

31. Corbula crassa. Hinds.

Corbula crassa, Hinds. Proc. Zool. Soc., p. 55, 1843.

Corbula crassa, Reeve. Conch. Icon., Vol. 2, pl. 1, sp. 8 a-b.

Found also in Torres Straits and north-east Australia.

32. Venus tiara. Dillwyn.

Concha Veneris orientalis, Chemnitz. Pl. 27, figs. 279-281.

Venus tiara, Dillwyn. Descriptive Catalogue of Shells, Vol. 1, p. 162, No. 8.

Chione tiara, Deshayes. Conchif Brit. Mus. 1, p. 121, No. 7.

Chione (Circomphalus) tiara, H. and A. Adams. Genera. Recent Moll., Vol. 2, p. 422.

Anaitis tiara, Romer in Malak. Blatter, p. 158, No. 7, 1865.

Venus alta, Sowerby. Thes. Conch., p. 724, pl. 158, figs. 131-133.

Chione alta, Deshayes. Conchif. Brit. Mus. 1, p. 122, No. 8.

Chione (Circomphalus) alta, H. and A. Adams. Genera. Recent Moll., Vol. 2, p. 422.

Venus thiara. Reeve. Conch. Icon., Vol. 14, pl. 23, sp. 109.

This somewhat common species is also found on the north and north-east coast of Australia.

33. Venus lamellaris. Schumacher.

Venus cancellata, Var. Chem. Conch. 6, p. 310, pl. 29, figs. 306 and 307.

Antigona lamellaris, Schumacher. Essai d' un Nouveau Systeme Vers. Testaces., p. 155, pl. 14, fig. 2, 1817.

Venus reticulata, Var. Lam. Anim. Sans. Vert. 5, p. 585, 1818.

Venus subrostrata, Gray (non Lam.) Wood. Ind. Test. Suppl., pl. 2, fig. 7, 1828.

Dosinia Lamarckii, Gray. Analyst., Vol. 8, p. 308, 1838.

Venus subrostrata, Reeve (non Lam.) Conch. Syst., Vol. 1, pl. 68, fig. 4, 1841.

Venus reticulata, Chemn. Conch. Illust., pl. 4, fig. 2, 1843.

Venus Lamarckii, Hanley. Desc. Cat. Shells, p. 113, 1843.

Venus Lamarckii, Reeve. Catlon. Conch. Nomenclator, p. 3, No. 63, 1845. Sowerby. Thes. Conch., Vol. 2, p. 707, pl. 153, figs. 20 and 21. Deshayes. Conchif. Brit. Mus. 1, p. 110, No. 31, 1853.

Venus lamellaris, H. and A. Adams. Genera. Recent Moll., Vol. 2, p. 418.

Venus Lamarckii, Theobald. Junr. Cat. Recent Shells in the Museum, Asiatic Society of Bengal, p. 143, No. 5, 1860.

Chione (Omphaloclathrum) Lamarckii, Romer in Malak Blatter, p. 39, No. 16, 1867.

Venus Lamarckii, Mitchell. Cat. of the Collection of the Government, Central Museum, Madras, p. 64, No. 7, 1867.

Venus nodulosa, Sowerby. Thes. Conch., Vol. 2, p. 708, pl. 133, fig. 16.

Deshayes. Conchif. Brit. Mus. 1, p. 110, No. 32.

H. and A. Adams. Genera. Recent Moll. 2, p. 418.

Venus Lamarckii, Reeve. Conch. Icon., Vol. 2, pl. 12, sp. 39.

Chione Lamarckii, Paetel. Cat. der Conch-Sammlung, p. 138, 1873.

Chenus lamellaris, Schmeltz. Mus. Godeffroy Cat. V., p. 168, 1874.

Venus (Antigona) lamellaris, Dunker. Index Moll. Maris. Japonica, p. 196, 1882.

This species has a very wide range. It is found sometimes at Sydney Heads, Port Curtis and Port Denison on the north-east coast; Torres Straits, Port Essington, and Port Darwin, round to the west and north-west coast of Australia. I have seen specimen from Hongkong, China, and Ceylon.

34. Dione impar. Lamarck.

Cytherea impar, Lam. Anim. sans Vert., Vol. 5, p. 565.

Hanley. Descriptive Catalogue of Recent Bivalve Shells, p. 98; Menke, Molluscorum Novæ Hollandiæ, p. 41, No. 240; Sowerby, Thes. Conch., Vol. 2, p. 625, pl. 131, fig. 77.

Chione impar, Gray. Anal. 8, 305.

Dione impar, Deshayes. Conchif. 1, Brit. Mus., p. 56.

35. Dosinia scalaris. Menke.

Cytherea scalaris, Menke. Moll. Nov. Holl., p. 42, No. 241.

Artemis scalaris, Hanley. Desc. Cat. Appendix, p. 357, pl. 15, fig. 42; Sowerby. Thes. Conch., Vol. 2, p. 674, pl. 144, fig. 78; Reeve. Conch. Icon., pl. 2, sp. 11.

Dosinia scalaris, Deshayes. Conchif. 1, Brit. Mus, p. 22.

36. Dosinia contusa. Reeve.

Artemis contusa, Reeve. Conch. Icon., pl. 7, sp. 38.

Sowerby. Thes. Conch., Vol. 2, p. 672, pl. 143. fig. 70.

Dosinia contusa, Deshayes. Conchif. 1, Brit. Mus., p. 28.

There was only one specimen of this in Mr. Bailey's collection from Copack. During the Chevert Expedition to New Guinea we purchased a large quantity of specimens from the natives of Katow who obtained them at low water by digging for them in the sand.

37. Cardium subrugosum. Sowerby.

Cardium subrugosum, Sowerby. Proc. Zool. Soc., p. 108, 1840; Conch. Illust., fig. 33, 71; Reeve, Conch. Icon., pl. 11, sp. 55.

38. Corbis Sowerbyi. Reeve.

Corbis Sowerbii, Reeve. Proc. Zool. Soc., p. 85, 1841.

Corbis Sowerbii, Hanley. Desc. Cat. Shells, p. 75, pl, 14, fig. 15, 1843.

Corbis Sowerbii, Reeve. Conch. Icon., pl. 1, sp. 2, 1872.

This is the only specimen I have ever seen of this beautiful shell. The valves are crossed transversely with distinct elevated lamellar ridges, between which there are numerous striæ running in a longitudinal direction. It is tinged with pink, particularly in an early stage of growth.

39. Crassatella decipiens. Reeve.

Crassatella decipiens, Reeve. Proc. Zool. Soc., p. 42, 1842; Conch. Icon., pl. 1, sp. 4.

Crassatella Kingicola, Reeve. Conch. Syst., pl. 44, fig. 3.

Crassatella decipiens, Hanley. Cat. Rec. Shells, p. 36, 340, pl. 11, fig. 9.

Crassitella Kingicola, Menke (non Lam). Moll. Nov Holl., p. 39, No. 233.

40. Cardita crassicostata. Lamarck.

Cardita crassicostata, Lam. Anim. sans Vert., Vol. 6, part 1, p. 24.

Cardita tridacnoides, Menke. Moll. Nov. Holl., p. 39, No. 222.

41. Arca fusca. Bmg.

Arca fusca, Bmg. Enc. Meth. vers., p. 102. Lam. Anim. sans Vert., Vol. 6, part 1, p. 39, No. 14. Reeve. Conch. Icon., pl. 12, sp. 82.

42. Lithodomus gracilis. Philippi.

Modiola (Lithophagus) gracilis, Philippi. Zeitschrift für Malak., p. 117, 1847. Abbild., pl. 2, fig. 1.

Lithodomus gracilis, Reeve. Conch. Icon., pl. 1, sp. 4.

43. Lithodomus cinnamominus. Chemnitz.

Mytilus cinnamominus, Chem. Conch. Cab., Vol. 8, p. 252, pl. 82, fig. 731; *Modiola cinnamomea*, Lam. Anim. sans Vert. 6, p. 114, No. 18. Hanley. Cat. Rec. Shells., p. 238, pl. 24, fig. 24; *Lithodomus cinnamominus*, Reeve. Conch. Icon. pl. 1, sp. 5.

44. Perna Australica. Reeve.

Perna Australica, Reeve. Conch. Icon. pl. 3, sp. 12.

45. Crenatula viridis. Lamarck.

Crenatula viridis, Lam. Anim. sans Vert.. Vol. 6, part 1, p. 157, No. 5; Hanley. Cat. Rec. Shells, p. 257; Reeve. Conch. Icon., pl. 1, sp. 2.

46. MALLEUS VULSELLATUS. Lamarck.

Malleus vulsellatus, Lam. Anim. sans Vert., Vol. 6, p. 145.
Hanley. Cat. Rec. Shells, p. 260.
Ostrea regula, Forskael. Desc. Anim., p. 124.
Malleus regula, Reeve. Conch. Icon., pl. 2, sp. 4.

47. SPONDYLUS LAMARCKII. Chenu.

Spondylus Lamarckii, Chenu. Conch. Illust., p. 6, pl. 9, fig, 4.
Reeve. Conch. Icon., pl. 8, sp. 30.

48. SPONDYLUS CASTUS. Reeve.

Spondylus castus, Reeve. Conch. Icon., pl. 13, sp. 47.

49. SPONDYLUS OCELLATUS. Reeve.

Spondylus ocellatus, Reeve. Conch. Icon. pl. 12, sp. 43.

50. SPONDYLUS WRIGHTIANUS. Crosse.

Spondylus Wrightianus, Crosse. Journal de Conch., Vol. 20, p. 360, 1872; Vol. 21, p. 253, pl. 9, fig. 1, 1873.

This species is also found on the east-coast of Australia, at Port Curtis and Port Denison, 7 to 10 fathoms; Cape Granville, North-East Australia, 12 to 20 fathoms; Darling Island, Torres Straits, 25 to 30 fathoms. A large number of specimens were obtained during the Chevert Expedition (*Brazier.*) I have a specimen from Professor Tate obtained by him at Port Darwin, brought up on the ship's cable with a number of examples. It is allied to *S. regius*, Chem. and *imperialis*, Chenu and may prove to be only a variety of *S. regius*.

SYNONOMY OF SOME LAND MOLLUSCA FROM PAPUA OR NEW GUINEA.

By J. Brazier, C.M.Z.S., &c., &c.

In the Annals and Magazine of Natural History, Vol. XI., fifth series, 1883, Mr. Edgar A. Smith described four new species of Helicidæ said to have been collected at D'Entrecasteaux Island, off the South-east of New Guinea. The four species so described were not from D'Entrecasteaux Island, but were collected by Messrs. Goldie, Rolls, Cairn, and Hunstein, inland from Port Moresby, under the Astrolabe Range of Mountains.

Mr. Goldie's party did send home birds collected on D'Entrecasteaux Island; and it is quite evident that they got into some dealers hands who came to the conclusion that the shells must have come from the same place as the birds. Mr. Smith says that besides the new species the collection includes examples of *Helix Tayloriana*, Adams and Reeve; *H. yulensis*, Brazier; *Helix Broadbenti*, Brazier; and a very beautiful variety of *Helix corniculum*, Homb. and Jacquinot. One of Mr.Smith's species I have renamed, as his name had been previously given to a fossil species.

1. Helix (Obba) Goldiei.

Helix Goldiei, Brazier. Proc. Linn. Soc., N.S.W. Vol. 5, p. 637, 1880. *Helix (Obba) oxystoma*, E. A. Smith. (non Thomae.) Annals. Mag. Nat. Hist., 5 series. Vol. XI., p. 191, 1883.

Hab.—The foot of the Mount Astrolabe and Owen Stanley Range, New Guinea (Mr. A. Goldie.)

There is already a fossil species named *Helix oxystoma*, Thomae. Nass. Jahrl. 2, p. 136, in Sandberger Die Land-und Süsswasser-Conchylien 1870-1875. The *oxystoma* of E. A. Smith I have changed to *Goldei*. It was on the 29th of December 1880, that I exhibited before this Society two Helices named *Goldiei* and *Hunsteinei*, and at the following Meeting held in January 27th 1881, I described the two above named species, but by some unaccountable means the papers with my description appear to have got either lost or mislaid by the Secretary.

2. Helix (Geotrochus) Zeno.

Helix (Geotrochus) Zeno, Brazier. Proc. Linn. Soc., N.S.W. Vol. I., p. 107, 1876. *Helix (Geotrochus) latiaxis*, E. A. Smith. Annals. Mag. Nat. Hist., 5 series. Vol. XI., p. 191.

Hab.—Hall Sound, New Guinea, Brazier. Laloki or Goldie River, Broadbent. Foot of Mount Astrolabe and Owen Stanley Range, Goldie, Rolls, Cairn and Hunstein.

During the Chevert Expedition to New Guinea, we obtained a few specimens of this species on the mainland of New Guinea at Hall Sound. They were found in the thick forest on a high ridge; since then it was collected by Mr. Broadbent on the banks of the Laloki or Goldie River, and twice since by Mr. Goldie and his party under the Mount Astrolabe and Owen Stanley Range.

The other species described by Mr. Smith as *Helix (Geotrochus) Tapparonei*, Mr. H. Hunsteini, with the indention in the outer lip is somewhat allied to *Geotrochus Macgillivrayi*, Forbes. The lip of *H. Tapparonei*, is of an intense jet black colour, some specimens are spirally banded, others again are pure white like beautiful porcelain, some again have the whole outer surface of a rich rose tint with the lip bright jet black; the species is very rare and was obtained under the Mount Astrolabe and Owen Stanley Ranges. The other species described by Mr. Smith is named *Helix (Sphærospina) Genardi*. It appears that when this was described Mr. Smith had only one specimen in the British Museum; as I have some dozens of them I can confirm Mr. Smith's opinion that it is a true species, and in no way distorted. The spine is granulated but it does not extend to the last whorl. Mr. Smith states "that the granules are arranged in such a manner as to form oblique series in two directions or in a criss-cross direction; they are excessively minute and crowded upon the topmost whorls, and gradually enlarge and become further apart as the shell grows. In addition to the sculpture already mentioned, there are indications on the body whorl of a few shallow transverse indistinct sulci, with faintly elevated broad ridges between them, especially around the middle. The apex of this species is peculiar; for the nucleus coils in and downwards and is less raised than the second whorl." The granulation around the spine of this species is very much after some of the Australian forms.

THE TIME OF THE GLACIAL PERIOD IN NEW ZEALAND.

By Dr. R. v. Lendenfeld, Ph.D.

In a recent Paper (1) I described the principal Glaciers of New Zealand of the present time, and I have found occasion several times to refer to the Glacial Period, which has left most striking traces in all parts of that country.

Von Haast (2) has furnished a Map of the Glaciers of the cold period, which shows that several of the ice-streams of that period extended down to the sea.

I had occasion to observe the characteristic scratches on the rocks in the Sounds of the West-coast close to the waters edge, which prove the correctness of Von Haast's views.

The Sounds in the southern part of the West-coast of the Middle Island of New Zealand are a most striking topographical feature. Similar Sounds are found in Norway and Kamtchatka, also there the traces of glaciers are to be seen on their steep sides.

(1) *R. v. Lendenfeld.* Der Tasman Gletscher und seine Umgebung. Petermanns Geografische Mittheilungen. Ergänzungsheft.
(2) *T. v. Haast.* Geology of Canterbury and Westland, Plate II. p. 371

The South-west corner of the Middle Island of New Zealand is a plateau 3000 to 5000 feet in height, which sinks abruptly towards the Western Ocean.

Numerous valleys extend from the open sea towards the interior of the Island which are remarkable for their small width the steepness of their rocky sides and their length. Along a coast line of 150 miles there are fourteen such Sounds which are similar to one another, about a mile broad and from ten to thirty miles long.

The sea stretches nearly to the ends of these valleys filling them up from side to side. The rocks rise steep and abruptly from the sea on all sides. The water in these Sounds is extremely deep averaging 100 fathoms, but what appears particularly remarkable is the fact that the water in many cases is deeper towards the interior than it is at the mouth. Small rivers pour from the sides of these Sounds into the sea, and there is always a larger one at the end. But it does not appear that the débris brought down by these mountains torrents has affected the depth of the water in the Sounds. And scarcely do we find a small delta pent up between the rocks at the mouths of the terminal rivers. This together with the great depth and the fact, that the rivers bring down a great amount of rock and sand, shows that the Sounds cannot have existed long, for otherwise they would necessarily have been filled up more or less by the material which is continually being deposited at the bottom of their still waters.

The character of the sides of the valleys shows, that they were originally produced by flowing water and that they were filled with glacier streams afterwards. As long as they were filled with ice nothing could be deposited in them, and we must assume that the land sank whilst this was the case; because if it had not been so, the originally shallow part would have been filled up by the rivers, partly at least, more rapidly than it could sink as such high mountains stand around it. Finally, when the land had sunk so much, that the bottom of the valley was 100 fathoms below the sea it got warmer and the ice receded up the mountains, and the sea filled the vacant place; then the process of filling in commenced, and we can calculate from the quantity of material deposited at the river mouths the time which has elapsed since then.

There is no doubt, that the New Zealand Glaciers were large all over the Island at the same period, and that therefore the Glacial period was simultaneous with the subsidence of land and later than the formation of the Sounds.

The minuteness of the Deltas mentioned above would lead one to suppose that they are of no great age and comparing them to similar alluvial formations which have been produced in the European Alps in historic time, one must come to the conclusion, that the Glacial period in New Zealand has not been more remote than two or three thousand years. This would account also for the extremely fresh appearance of the old moraines and ice scratches.

This part of the West coast, has, as far as it is known, never been inhabited by Maoris and the Middle Island never appears to have been at all thickly populated by them. To judge from their myths, they immigrated from the North, probably after it had begun to get warmer, and with them came animals and plants, the Glacial Fauna and Flora receding with the Glaciers at the margins of which even now the greatest number of plants and even birds are found.

CATALOGUE OF PAPERS AND WORKS RELATING TO THE MAMMALIAN ORDERS, MARSUPIALIA AND MONOTREMATA. -

Compiled by J. J. Fletcher, M.A., B.Sc.

The following list of papers is an attempt to do for students interested in the study of the Marsupialia (including the Didelphidæ) and the Monotremata, what Messrs. Etheridge and Jack's Catalogue, recently republished in this colony, has done for students of Australian Geology and Palæontology. It was compiled in the first instance for private use, and with the resources of the British Museum Library at hand. In these days, when the Bibliography of Comparative Anatomy and Zoology and allied branches has reached such formidable proportions, it is a task involving some labour to get an accurate idea of what has been done in connection with any important orders, without the aid derivable from Catalogues. Much more is this the case in the Colonies, where even the best of our libraries contain, as yet, but imperfect collections of the publications relating to the Australian Fauna in general, and to the mammalian section of it in particular. Imperfect as this Catalogue doubtless is, it is hoped that it may be of sufficient use to Australian students to justify its publication.

Meckel in his classical monograph (1826) gives a bibliography for the Monotremata, and this was subsequently amplified by Strauch in his Dissertation (1859). Both these works, however, are now out of print, and but few copies have found their way to Australia, and moreover, many papers have been published during the last twenty-five years. Incomplete lists of Papers relating to the Marsupialia will be found appended to some of the memoirs, but nothing like a complete list has hitherto been published.

In the following Catalogue the effort has been made to include the references to all the new species which have been described since the appearance of the works of Messrs. Waterhouse and Gould. To have included all the references to earlier descriptions was unnecessary because they are to be found in one or both of these monographs, and in many cases the original descriptions consist of but a few brief sentences in anticipation of subsequent more complete accounts. Where anatomical or other impoitant details are included, the references are given as far as has been possible. References to Papers dealing with Palæontology are not included if they are to be found in the Catalogue of Messrs. Etheridge and Jack. Doubtless some important Papers have been overlooked, as also have many which contain important allusions to Marsupials and Monotremes, but to which the titles of the Papers give no clue. Of such papers in most cases there are no copies at present to be consulted in any of our libraries.

There are many gaps in our knowledge of Australian Marsupials even apart from their embryology, of which, with his known ability and with the resources at his command, we may hope very shortly to have a good accouut from Mr. Caldwell. At present we know almost, if not absolutely, nothing of the soft parts of many highly interesting forms such as Chæropus, Myrmecobius, Hypsiprymnodon, and Tarsipes, yet, with the exception of Mr. Ramsay's interesting genus, the most recently described of them has been known to science for more than forty years.

These rare animals are not likely to become more numerous now that the interior parts of the colonies are every year becoming more settled. Surely before they become extinct some special efforts might be made to obtain specimens of these animals with a view to the description of something more than skins and bones, which is all we have at present. Of the smaller Dasyuridæ too, such as Antechinus, Chætocercus, and Podabrus, our anatomical knowledge is very meagre, Mr. Alston's brief but valuable notes on Antechinomys, with woodcuts of the stomach and liver being the only special paper and illustrations, which deal with this section, and with a few stray allusions elsewhere, comprising about all that is known of the soft parts. Among the smaller Phalangers, Dromicia and Dactylopsila for example, yet await the description of their soft parts. True it is that some of these forms may not yield any very striking results, nevertheless it would be satisfactory to know something more of them than is known at present.

In conclusion, I beg to acknowledge my indebtedness to the Royal Society's (London) Catalogue, to Carus and Engelmann's Bibliotheca Zoologica, to the Zoological Record, to the Zoologischer Anzeiger and to many other works. I have also to thank Hon. W. Macleay, Mr. Haswell, and Mr. Ramsay for the opportunity of consulting books, and Baron Maclay for the correct titles of several Papers.

NOTE.—References to Papers not dealing exclusively with Marsupials and Monotremes will be found chiefly under the headings Myology, Osteology, &c. In a few cases in which the title is in brackets, it means that the compiler, not having seen the paper, was unable to give the exact title.

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ERRATA.

Professor Bell's Paper. Page 496.

Page 497, line 24—for "Cenioidea," read Crinoidea.
,, ,, line 27—for "mauonema," read *macronema*.
,, 498, line 2—from bottom of page; for "Gunnu," read *Gunnn*.
,, 499, line 9—Sp. 12; for "Actaster," read *Retaster*.
,, ,, line 21—Sp. 3; for "marmoratu," read *marmorata*.
,, ,, line 23—Sp. 4; for "Ophiofloeus," read *Ophioplocus*
,, ,, line 25—Sp. 5; for "multispira," read *multispina*.
,, 500, line 5—Sp. 9; for "scolopendima," read *scolopendina*.
,, ,, line 17—Sp. 15; for "coespitora," read *caespitosa*.
,, ,, line 25—for "sho," read *should*.
,, 501, line 13—Sp. 2; for "tenuiispinus," read *tenuispinus*.
,, 502, line 1—Sp. 10 "S.," read *Salmacis*.
,, ,, line 13—Sp. 16; for "S.," read *Strongylocentrotus*.
,, ,, line 21—Sp. 20; for "mammelatus," read *mammillatus*.
,, 505, line 8—from the bottom of the page, for *erythrogrammus*, read "*eurythrogrammus*."
,, 506, line 4—from the bottom, for "*Vide*," read *Vide*.

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(Original description and figure.)

* For letters on the distribution, &c., of Monotremes, in answer to a remark in this article, see Nature of the following dates:—(W. E. A.), September 13th, 1877, Vol. XVI., p. 420; (P. L. S.), Ibid., p. 439 (Bennett), Ibid., pp. 475-476; (E. P. R.), Ibid., Vol. XVII., 1878, March pp. 401-402; (W. E. A.), Ibid., Vol. XVIII., August 28th, p. 464.

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DESCRIPTIONS OF TWO NEW SPECIES OF BIRDS FROM THE AUSTRO-MALAYAN REGION.

BY E. P. RAMSAY, F.R.S.E., F.L.S.

HALCYON (*Cyanalcyon*) ALBONOTATA, sp. nov.

Adult male, the whole of the head rich dark blue, brighter and of an ultramarine tint over the eyebrows and on the sides of the head; from the lores and mandible across the ear-coverts and round the hind neck a narrow deep blue band, a small white spot in front of the nostrils and a rather large semi-lunar white spot on the nape; the throat and all the under surface, a broad collar on the hind neck, the interscapular region, the whole of the back and rump, and upper and under tail coverts, white; wings and tail dark blue, concealed portions of the quills black margined with white at the base; under wing-coverts white, a black spot on their tips at the base of the primaries; bill black, feet and legs blackish grey.

Length, 6·8; wing, 3·3; tail, 2·1 inch; tarsus, 0·45; bill from forehead, 1·4 from nostril 1 1 height at nostril 0·4 its width 0·4.

Hab. New Britain.

This description has been taken from a single specimen received in spirits, and which proved on dissection to be a male. It belongs properly to the sub-genus *Cyanalcyon*, and is most nearly allied to *C. diops*, *C. leucopygialis*, and *C. macleayana*, but may be distinguished from all of them by its white interscapular region, back, and upper tail colours. It appears to be smaller than any other species of the genus, being about the same size or smaller than *Halcyon recurvirostris*.

PITTA (*Erythropitta*) FINSCHII. sp. nov.

The whole of the head, nape, neck and chin of a dark reddish chocolate brown, tinged with reddish in certain lights; throat black, across the chest a broad band of blue, bounded below by a narrow band of black, all the feathers of this black band tipped with crimson; the remainder of the under surface very deep rich crimson; outer series of the under tail coverts tipped with blackish blue. The whole of the upper surface, lower portion of hind neck, wings and tail deep blue of the same tint as that of the chest, inner webs of the quills above, and all their under surface black, a small white spot on the shoulder coverts, and an oval white spot on the 3rd, 4th, and in some on the 5th primary quill.

Bill black, legs and feet blackish brown.

Length of skins 6 to 7 inches.

Wing, 4 inches; tail, 2 inches; tarsus, 1·6; bill from forehead 1·15, from nostril 0 8.

Hab.—Astrolabe range.

What I take to be the females or not quite adult individuals have the sides of the chest and interscapular region oil green.

Dr. Otto Finsch, however, is of opinion that these with the green backs must be referred to *Pitta macklotii* (Tem.)

NOTES AND EXHIBITS.

Professor Stephens exhibited, for the Rev. J. Milne Curran, some specimens of the conifer *Walchia Milneana* known only from the coal measures of Ballimore, near Dubbo. Also a specimen of Spirifer from the Marine Coal Measures, near Mudgee.

Mr. P. McMahon, J.P., exhibited a fragment of a fossil tree stem from the Coal Measures exposed in the cliffs of the Nobbys, at Newcastle; also a sample of white wood from Queensland, resembling cedar in texture and of remarkable lightness.

The President exhibited some fine specimens of fossiliferous limestone from the Tertiary formation at Aldinga, South Australia, and samples of diamond drill cores containing cretaceous fossils from the Government bore at Hergott, South Austialia, where artesian water was struck at a depth of 334 feet, which rises 40 feet above the surface. He also exhibited a curious shoe which was obtained by Mr. H. G. L. Brown from some natives in Central Australia: it is made of emu's feathers and human hair, and is said to be worn by the natives to prevent their footprints being detected.

Mr. Macleay exhibited a lizard sent for exhibition by the Rev. J. Milne Curran, from Dubbo. He captured it on account of its singular mode of progression, having observed it run for six yards in an erect posture with the fore legs quite off the ground. The lizard was of the genus *Grammatophorus*, of which there are several species in the country, all of them much given to playing and gambolling on sunny days, but the peculiar mode of progression mentioned by Mr. Curran had not been observed by any of those present.

Mr. Masters exhibited a specimen of *Ibacus antarcticus* which had been taken lately at Newcastle, and presented by Dr. Cox to the Macleay Museum. He stated that it was, he believed, the largest specimen of that very rare crustacean that had been found in Australian seas.

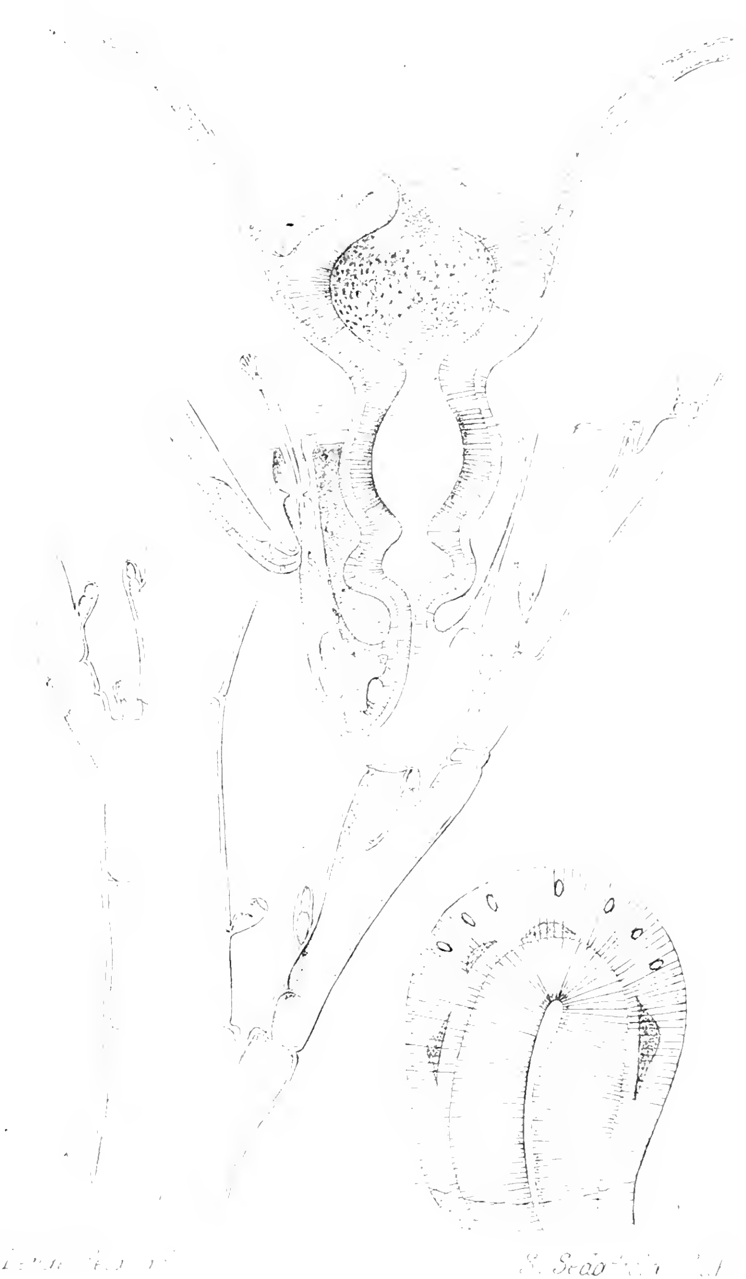
Mr. Trebeck exhibited two samples of wool grown on the same sheep. The first, grown in Victoria in 1879, was fully four inches long, and showing every good quality of the highest type of combing wool. The second, grown this year on the east side of the Liverpool Range, was scarcely 1½ inches long, and approached in character the early Mudgee wools of Silesian type. In the first specimen, the normal black tip of the old Merino had disappeared under the influence of Victorian cultivation, but after a period of growth in New South Wales, the wool of the same ram reverted to the original type of the pure Merino. The contrast between the two samples was due simply to the effects produced by the differences in the climate, soil, and culture.

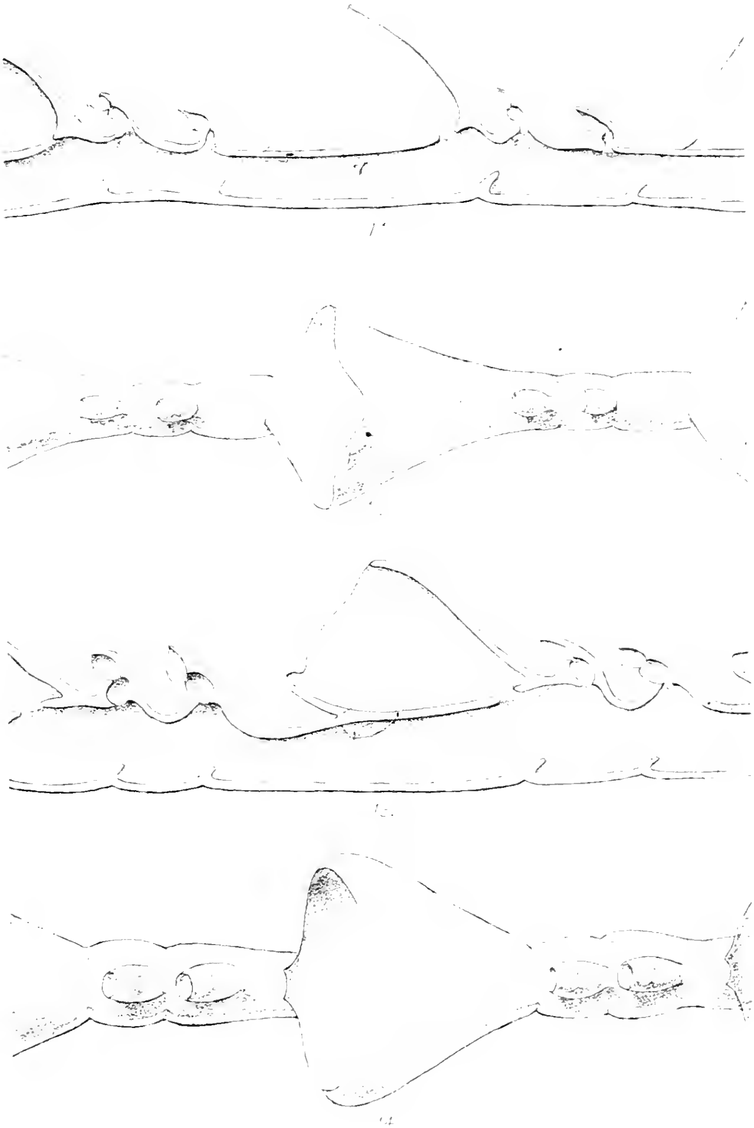
Dr. von Lendenfeld exhibited a specimen of *Haliphysema suberites*, nov. spec., obtained from *Macrocystis* in Port Jackson. This *Haliphysema* is in appearance somewhat similar to *H. ramulosa*. The skeleton of the hollow stem consists of truncate longitudinally disposed spicules. Similar spicules with bulbous centripetal ends are found in the spherical body; these are situated radially. In the stem, sand-particles are found, which protrude two-thirds of their length. Dr. Lendenfeld was inclined to consider the spicules to be *produced*, and not *collected* by the *Haliphysema*.

E. P. Ramsay exhibited the new birds described in his Paper. Also specimens of *Halcyon diops* from various localities, and a rare species of *Coriphilus*, *C. Kuhlii*, peculiar to the Fanning Islands.

Mr. Brazier exhibited the following species of *Helicidæ* in connection with his Papers:—*Helix Broadbentii*, Braz.; *H.* (*Obba*) *Goldiei*, Braz.; *H.* (*Geotrochus*) *Zeno*, Braz.; *H.* (*Geotrochus*) *Tapperonii*, Smith; *H.* (*Geotrochus*) *Tayloriana*, Ad. and Reeve; *H.* (*Sphærospina*) *Gerrardi*, E. A. Smith; *H.* (*Planispina*) *corniculum*, Hombr. and Jacq.; *Nanina* (*Xesta*) *citrina*, Linn.

Mr. Fletcher exhibited a number of very old and rare publications referred to in his list of works on the Marsupialia and Monotremata.





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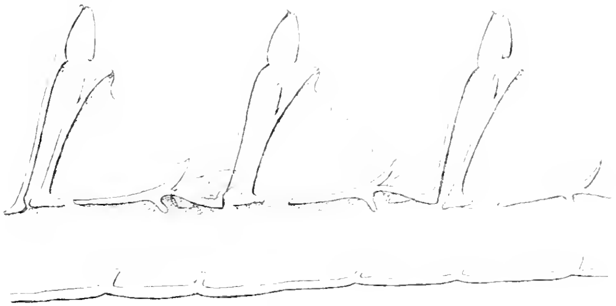

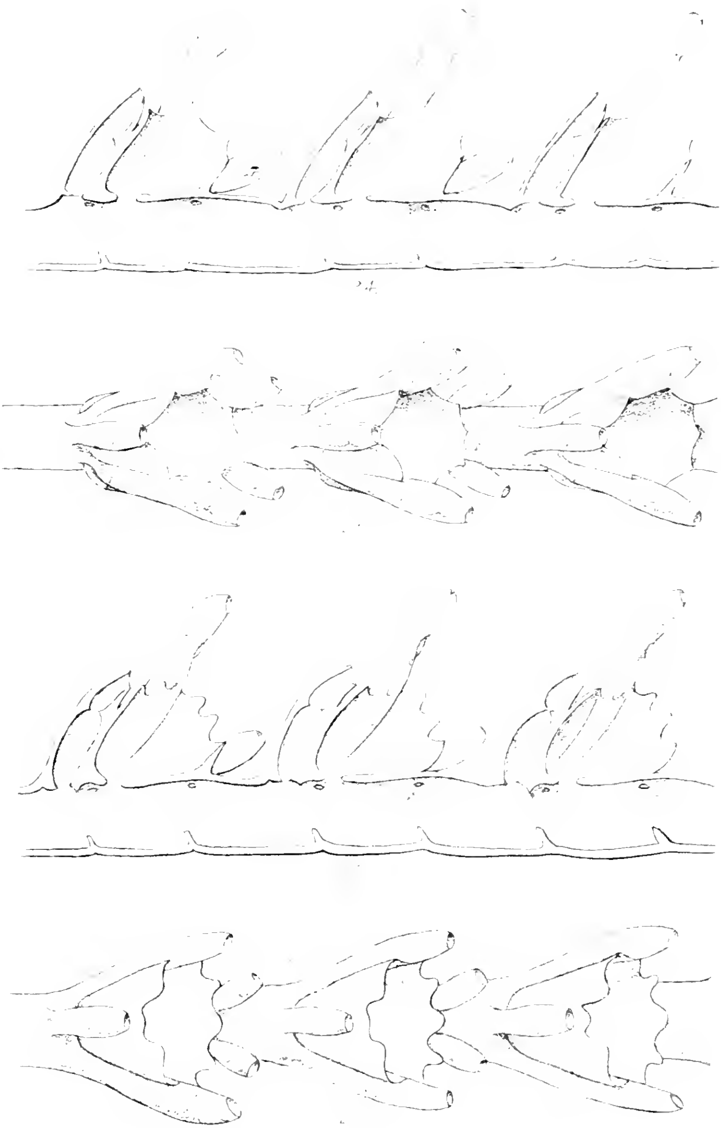

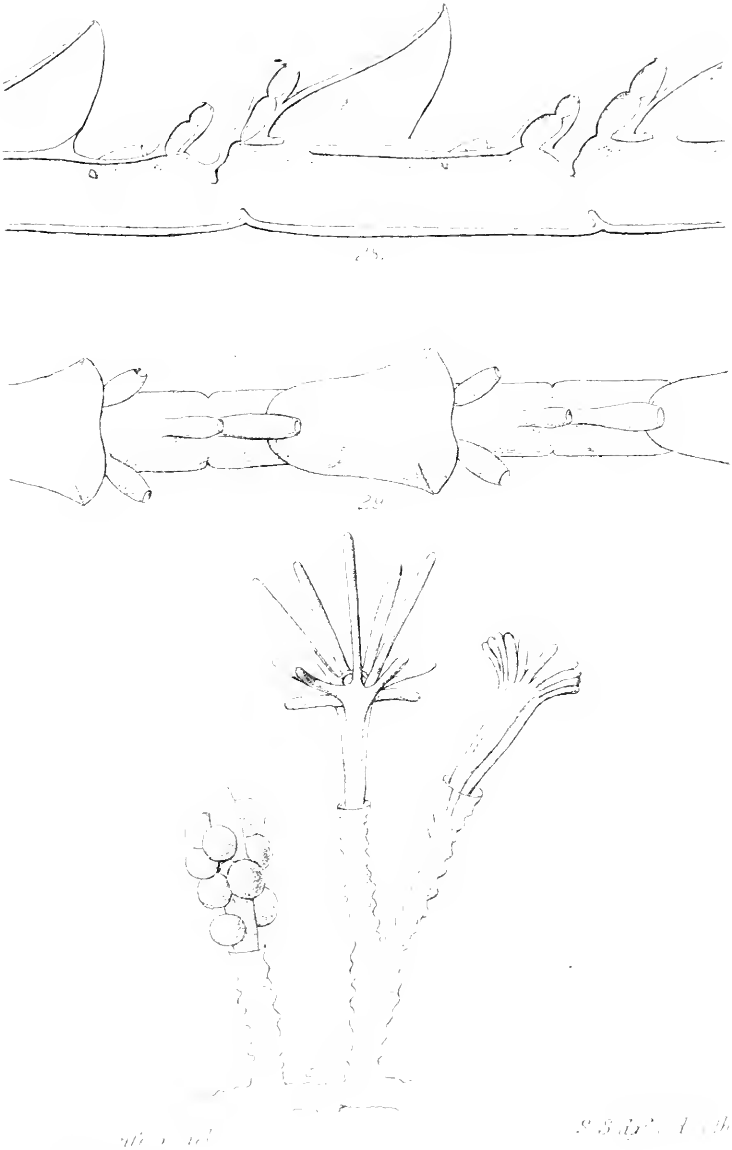

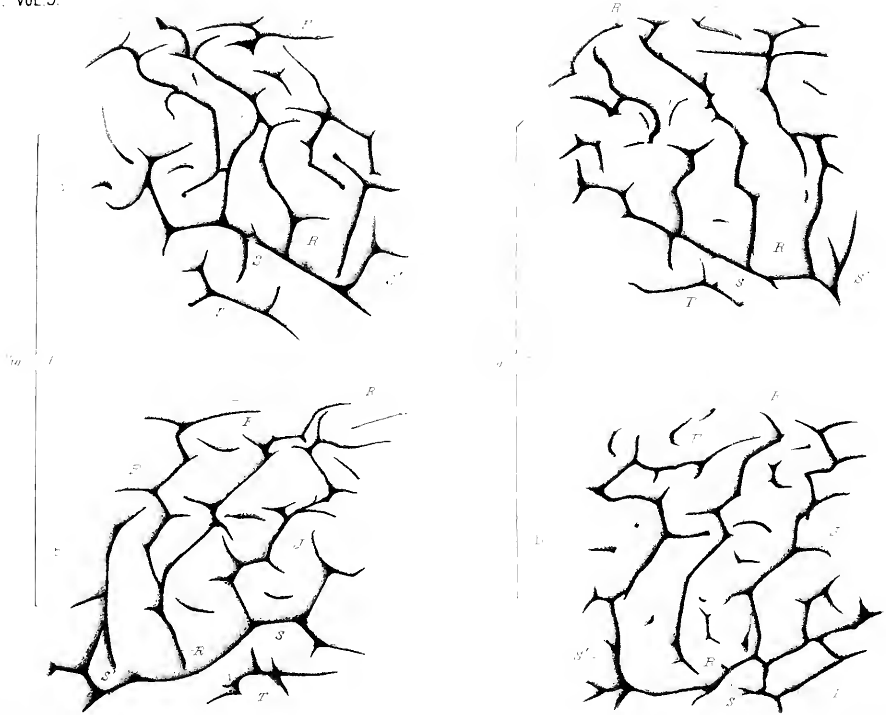
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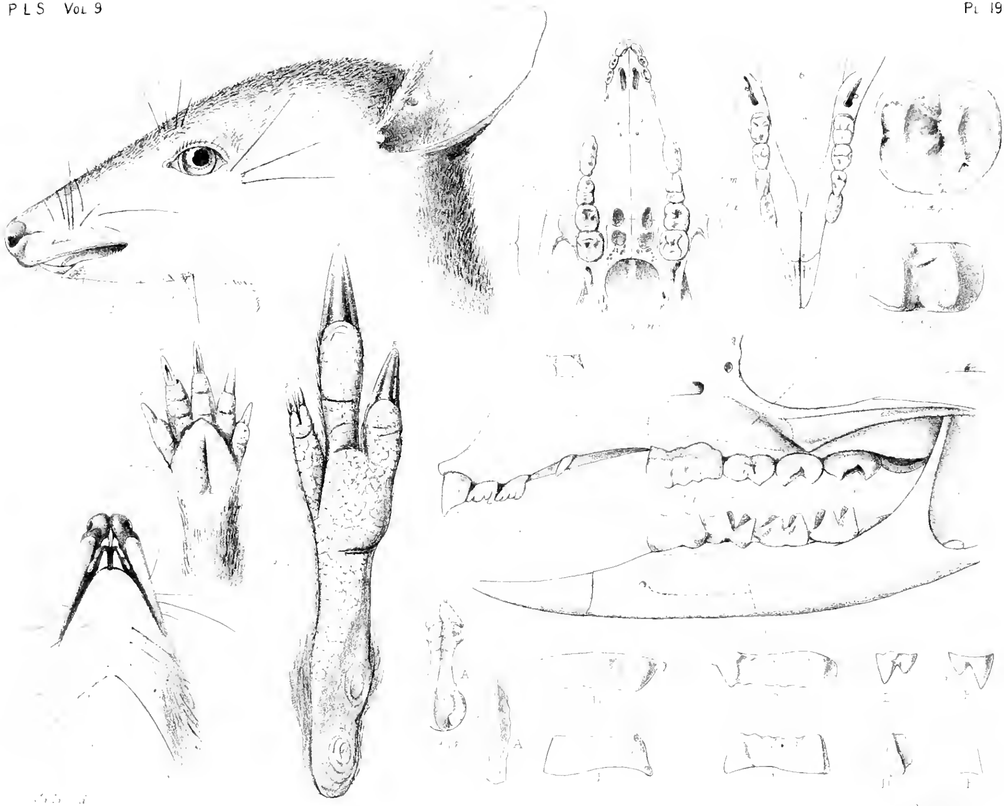

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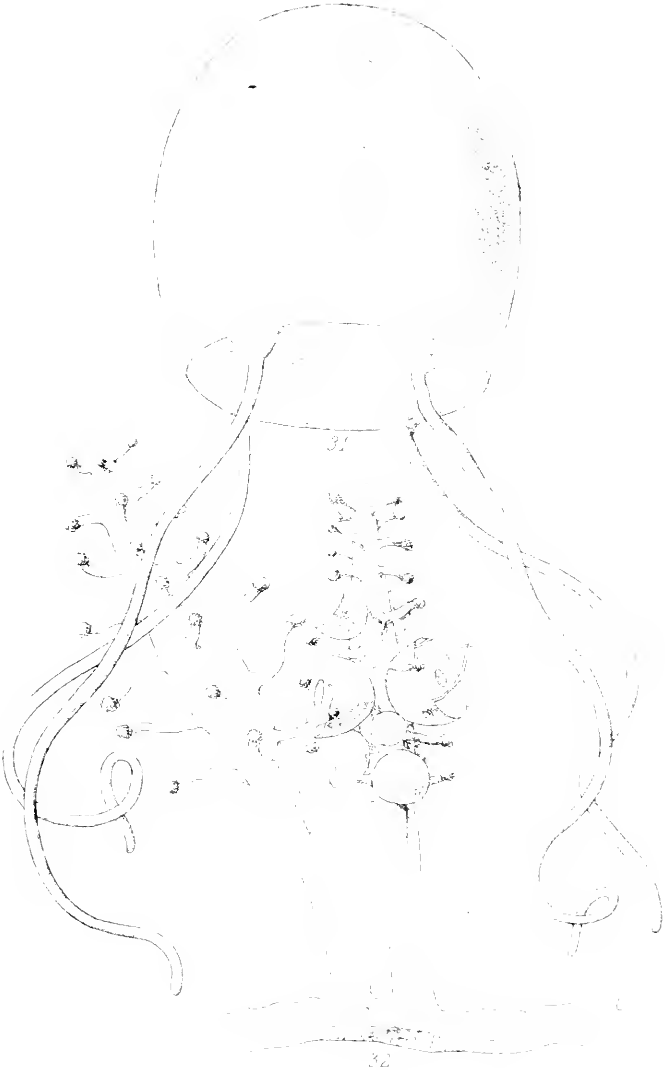

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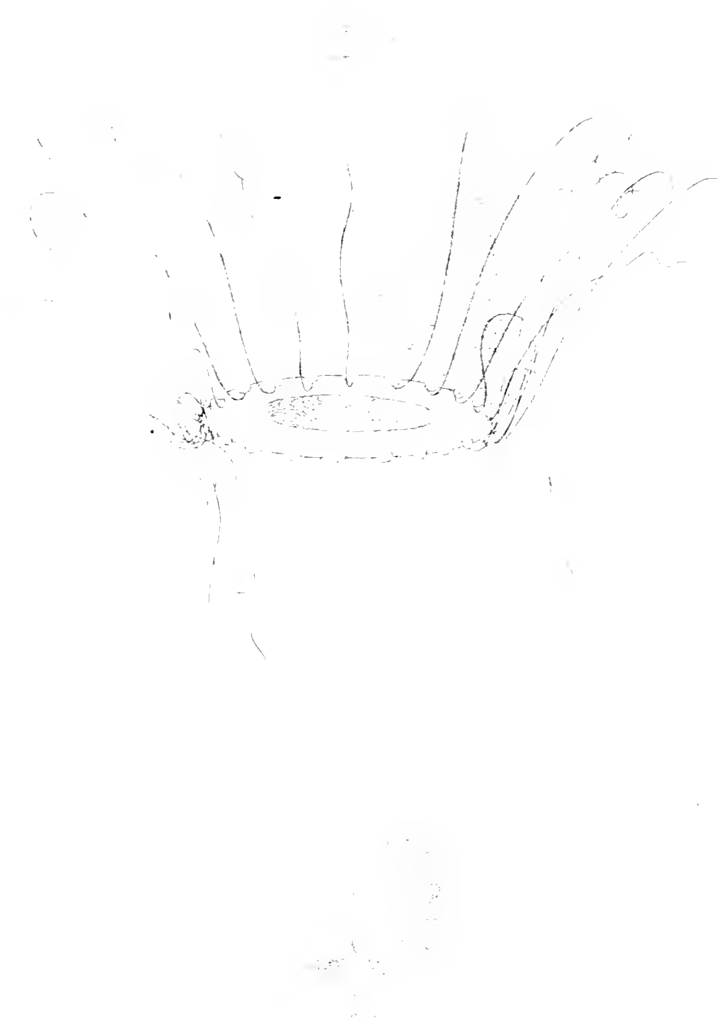

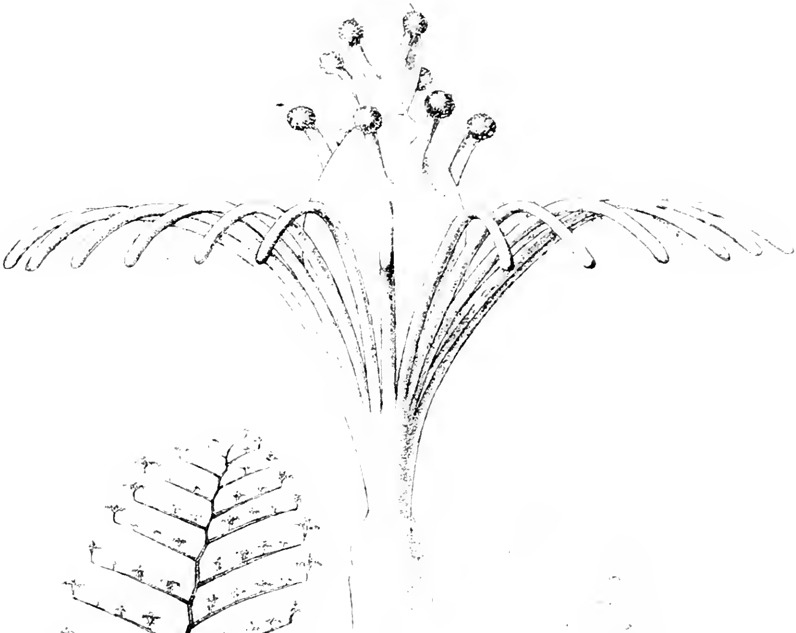

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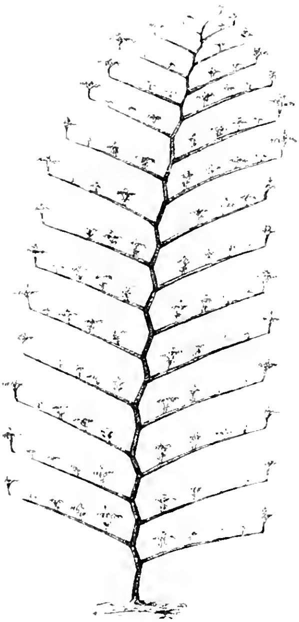

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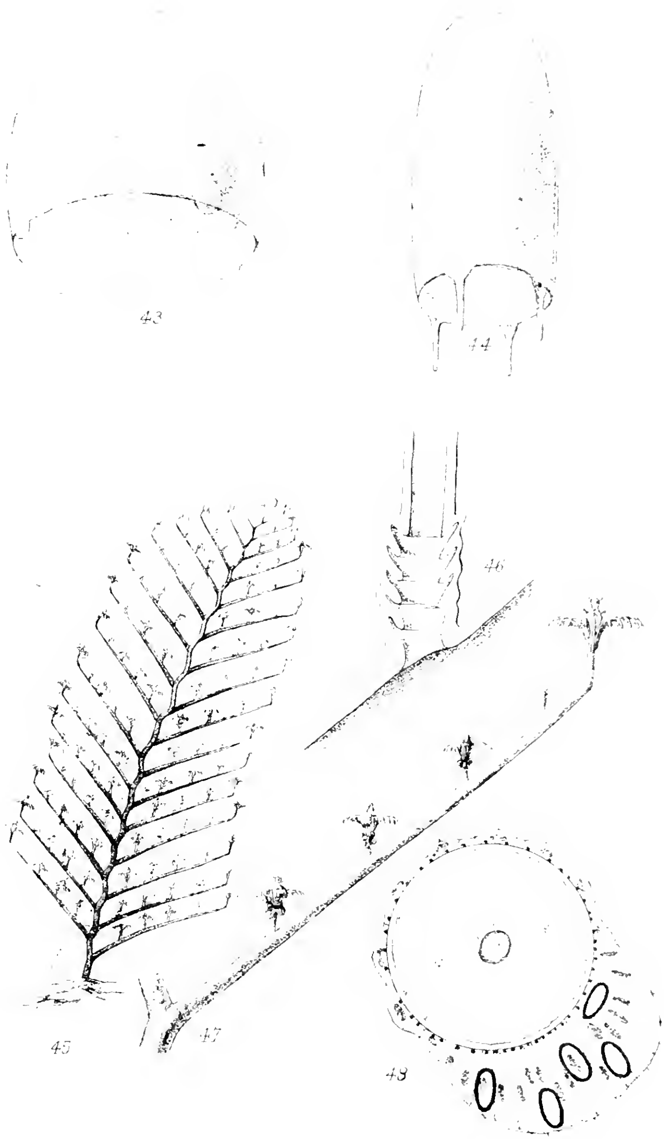

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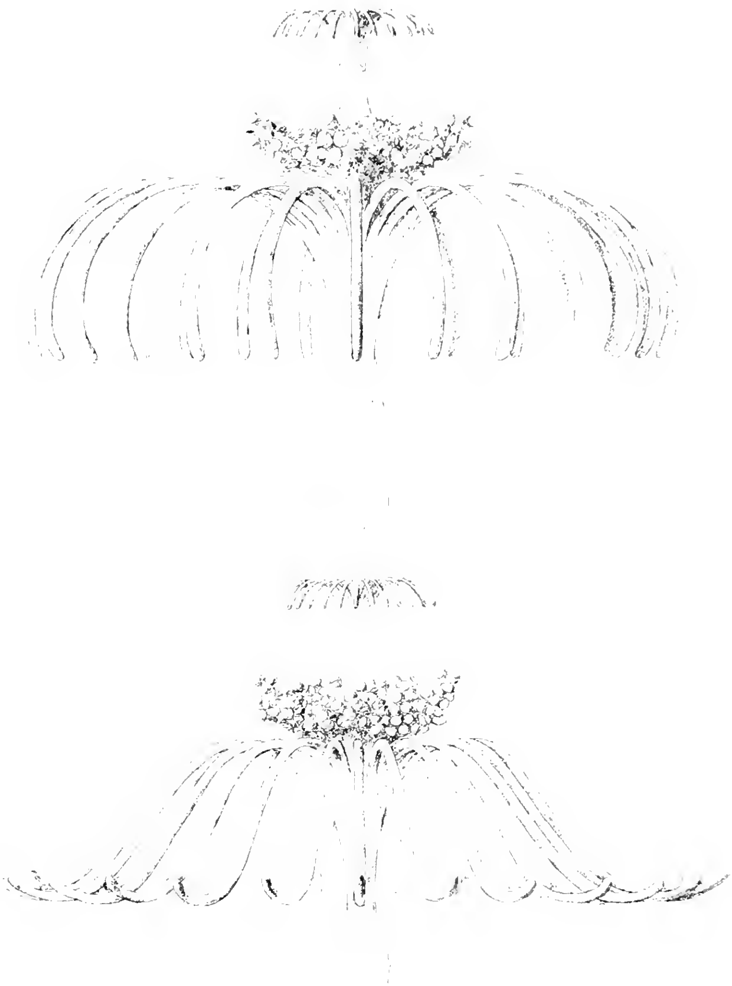

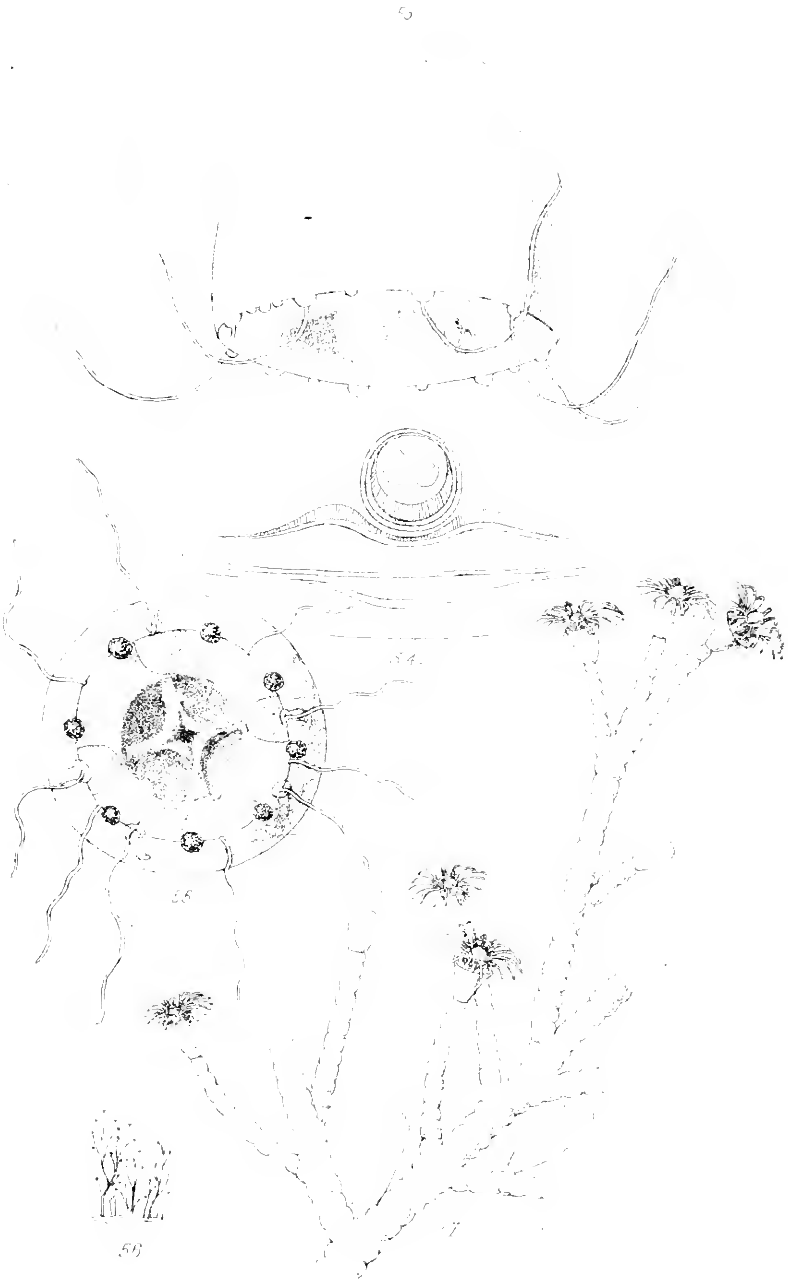
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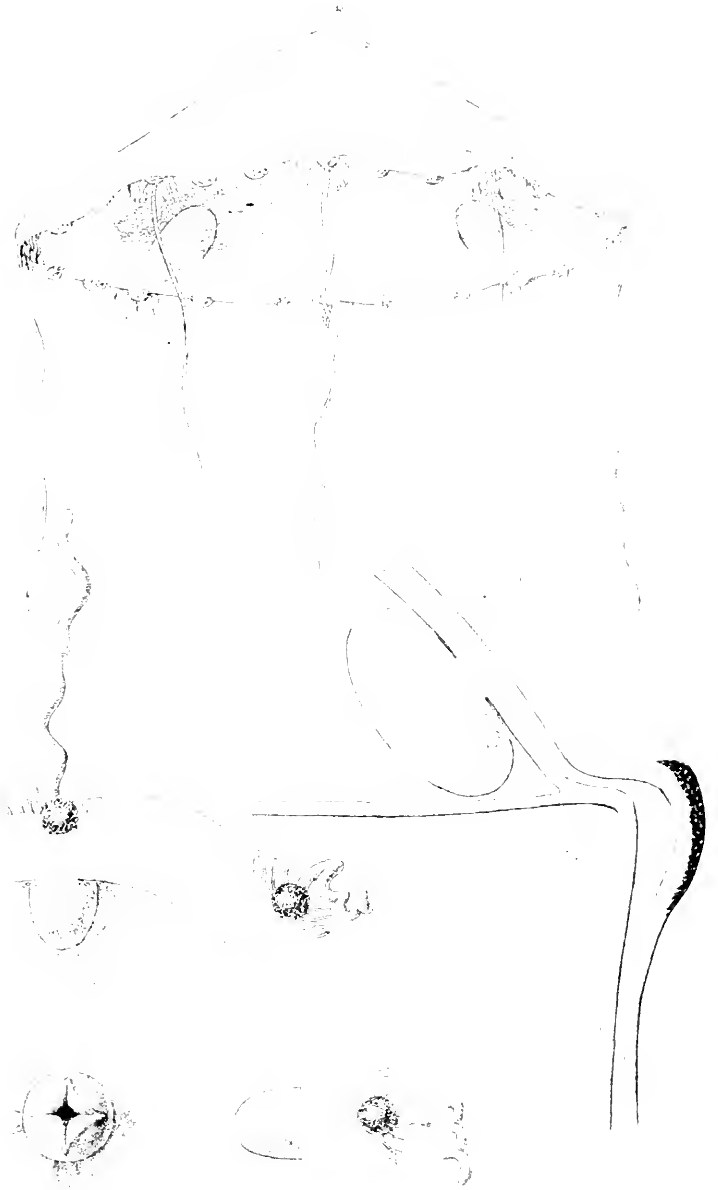

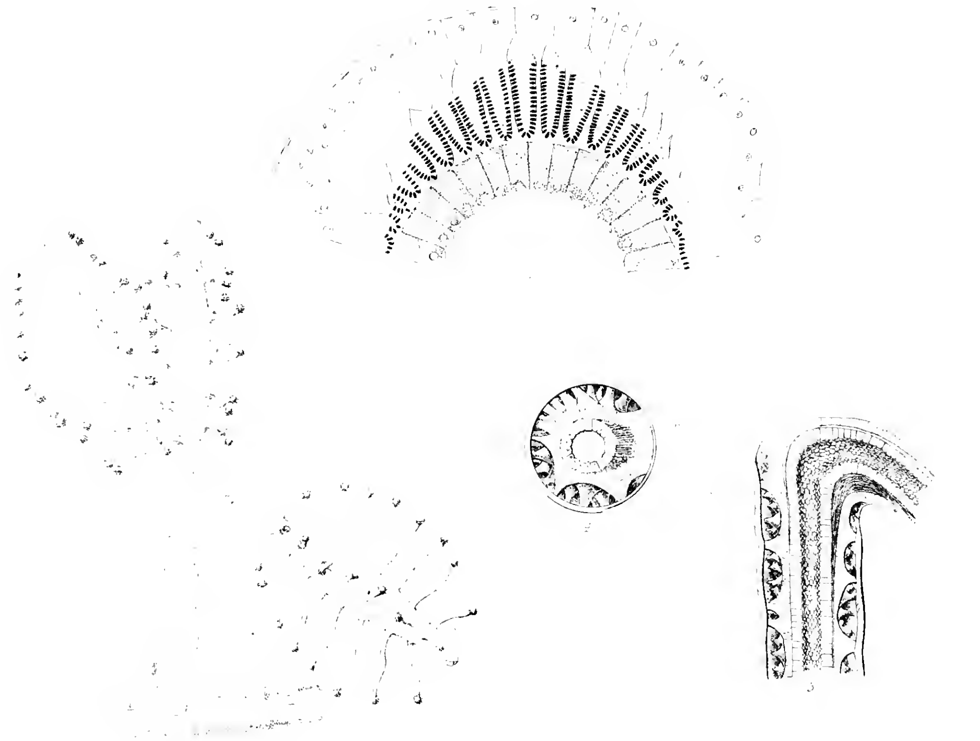

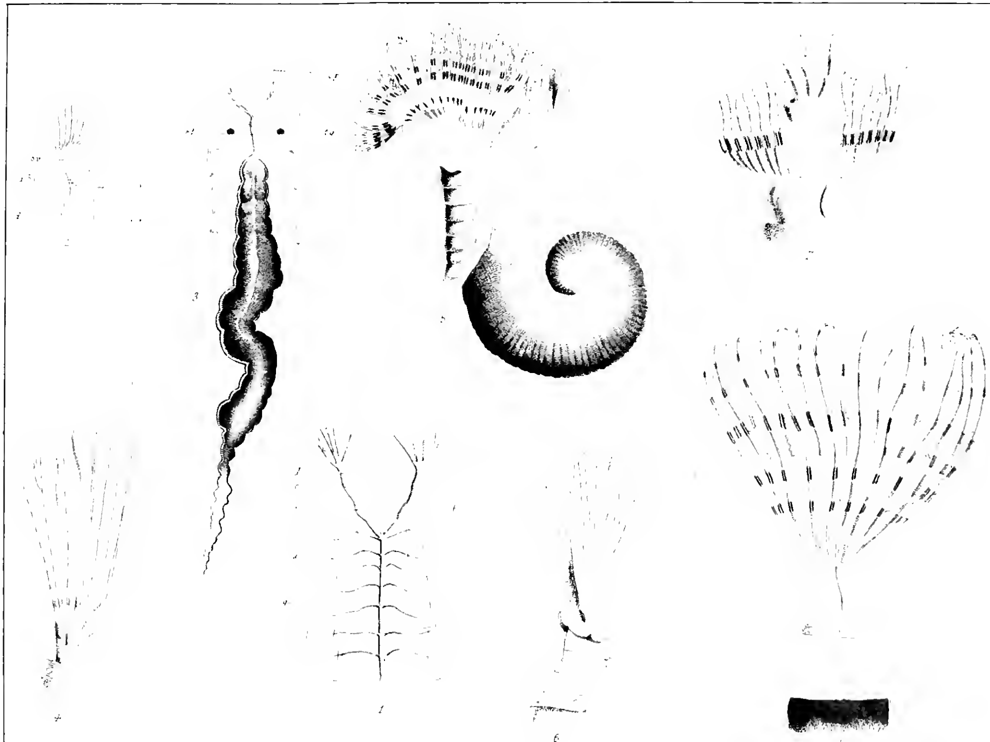

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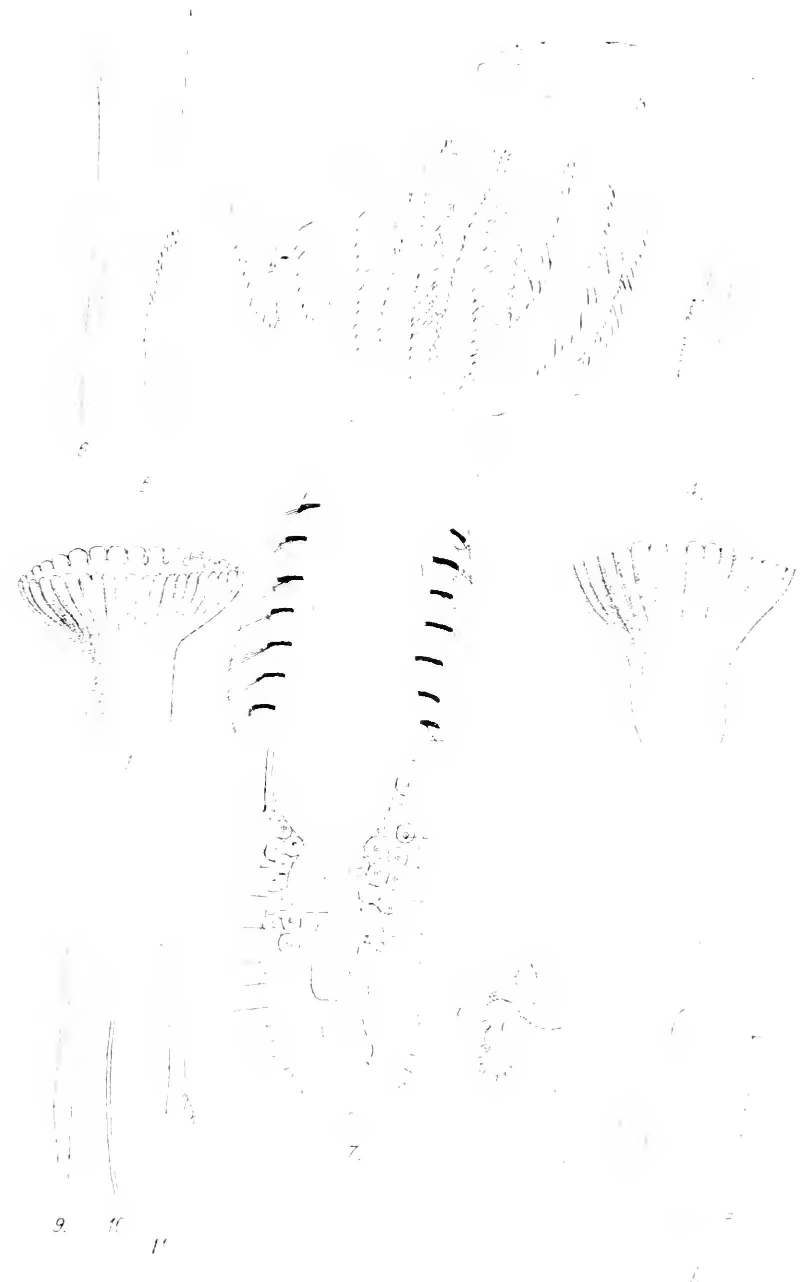
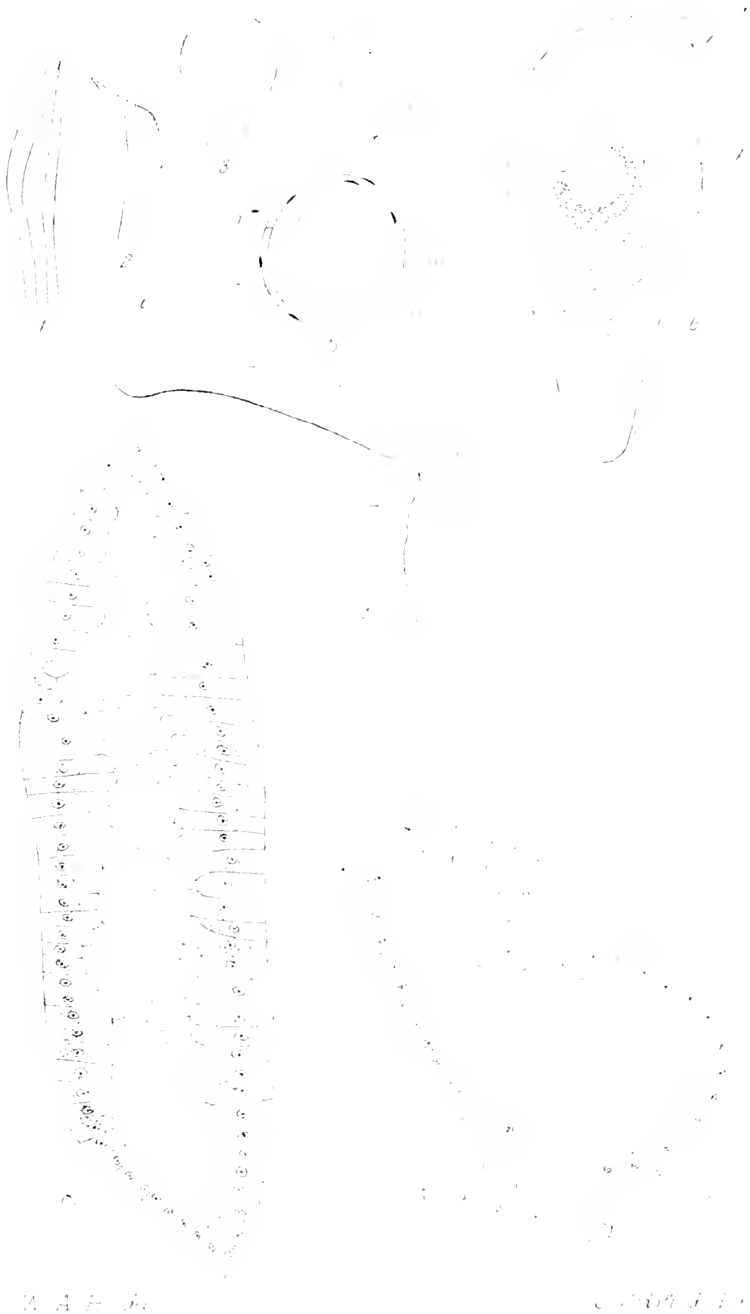
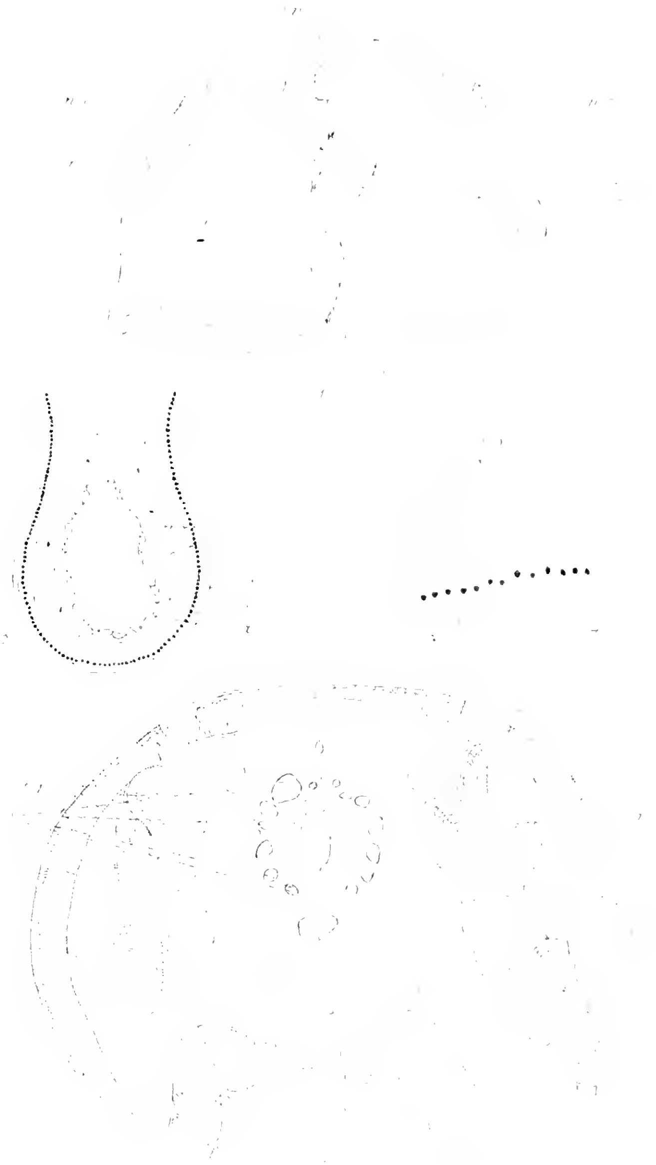
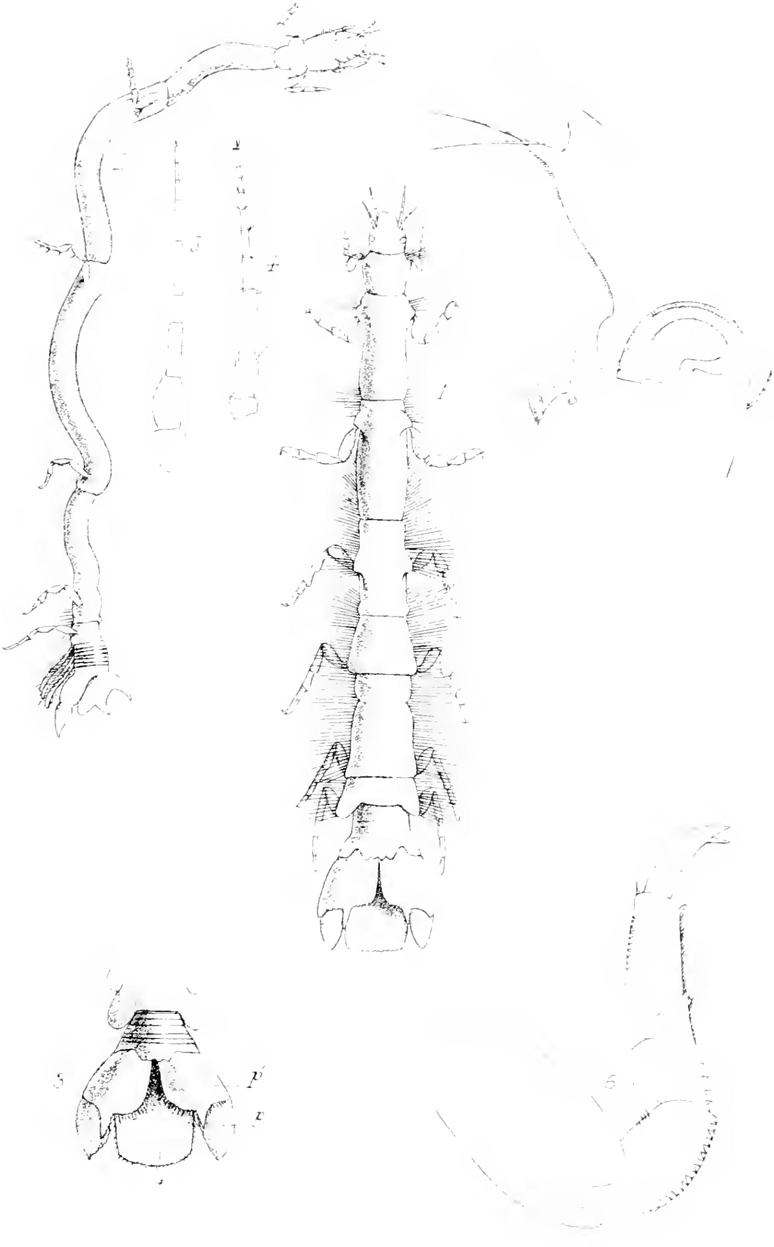
AUSTRALIAN SERPULEA









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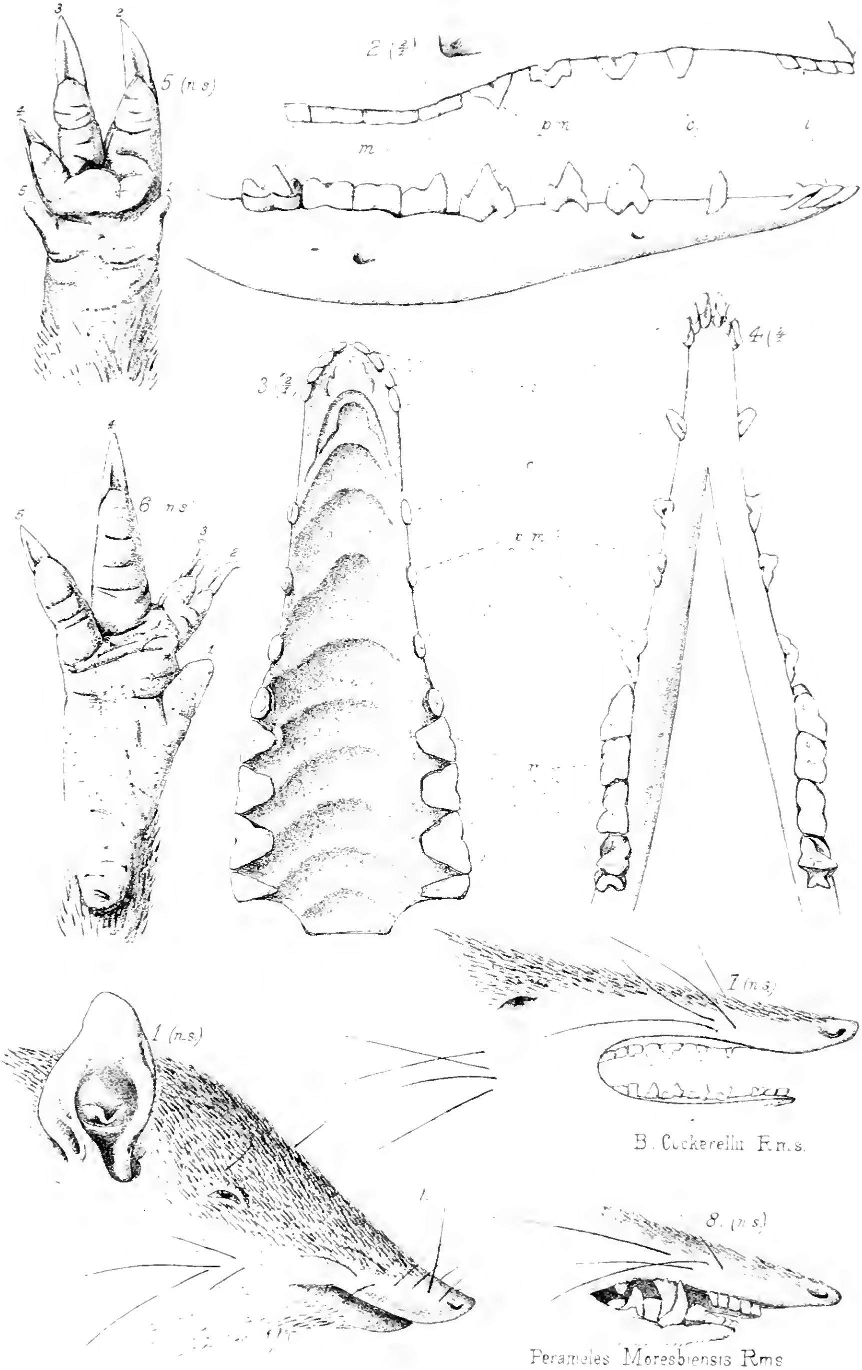

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Figs 1–6 Brachymelis Garagassi Mcl.

WEDNESDAY, SEPTEMBER 24TH, 1884.

The President, C. S. Wilkinson, Esq., F.L.S., F.G.S., in the chair.

The following gentlemen were introduced as visitors:—E. Bedwell, Esq.; H. Hammond, Esq.; Dr. Bancroft, of Brisbane; Mons. Lison, of Noumea; and Mons. L. Marin La Meslée.

MEMBERS ELECTED.

Professor T. P. Anderson Stuart, M.D., of Sydney University.

DONATIONS.

"Science," Vol. IV., Nos. 74, 75, 76, 77, July 4th to 25th, 1884. From the Editor.

"Journal of Conchology," Vol. IV., No. 6, April, 1884. From the Conchological Society of Great Britain and Ireland.

"Journal of Proceedings of the Royal Society of New South Wales for 1883," Vol. XVII. From the Society.

"Verhandlungen der Kaiserlich-Koniglichen Zoologisch-Botanischen Gesellschaft in Wien," Austria. Band XXXIII., for 1883. "Brazilische Säugethiere. Resultate von Johann Natterers Reisen in den Jahren 1817 bis 1835. Dargestellt von August von Pelzeln," I Vol. 8vo., 1863. From the Kaiserl. Konig. Zool. Bot. Gesellschaft in Wien.

"Zoologischer Anzeiger." Complete set. Vols. I. to VI., 1878 to 1883. Also, Vol. VII., Nos. 157 to 167, and 173, 1884. From the Editor.

"Mittheilungen der Naturforschenden Gesellschaft in Bern," Nos. 1 and 2 for 1882, and No. 1 for 1883.

"New Guinea Bibliography." By E. C. Rye, F.Z.S. (Pamphlet.) From the Author.

"Proceedings and Transactions of the Royal Society of Canada." Vol. I., for 1882 and 1883. From the Society.

"Medical Press and Circular," No. 2359, July 16, 1884. From the Editor.

"Victorian Naturalist," Vol. I., No. 8, August, 1884. From the Field Naturalist's Club, Victoria.

"Annual Report of the Registrar of Births, Deaths and Marriages, as embodied in the Statistics of Tasmania, for 1883." From R. M. Johnston, Esq., F.L.S.

"Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirks Frankfurt." Jahrg. II. Nos. 3 and 4. June and July, 1884. From the Society.

"Feuille des Jeunes Naturalistes." No. 166. August 1884. From the Editor.

"Result of Rain and River observations in New South Wales during 1882." "Sydney Observatory, History and Progress, 1882." "Spectrum and appearance of the recent Comet, 1881." By H. C. Russell. "Anniversary Address to the Royal Society, 1882." By H. C. Russell, B. A. From the Author.

"Jahreshefte des Vereins für vaterlandische Naturkunde in Württemberg." Jahrg. 40, 1884. From the Society.

NEW FISHES IN THE QUEENSLAND MUSEUM.

By Chas. W. De Vis, M.A.

No. 5.

Atherinichthys punctatus.

D. 6, 1/9. A. 1/10. Lat. 35.

The height of the body is $6\frac{1}{4}$, the length of the head $4\frac{1}{3}$ in the total length. Orbit 3, snout nearly the same, interorbit $2\frac{1}{3}$ in the length of the head. Habit much that of a young mullet. The origin of the first dorsal is in the middle of the length, s.c. The space between the dorsals equals that between the second and the caudal. The origin of the anal is in advance of that of the second dorsal. The ventral rises between the pectoral and the first dorsal. The cleft of the mouth extends to below the anterior nostril. Teeth minute. Upper jaw the longer. Pinky yellow. The lateral band blue edged above. Scales of the upper parts edged with dots. Tip of the snout nearly black with a group of close spots behind it. A black dot on the lower edge of the base of the pectoral.

Locality, Cape York. Collected by Mr. K. Broadbent.

Mugil convexus.

D. 4, 1/8. A. 3/10. Lat. 34. Tr. 11-12.

The height of the body is 4, the length of the head 5 in the total length. Orbit $4\frac{1}{2}$, snout 4, interorbit $2\frac{1}{2}$, pectoral $1\frac{1}{4}$ in the length of the head. No adipose eyelid. Upper profile convex, lower nearly straight. Head narrow. Snout rather pointed. No pectoral axillary scale. Maxiilary exposed throughout its length. Preorbital strongly serrated behind and in front. Jaws with fine close set teeth. About 27 scales between the dorsal and the interorbit, the rest of the head naked. The pectoral rises rather below the angle of the operculum, the ventral below the posterior third of the pectoral. The first dorsal over the tip of the ventral. The second dorsal considerably behind the anal. The height of the caudal peduncle at its greatest is equal to its length. The free space on the chin is broadly lanceolate. Colour entirely silvery. Operculum golden. No markings.

Length, 8 inches. Locality, Cardwell.

The "Mangrove Mullets" of the Brisbane fishermen are *M. tade* Forsk and *M. longimanus*, Gth.

Mugil marginalis.

D. 4, 1/8. A. 3/8. Lat. 40-41. Tr. 13.

The height of the body and length of the head are $4\frac{3}{4}$ in the total length. Orbit $3\frac{1}{3}$, snout $4\frac{1}{3}$, interorbit $2\frac{3}{4}$ in the length of the head. Pectoral $\frac{2}{3}$, caudal peduncle $2\frac{1}{2}$, first dorsal spine less than 2 in the same. The adipose membrane broad fore-and-aft with a gelatinous mass on the snout and pre-operculum. Upper lip thin. Hinder nostril much nearer to the eye than to the snout. Preorbital entire in front tapering to an obtuse point, slightly armed behind. Maxillary uncovered. Mandibulary angle rather more than a right angle. Cleft of the mouth twice as broad as long. Free space behind the chin very broad. The opercles widely separate behind. First dorsal midway between the snout and the base of the caudal. The 11th scale corresponds with the tip of the pectoral and origin of the first dorsal. The twenty-third with the origin of the second dorsal. There are about 25 scales between the snout and the origin of the dorsal. The pectoral is above the middle of the height, rather above the angle of the operculum. It has no axillary scale. Origin of ventral nearer to the pectoral than to the dorsal. Second dorsal and anal nearly on the same parallel. Caudal moderately forked. Second dorsal spine the longest. Head thick, obtuse; scales over it concentrically striated. Body with alternate clear and clouded lines. An obscure blue spot on the base of the pectoral. Dorsals and caudal with a broad dark and narrow black edge.

Length, $5\frac{1}{2}$ inches. Locality, Brisbane.

In a younger example there are differences which might mislead. The mandibulary angle is acute and the lower jaw much longer in proportion; the free space much narrower, the opercles nearly meeting behind, the head is more pointed and longer than the height of the body. There is a large dark patch in the middle of the caudal, another in that of the soft dorsal and a streaky one on the spinous dorsal.

The affinities of the species seem to be with *M. cephalotus* on the one hand and *M. gelatinosus* on the other.

Mugil splendens.

D. $4\frac{1}{8}$. A. 3/9. Lat. 40. Tr. 12.

The height of the body is $4\frac{1}{5}$, the length of the head 5 in the total length. Orbit and snout $4\frac{1}{2}$, interorbit $1\frac{4}{5}$ in the length of the head.

No adipose eyelid, the eye in spirits covered with an opaque membrane. No teeth. Lower lip strongly ciliated. No free space under the chin. The lower end of the maxillary is visible at the angle of the mouth. The preorbital is strongly serrated on its posterior limb. Twenty-one series of scales between the snout and the first dorsal. The root of the pectoral is level with the upper angle of the operculum; it has a moderately long axillary scale and reaches nearly to the origin of the dorsal. The dorsals rise opposite the 13th and 25th scale rows, the anal opposite the second dorsal. Elongated scale of first dorsal $\frac{3}{5}$ of the first spine, that of the ventral short.

Colour golden, rather greyish on the back and yellow on the lower part of the head. The scales with shining margins. The duller centres produce longitudinal bands changing their position as the incidence of the light is altered. Pectoral with a bright yellow elongated spot across the base, above it a black spot extended on the edge of the fin.

Length, 10 inches. Locality, Cardwell.

AMPHISILE CRISTATA.

D. 3 1/9. A. 14. C. 10. V. 7. P. 11.

The height of the body is 5, the length of the head 1 $\frac{7}{8}$d in the length from the snout to the base of the caudal fin. Snout one-fourth longer than the height of the body. The distance of the pectoral from the operculum is thrice the distance of the latter (i.e., its posterior edge) from the orbit. There are six vertebral shields, the sutures indistinct, simple, and five lateral shields with no suture along the vertebral line. The operculum is very little broader than high. The humeral does not nearly extend to the base of the pectoral. There is no longitudinal groove on the head, the sharp edge of the nostral is continued to the first vertebral shield. The top of the root of the pectoral is on the upper third of the body. The first and second super-abdominal shields are equal in size and as high as broad. The cuirass covers two-thirds of the height of the body and is equal in height to the caudal peduncle. Profile regularly convex from the snout to the caudal. There are three radiating dorsal spines, but the tip of the cuirass being lost its appendages remain to the ascertained.

Length, 11 inches. A dry specimen picked up on the beach at Noosa and not in good condition, but the absence of serrated sutures between the plates, length of the thorax, ridged crown, &c., are in the present state of our knowledge of these remarkable fish, sufficient to separate it from *A. scutata*. Linn.

HEPTADECANTHUS BREVIPINNIS.

D. 17/15. A. 2/14.

The height of the body is less than 2, the length of the head 4 times in the total length. Profile of head regularly subconvex, of nape gibbous. Operculum entire, preoperculum serrated, preorbital finely serrated. The pectorals reach the third scale row from the anal. The lateral line reaches the middle of the soft dorsal. The first ray of the ventral elongated, filiform. Caudal forked. Colour nearly uniform greenish brown, a little clouded with darker.

Upper rays of pectoral and soft portion of dorsal, lobes and middle rays of caudal and a few rays of spinous part of dorsal with dark brown specks.

Length, $4\frac{1}{2}$ inches. Locality, Queensland Coast.

Heptadecanthus maculosus

D. 17/15. A. 2/16.

The height of the body is 2 or less in the length s.c., $2\frac{3}{5}$ c.c. Head $4\frac{2}{3}$ in the total. Orbit 3, snout 4 nearly, interorbit 3, in the length of the head. The pectorals and ventrals reach nearly to the anus. Preopercule and preorbital finely serrated. Caudal deeply forked.

Colour, anterior two thirds of body greenish brown with lines of dark brown (blue) spots on each side. Similar spots on operculum cheeks, and chest. Posterior third of body greenish grey. Spinous part of dorsal dark brown.

Length, 4 inches. Locality, Cardwell.

The profile, especially of the head, is much lower down than in *H. longicaudis.* Macl.

Pomacentrus subniger.

D. 12/16. A. 2/13. Lat. 34. Tr. 3/10.

The height of the body is $2\frac{1}{2}$ in the total length. Infraorbital denticulated. Dorsal spines lengthening to the fifth, the rest equal to it. Second anal spine very long and strong, as long as the breadth of the base of the caudal peduncle. Caudal subblobed.

Colour murky black. Scales with some obscure pearly markings.

Length, $4\frac{1}{2}$ inches. Locality, Cardwell.

Pomacentrus prosopotœnia. Blk.

Locality, Cardwell.

Pomacentrus profundus.

D. 12/14. A. 2/15. Lat. 28. Tr. 3/9.

The height of the body is $1\frac{4}{5}$ in the length s.c. Preorbital with a notch in front and a hook posteriorly. One or two small teeth on the infraorbital and one on the opercle. Preopercle sharply toothed, the teeth larger at the angle. Profile above regular and very convex, below deep beneath the postabdomen. Eye large, $2\frac{1}{2}$ in the length of the head.

Colour uniform pale yellowish brown.

Length, 2 inches. Locality, Barrier Reef.

Pomacentrus apicalis.

D. 13/14-15. A. 2/13. Lat. 26-28. Tr. 3/11.

The height of the body is $2\frac{4}{5}$ in the total length. Dorsal spines behind the third sub-equal in length. Second anal spine equals the third dorsal and half the length of the head nearly. Preorbital denticulations broad and flat near the angle. Caudal deeply forked, lobes slightly rounded, upper one the largest. Profile of nape elevated.

Colour uniform greenish brown. The soft dorsal narrowly and the upper lobe of the caudal broadly tipped with white.

Length, $4\frac{1}{2}$ inches. Loc., Barrier Reef.

A *Pomacentrus* also from the Barrier Reef, having a height of $2\frac{1}{3}$ in the total length, differs from the preceding species not only in its shortened proportions but in having a black blotch between the 2nd and 4th dorsal spines. It may possibly be distinct.

Pomacentrus frenatus.

D. 13/14-15. A. 2/13-14. Lat. 25. Tr. 3/8.

The height is $2\frac{3}{4}$ in the total length. Infraorbital denticulated without stronger teeth anteriorly. Dorsal spines gradually lengthening posteriorly. Caudal emarginate with rounded lobes. Operculum with a short spinous tooth. Upper teeth with a basal lobe.

Colour pale yellowish green. Between the eyes two transverse lines curving strongly forward. On the cheek two straight lines from the upper part of the preopercle to the angle of the mouth and a line of spots below them. Opercle with spots, dashes, and curved streaks. Scales of the body below the lateral line each with a vertical line on the base extending to the scales above and below it. On the scales above the lateral line posteriorly, small round spots extending a little on the base of the soft dorsal. Base of caudal and pectoral similarly spotted. A very obscure brown patch on the base of the first four dorsal rays. A dark brown axillary spot and an obscure bluish spot on the origin of the lateral line.

Length, 5 inches. Locality, Cardwell.

GLYPHIDODON EXPANSUS.

D. 13/13. A. 2/11. Lat. 32. Tr. 3/8.

The height of the body is rather more than $\frac{1}{2}$ of the length s.c. Interorbit flat. Profile symmetrically concave above and below. Three series of scales on the cheeks. Preorbital not half the breadth of the orbit. Infraorbital narrow merging gradually into the preorbital.

Colour uniform blueish silvery. Fins darker. Hinder part of the dorsal and anal whitish, with the rays minutely dotted black.

Length, $2\frac{1}{4}$ inches. Locality, Barrier Reef.

ONAR N.G. POMACENTRIDÆ ?

Pungent spines of the dorsal few. Dentition labroid, none of the bones of the head curved. Scales ctenoid. Lateral line resumed. Branchiostegals five.

ONAR NEBULOSUM.

D. 2/17. A. 3/14. Lat. 46. Tr. 3/14.

The height of the body is $4\frac{1}{3}$, the length of the head 4 in the total length. Orbit 3 in the length of the head.

Lower lateral teeth short, stout, conical close set, canines one pair in front. Upper laterals small transversely compressed on edge of the jaw, canines, two pairs, small. The first two rays of the dorsal the shortest, pungent, the rest flexible. Lateral line ending beneath the soft dorsal on the 32nd scale and resumed below on the 36th. Lower jaw protruding and teeth exposed. Lips thin, cheeks with five rows of scales, caudal scaly at base. Dorsal a little scaly at posterior end. Brownish black, each scale with a round black spot at the base. Fins black.

Locality, Murray Island. Collected by Mr. K. Broadbent.

This form seems a link between the Pomacentridæ and Labridæ.

CHŒROPS ALBIGENA.

D. 13/7. A. 3/10. Lat. 29. Tr. 3/8.

The height of the body is less than a third, the length of the head less than a fourth of the total length. Snout and preorbital $2\frac{2}{3}$ in the length of the head. Scales of cheeks not imbricated, caudal truncate, no posterior canines. Violet brown, chin yellowish white; anal with four pale longitudinal bands. A dark blotch (sometimes obsolete) on the back beneath the ninth dorsal spine.

Locality, Cape York. Collected by Mr. K. Broadbent.

CHŒROPS OLIVACEUS.

D. 13/7. A. 3/10. Lat. 28. Tr. $3\frac{1}{2}/8\frac{1}{2}$.

No posterior canine. Scales of the cheeks rudimentary in regular distant rows Preorbital (from snout to orbit) $\frac{1}{2}$ of the length of the head. Preoperculum entire.

Colour (in spirits) olive green to rosy green on the post abdomen, anterior portion of the base of the anal pale with 3 rose coloured bands and another along the base. A pale blotch beneath the posterior half of the soft dorsal.

Length, 2 inches. Locality, Barrier Reef (Cardwell), Cape York.

The living fish appears to be streaked with red on the abdomen and lower half of the caudal peduncle.

CHŒROPS CONCOLOR.

D. 13/7. A. 3/10. Lat. 27. Tr. 2/8.

No posterior canine. Serrature of preopercle distinct. Head longer than high, snout pointed. Preorbital high $2\frac{4}{5}$ in the length of the head. Scales on the cheeks not imbricate.

Colour uniform greenish brown (dry). Caudal with numerous faint brown bars near the tips. Anal with two or three pale longitudinal bands.

Length, $5\frac{1}{2}$ inches. Locality, N. E. Coast.

CHŒROPS UNIMACULATUS.

D. 13/7. A. 3/10. Lat. 27. Tr. 2/8.

No posterior canine. Serrature of preopercle rather coarse. Head much longer than high. Snout obtuse. Preorbital $\frac{1}{5}$ in the length of the head. Scales on the cheeks not imbricate.

Colour light brown (in spirits) with hardly appreciable broad cross bands. Fins immaculate. A bright oval spot below the end of the soft dorsal. Middle of the operculum rather bright.

In a younger example the body and preorbital are somewhat less deep; the general colour darker, nearly black at the root of the caudal and round the oval spot and the end of the upper lobe of the caudal numerous short dark brown bars composed of spots on the rays.

Length, 4 inches. Locality, Barrier Reef.

CHŒROPS PERPULCHER.

D 13/7. A. 3/10. Lat. 28. Tr. $3\frac{1}{2}$/10.

No posterior canines. Preoperculum entire. Cheeks with a few embossed scales towards the limb of the preopercle. Caudal very rounded or a little produced in the middle. Canines $\frac{4}{4}$, the outer lower pair very long outwardly curved. The middle upper long curved forwards.

Colour, recent, forehead from upper lip to nape blue crossed by narrow orange lines. Chin with blue descending lines. Between nape and dorsal flame red. Opercula with small orange spots enlarging posteriorly. A blue line across the base of the pectoral a few others above the the axil. Behind the pectoral an indistinct dark oblique band. Last ray of pectoral bright blue edged with cinnamon. Body bluish green, base of most of the scales blue. Dorsal edged with cinnamon with the free tips blue, base yellowish, above it oblique blue streaks and a blue longitudinal band. Anal bright blue at the base, pale yellow in the middle, near the margin pale blue with golden spots. Tail blue with broad close wavy yellowish brown bands. Teeth blue.

In spirits the colours mostly disappear, in dry specimens almost entirely.

Length to 14 inches. Locality, Moreton Bay.

Chœrops graphicus.

D. 13/7. A. 3/9-10. Lat. 27-28. Tr. 3/9.

The height of the body is 3 to $3\frac{1}{8}$, the length of the head 4 nearly in the total length. Orbit 5, snout less than 3, interorbit 4 in the length of the head. No posterior canine. Preoperculum not serrated. Scales of the cheeks in 8 series, subimbricate. Preorbital $2\frac{1}{2}$ to $3\frac{1}{4}$ in the length of the head. Yellowish grey to brown with seven or eight broad black cross bands confluent in the middle or on the dorsum. In one example a distinct black spot on the lateral line opposite the 6th and 7th dorsal spine. Teeth blue. Fins immaculate.

Length to 14 inches. Locality, Queensland Coast (Cardwell.)

Cossyphus latro.

D. 12/9. A. 3/11. Lat. 33. Tr. 5/12.

The height of the body is $3\frac{1}{2}$, the length of the head $3\frac{4}{5}$ in the total length. Orbit 7 preorbital $3\frac{1}{2}$ in the length of the head. Ventral $\frac{3}{4}$ of the height of the body. Both limbs of the preoperculum naked and entire. Nine series of scales on the cheeks decreasing to four behind the orbit. Lateral teeth of lower jaw distinct and large. Caudal rounded in the middle edge, the lobes elongated. Ventrals with the outer rays gradually elongated. The eight anterior spines of the dorsal without scales at the base, increasing in length to the 4th and 5th, then decreasing, the ninth one third longer, and together with the rest of the fin and the anal scaly at the base. The first dorsal spine stands over the middle of the pectoral.

Colour of body (dry) yellowish. The scales margined with grey, and each with a dark medial streak near the tip constituting continuous lines. The eight anterior dorsal spines and webs black. A black blotch at the base of the middle caudal web, another on the base of the pectoral. Ventral streaked longitudinally with black.

Length, 20 inches. Locality, Moreton Bay.

LABRICHTHYS GUNTHERI. Blk.

A fish occurs in Moreton Bay which may possibly be the one named by Dr. Bleeker, *L. Guntheri.* If it be so it is either variable in colouring to an unusual extent or it has suffered from a too imperfect description. Though I should prefer to think the latter alternative impossible so much doubt remains in my mind as to the identity of the fish with *L. Guntheri* that I venture to give its characters.

Lat. 26.

Posterior canine very small. Cheek with four series of scales. Tubercles of lateral line unifurcate. Canines $\frac{2}{4}$? Caudal slightly rounded with the lobes a little produced.

Recent colour, green, in one specimen rosy green on the trunk, oil green on the back, blue green on mouth and chest, yellowish green on the base of the caudal. Six red stripes radiate from the eye, the upper postorbital one extending on the body, above it a broader red band traversing nine cross bands which are more distinct above the longitudinal band and extend on the base of the dorsals. From the angle of the mouth a red band running beneath the pectoral to the abdomen. Base of the caudal with two oblique blotches, the hinder half golden brown with the webs stained with purple. Spinous dorsal red between the first three spines, with a black blotch in the centre and the base yellow. Soft dorsal mingled green and red, the red predominating posteriorly and forming a broad margin. Anal with three red longitudinal bands and a sky-blue margin. Pectoral red with a black axillary spot. Throat golden brown, the preopercle and opercle tinged with the same. The upper teeth consists of a pair evidently canines, the next on each side very much smaller, can only rank as the first of the diminishing series behind it.

LABRICHTHYS CRUENTATUS.

Lat. 27.

A posterior canine. Scales of the cheeks in four series, the upper two the larger. Canines two above and probably four below. Tubules of scales twice, or once dichotomous, caudal truncate.

Colour, recent, reddish olive with stains of crimson on the base of pectoral, and on the dorsal and anal especially along their bases. Rest of the fins green. A spot on the axil and one between the 3rd and 4th dorsal spines deep blue. Pectoral and upper lip pinky yellow.

Length, 7 inches. Locality, Moreton Bay. Collected by Captain Towneley, St. Helena.

LABRICHTHYS SEXLINEATUS.

A posterior canine. Scales of the cheeks in three series. Canines $\frac{2}{4}$. Tubules of scales bifid. Caudal truncate.

Colour, (in spirit) upper half of the web between the first three dorsal spines black, an obscure dark blotch on the base of the caudal above and below, a black stripe along the back from the upper part of the orbit, two on the side converging towards the orbit and continued as one on the snout, the upper commencing on the caudal peduncle as black spots, the other vanishing beneath the pectoral, the fourth obscure, from the infra orbital to the base of the pectoral, the fifth from the angle of the preoperculum passes below the pectoral to the abdomen, the sixth on the chest and abdomen. Two obscure stripes on the lower side of the caudal peduncle. Dark blotches on the anterior part of the web of the soft dorsal, above them a faint narrow dark band.

Length, 4 inches. Locality, Barrier Reef.

LABRICHTHYS REX.

Lat. 26.

A posterior canine. Six rows of scales on the cheeks, two behind the orbit. Caudal subconcave, lobes a little prolonged. Canines $\frac{2}{4}$.

Colour, recent, olive brown to olive grey, stained more or less with pink with six indistinct subvertical bands across the trunk. Two oblique bands converging towards the end of the caudal peduncle and a broad one across the middle of the caudal. A broad black band on the centre of the first four dorsal webs and spines. Soft dorsal pink with or without three cloudy patches at the base. Anal pink posteriorly. A greater or less pink patch on the cheek. Two dark lines from the orbit to the lips and two running backwards to the edge of the opercle. A black axillary spot. A line from the angle of the mouth to the side of the chest.

In spirits variable, more or less of the pink stainings being destroyed, a little on the dorsal and anal however usually remains. In pale specimens the lower postorbital line is undulated on the opercle or both lines are continued as longitudinal bands along the back.

Length 5 inches. Locality, Moreton Bay. Collected by Captain Townley, St. Helena.

LABRICHTHYS MACULATUS.

Lat. 27.

A posterior canine. Scales of the cheeks in four series. Canines $\frac{2}{4}$. Caudal short, truncate. Tubules of lateral line widely bifid.

Colour olive yellow. Two dark streaks from the upper lip through the eye to the edge of the operculum. A double line of black spots on the posterior half of the trunk over the lateral line. The first two dorsal webs black. Fins orange red. A faint yellow line along the middle of the anal.

Length, $4\frac{1}{2}$ inches. Locality, Moreton Bay. Collected by Captain Townley, St. Helena.

LABRICHTHYS NUDIGENA.

Lat. 27.

A posterior canine. Scales of the cheeks in one infraorbital series. Canines $\frac{2}{2}$. Caudal subconvex. Tubules of lateral line simple. Height $4\frac{1}{3}$ in the total length.

Colour (dry) brownish grey, head and fins yellow. A broad ill-defined dark streak down the operculum. Each scale of the upper part of the trunk with a dark vertical streak. A black blotch on the middle of the upper side of the caudal peduncle.

Length, $4\frac{1}{2}$ inches. Locality, Barrier Reef.

TORRESIA LINEATA.

D. 13/7. A. 3/10. Lat. 27.

Height of the body $2\frac{1}{2}$, length of the head $3\frac{1}{4}$ in the length of the body, s.c. Orbit and snout each 4, interorbit $3\frac{1}{2}$ in the length of the head.

Four lower canines, the two laterals of the upper jaw minute. Upper profile tumid over the nape, the lower over the post abdominal region. Nape tubuliferous.

Colour yellowish brown, with numerous bluish longitudinal stripes on the trunk formed by the pearly centres of the scales. Head with four blue stripes diverging backwards over the cheeks and opercles, the lowest from the angle of the mouth to the chest. A black blotch on the dorsum extending on the base of the posterior third of the dorsal fin. In a second example the fish is uniform in colour except the dorsal blotch.

Length, 4 inches. Locality, Cardwell.

PSEUDOJULIS ZICZAC.

D. 9/12. A. 3/11. Lat. 28. Tr. 2/9.

The height of the body and length of the head each 4 in the total length. Caudal truncated. Ventrals produced beyond the origin of the anal. Brownish white. A broad dark band of ziczac markings (distinct when recent) from the snout below the eye to behind the soft dorsal. A salmon coloured stripe from the angle of the operculum to the abdomen. Blotches of the same on the cheeks and opercles A longitudinal band of the same near the base of the anal. Dorsals very pale salmon with a central paler band. Base of caudal orange.

Locality, Murray Island. Collected by Mr. K. Broadbent.

PSEUDOJULIS MURRAYENSIS.

D. 9/11. A. 3/11. Lat. 27. Tr. 1½/8.

The height of the body and length of the head are each 4 in the total length. Caudal rounded, yellowish. A broad blackish band occupies the middle of the side of the body. A dark spot behind and before the eye and on the snout. Anal with four small bright black spots on each web. Dorsals with fainter spots more or less confluent on the spinous portion into oblique bands.

Locality, Murray Island. Collected by Mr. K. Broadbent.

Coris coronata.

D. 9/11. A. 2/11. Lat. 55.

The height of the body and length of the head each $4\frac{1}{2}$ in the total length. Caudal rounded. Anterior dorsal spines low. Body with three or four broad faint ill-defined bands across the back, the first sometimes as though composed of large spots. This ends above in a dark spot on the anterior dorsal spines and a distinct band across the base of the pectoral. A spot before and behind the eye, one on the side and another near the rays of the nape. These form together a circle of spots around the head, but are sometimes replaced by small irregularly scattered spots on the head. Under parts pink, the base of the scales bearing each a pink triangle. The dorsal bands sometimes nearly obsolete, the pectoral band and soft dorsal ocellus constant.

Locality, Murray Island. Collected by Mr. K. Broadbent.

Heteroscarus tenuiceps.

D. 14/9. A. 2/12. Lat. 36. Tr. 4/8. V. 1/4. P. 14.

The height of the body is $2\frac{1}{2}$, the length of the head 3 in the length, s.c. Orbit $4\frac{1}{2}$, snout and interorbit each $3\frac{1}{2}$ in the length of the head. Lower jaw with a median suture. Head naked, minutely rugose, profile sloping at a low angle from the dorsal and tumid over the orbit. Three series of scales on the operculum. Jaws equal. Preoperculum denticulated. Anterior dorsal spines not filamentose. Dorsal and anal sheathed at their base.

Colour, after long maceration in spirits, ferruginous with a few brown blotches. No markings discernible.

Length $2\frac{1}{2}$ inches. Received from the South Australian Institute.

In a second specimen the attenuation of the head is not so pronounced. The fish is evidently very near to *H. Castlenaui*, Macl., but it has the normal number of anal spines, and the abnormal median suture in the lower jaw, and it has no trace of lines upon the head.

JULIS VENTRALIS.

D. 8/13. A. 2/10. Lat. 28. Tr. 3/9.

The height of the body is $3\frac{2}{3}$, the length of the head 4 in the length s.c. Orbit and interorbit each 4, snout 3 in the length of the head.

Head blue black with obscure green streaks, one above the eye to the lateral line, one from the snout touching the lower edge of the orbit and going to the base of the pectoral, the third produced from the lower edge of the body colour as a bright blue green streak to the subopercle, thence obscurely to near the angle of the mouth, where it curves down to meet its fellow of the opposite side on the chin, on which there is before it another transverse streak, from its centre a longitudinal streak runs along the median line of the belly. Between these three green lines the thorax and belly are of a copper red colour. Body green, each scale brownish at the base. Pectoral green with a broad chocolate band near its upper edge. Hinder part of spinous dorsal with a band of white-edged green spots at the base. A mesial chocolate streak extending forwards and a yellow marginal band. Anal chocolate at the base, green in the middle, yellow on the edge. Caudal yellow, lobes edged above and below with green, enclosing a reddish orange streak.

Length, 5 inches. Locality, Moreton Bay. Collectedby Mr. G. Watkins, Dunwich.

Allied to *J. Aneitensis.*

JULICHTHYS, n.g.

Dorsal with eleven spines. A posterior canine. Scales of the thorax comparatively small. Cheeks and opercles nearly naked. Anterior canines $\frac{2}{2}$. Lateral line continuous.

JULICHTHYS INORNATA.

D. 11/11. A. 2/11. Lat. 28. Tr. 3/10.

The height of the body is $4\frac{1}{3}$, the length of the head $4\frac{1}{2}$ in the total length. Suborbital 4, orbit 5, interorbit 4 in the length of the head. Snout pointed, head attenuated. Cheeks with one series of piercedinfraorbital scales. Operculum with one or two rudimentary scales. Tail subtruncate. Dorsal spines gradually lengthening posteriorly. Lateral line deflected on the 20th scale. Tubules simple except the first three which are bifid.

Pale yellowish (dry). Trace of a black spot behind the orbit, of a curved mark from the angle of the mouth across the preopercle, of a bluish coloration on the opercle and a dark one on the sides of the trunk. A small dark spot on the base of the pectoral Scales of the posterior part of the body with one, occasionally two, dark brown dots, of the fore part below the lateral line each with a dark vertical streak.

Length, 6 inches. Locality, Barrier Reef.

Platyglossus punctatus.

D. 9/11. A. 2/11. Lat. 30. Tr. 3/10.

The height of the body and length of the head are each $4\frac{1}{2}$ in the total length. Caudal rounded. Light pinky yellow, each scale of the upper parts with a small blue spot on the base. A blue edged pearly ? bar from the orbit to the snout. A dark blotch behind the orbit and a light crimson one below it.

Locality, Murray Island. Collected by Mr. K. Broadbent.

Platyglossus amabilis.

D. 9/11. A. 3/11. Lat. 30. Tr. 3/10.

The height of the body and length of the head are each (nearly) 4 in the total length. Caudal rounded. Pale green. A pale violet bar from the snout through the eye over the operculum. A second from the angle of the mouth over the operculum, a third from the side of the chin over the suboperculum to the abdomen, a fourth along the chest and abdomen. A faint spot behind the orbit. Caudal largely tipped with rich violet and with a spot of the same on the upper part of its base.

Locality, Murray Island. Collected by Mr. K. Broadbent.

Platyglossus equinus.

D. 9/11. A. 2/10. Lat. 27. Tr. 2/8.

The height of the body is $4\frac{1}{5}$, the length of the head $3\frac{3}{4}$ in the total length. Caudal a little rounded. First ventral ray produced.

Lilac grey. A large oval white patch on the cheeks enclosing a horse shoe shaped dark edged blue band. A similar band from the orbit to the angle of the mouth. On the operculum a curved band edging the white patch and enclosing a blue dot in its upper rounded end, a dark blue patch on the angle. A ring on each side the nape, a horse shoe mark on the vertex. Body marbled with purplish brown on its upper part descending in broad irregular bands over the postabdomen. Soft dorsal with a series of pale spots along the base and a black blotch on the anterior rays and webs, traces of pale spots in rows on the spinous dorsal. Caudal with six brown bars across its middle rays. A deep blue axillary spot.

Length, 6½ inches. Locality, Barrier Reef (Cardwell).

Pseudoscarus flavipinnis.

D. 9/10. A. 3/9. Lat. 25. Tr. 1½/6.

The height of the body is 3½ nearly, the length of the head 4 nearly, in the total length. Orbit 4, snout 3 in the length of the head. Three series of scales on the cheeks; one series on the lower limb of the preoperculum. Upper lip thin. Dental ridges slightly grooved and nicked on the edge. No corner tooth. Caudal subtruncate. Yellowish brown, paler beneath. The scales striated with brown, fins yellowish.

Locality, Cape York. Collected by Mr. K. Broadbent.

Pseudoscarus strigipinnis.

Three series of scales on the cheeks, the lowest composed of five on the preopercular limb, the middle series composed of six scales. Upper lip narrow, leaving the jaw exposed. Jaws white without pointed teeth at the angle. Dorsal spines subequal in length. Pectoral with fourteen rays. Caudal short, truncate with three long jointed scales at the base. Grey, clouded with darker grey. Fins black, the caudal with alternating white longitudinal stripes equalling the black intervals in breadth. Dorsal, anal and pectoral, with irregular white lines and streaks in the direction of the rays. All the white streaks appearing as if laid on with pigment.

Length, 6 inches. Locality Cardwell.

Pseudoscarus fuscus.

Two series of scales on the cheek and two scales on the lower preopercular limb; the middle series composed of five scales. Upper lip broad. Jaws whitish with pointed teeth at the angle. Thirteen pectoral rays. Caudal lobes prolonged. Uniform brownish olive, vertical fins darker. Caudal white on its posterior edge.

Length, 10 inches. Locality, Barrier Reef.

NOTE ABOUT THE TEMPERATURE OF THE SEA WATER ALONG THE EASTERN COAST OF AUSTRALIA, OBSERVED IN JULY 1878 AND 1883.

By N. de Miklouho-Maclay.

Having found a complete absence of published records of observation of the temperature of sea water on the Coasts of Australia, I venture to submit tc the Society these very limited observations, hoping that they may be of some use for Zoologists who are interested in the geographical distribution of marine animals.

On my way from Singapore to Sydney in 1878, it appeared interesting to me to observe the temperature of the sea water as we were steaming near the coast of Australia. I used to do it every day at noon with a very exact thermometer of Grainer in Berlin (well compared with the Standard Thermometer of the Meteorological Observatory of Batavia), leaving the same each time over ten minutes in the bucket of sea water, which was hauled up from the sea just before the observation.

Before submerging the thermometer in the water, it was left suspended for half-an-hour or more in a shady place under the awning, to ascertain the temperature of the air.

THESE OBSERVATIONS ARE FOLLOWING :—

July.	Lat. South.	Long. East.	Near what Place.	Temperature of Sea Water.	Appearance of the Sea.	Temperature of the Air.	Appearance of the Sky.
8	11° 47′	143° 09′	......	27° 5 C.	Sea rough	21° 1 C.	Cloudy
9	14° 08′	144° 36′	......	26° 4 —	,, rough	27° 0 —	Clear
10	15° 26′	145° 15′	Cooktown	24° 5 —	,, rough	27° 5 —	Clear
11	17° 57′	146° 20′	Cardwell	24° 3 —	....	25° 6 —	Clear
12	19° 43′	148° 60′	Bowen	23° 6 —	....	23° 5 —	Clear
13	22° 09′	150° 40′	......	22° 8 —	,, rough	21° 5 —	Clear
14	23° 55′	152° 22′	P. Curtis	21° 5 —	....	20° 0 —	Clear
15	26° 41′	153° 23′	......	22° 4 —	Current from N.	20° 0 —	Clear
16	27° 48′	153° 37′	......	22° 0 —	,, rough	20° 0 —	Clear
,,	At Anchor Mor	eton Bay	......	20° 5 —	,, calm	20° 0 —	Clear
17	31° 04′	152° 24′	......	22° 0 —	,, rough	17° 8 —	Clear
18	Outside Sydney	Heads	......	19° 0 —	,, rough	17° 0 —	Clear
,,	At Wharf Darl	ing Harbour	......	14° 7 —	,, calm	17° 0 —	Clear
20	,, ,,	,, ,,	......	15° 0 —	,, calm	18° 5 —	Clear*
,,	Outside Sydney	Heads	......	18° 0 —	,, calm	18° 5 —	Clear
21	36° 06′	150° 10′	......	15° 5 —	,, calm	15° 0 —	Clear
22	38° 52′	146° 14′	......	12° 5 —	,, calm	15° 0 —	Clear
,,	At Port Phillip	Heads	......	13° 0 —	,, calm	14° 5 —	Clear
,,	At Sandridge	Wharf	......	11° 0 —	,, calm	16° 0 —	Clear

* For the observations from the 20th to the 22nd, I am indebted to Mr. St. John A. Biggs, Purser of the R.M.S. "Somerset," who was kind enough to continue with my Thermometer which I left on board for this purpose until the arrival of the ship in Melbourne.

On my return voyage from Hongkong to Sydney in June 1883, I had the opportunity to verify the correctness of these observations, and found that the list of temperatures obtained, agreed very closely with the former, taking into consideration the slight difference in the time of the year, and that the observations have not been made in both cases in exactly the same place.

DATE.	NEAR WHAT PLACE.	TEMPERATURE OF THE AIR.	TEMPERATURE OF THE SEA WATER
30th June	Hogestone Island	27° 2 C	26° 5 C
31st ,,	Cap. Sidmouth	26° 7 —	25° 9 —
2nd July	P. Douglas	27° 1 —	25° 4 —
3rd ,,	Townsville	25° 6 —	24° 0 —
4th ,,	Percy Islands	22° 3 —	24° 0 —
5th ,,	L. Elliot Islands	17° 2 —	23° 6 —
6th ,,	Glass Houses	22° 3 —	22° 1 —
7th ,,	Moreton Bay (on anchor)	20° 5 —	18° 0 —(1)
8th ,,	P. Danger	19° 6 —	22° 0 —
9th ,,	Solitary Island	20° 1 —	21° 7 —
10th ,,	Broken Bay	17° 8 —	18° 8 —
,, ,,	Sydney Heads	,,	18° 5 —
,, ,,	Port Jackson	,,	16° 2 —(2)

The steamers on the Eastern Coast of Australia follow a track from 5 to 10 miles (seldom more) distant from the shore, and the average depth of the sea in this track varies from 12 to 60 fathoms. (See Admiralty Charts.)

The current which runs from the northward (with a velocity of 1 to 3 knots) (3) on the Eastern Coast of Australia, from about the latitude of Brisbane, is, as we know, a part of the current which having followed the tropic of the Capricorn divides in two branches on the south end of New Caledonia; one in the direction towards Torres Straits, the other along the coast of New South Wales, turns near Cape Howe towards New Zealand. This current is a warm one and explain the reason why the sea water at the Heads of Sydney Harbour is about 7° C warmer than the

(1). An hour before anchoring at Moreton Bay, I found the temperature of the sea water to be 23° 3, and leaving the bay and passing Stadbroke Island outside the temperature of the sea water was 22° 5.

(2). The place of observation was passing Camp Cove.

(3) Wellbank's Australian Nautical Almanac, 1884, p. 280.

water on the Western South American coast in about the same latitude (Valparaiso) (4), which on the other hand is, on account of the cold Peruvian current, lower than on the Eastern Coast of South America, in the Atlantic Ocean, where (in the latitude of 42° and 43° south) the temperature of the sea water on the surface varies between 14° 0 and 14° 5 C (5).

My fragmentary observations of sea temperature prove also, that during the winter months, the sea water in comparatively shallow bays in Port Jackson (in Darling Harbour the depth is from 3 to 5½ fathom) is much colder than the water of the ocean. It is very likely that in the hot summer months the reverse is the rule, i.e., that the water of the ocean is colder than the water in the Bay.

ON TWO NEW SPECIES OF MACROPUS FROM THE SOUTH COAST OF NEW-GUINEA.

(Plate XXXIX.)

By N. de Miklouho-Maclay.

Amongst the collection of Mammals from New Guinea in the Macleay Museum, two undescribed species of Kangaroo attracted my attention. Through the well-known kindness of Mr. W. Macleay, I had the opportunity of examining the specimens sufficiently to enable me to bring the following remarks and description before this Society.

Both were remarkably alike in the general proportions of the body and the colour of the fur. One was smaller than the other, which difference however, I accounted for its being a female. But the closer inspection of its incisors (Fig. 5 and Fig. 8), presented

(4). I found the temperature of the sea water on the surface in the harbour of Valparaiso (in May, 1871) to vary from 12° 0 and 12° 5 C.

(5). Vide: my letter on the way to New Guinea in 1871, published in the "Iswestija" of the Imp. Russ. Geograph. Soc. of St. Petersburg.

such diversity in shape, that it cannot be explained, I believe, as a sexual difference and therefore, I find myself obliged to distinguish them as two different species.

The general shape of the body, principally the greyish brown colour of the fur, greatly resembles Dorcopsis luctuosa, but the hair on the neck directed backwards and the large incisors contradict this supposition.

Having been informed by Mr. Masters, the Curator of the Macleay Museum, that a few skins of some New Guinea Kangaroo's, purchased by Mr. Macleay from Mr. Goldie, were preserved in spirits, I examined them at the first opportunity and had the good chance of finding amongst them a skin, with the skull, of one of the new species, which discovery put me in the position of examining the dentition and of making the description of this species more complete.

The shape of incisors, the absence of canines, the smallness of premolars and the direction (backwards) of the hair on the neck are reasons why I include the two new species in the Genus Macropus. One of them I have called in honor of J. Beete Jukes, the distinguished naturalist of the surveying voyage of H.M.S. Fly in Torres Straits and New Guinea during the years 1842-46.

1. Macropus Jukesii. n. sp.

♀. From the hills near Anuabada (Port Moresby) on the South Coast of New Guinea. (Stuffed specimen in the Macleay Museum.)

Measurements.

From tip of nose to base of tail......	635 mm.		24,8 in.
Tail ,, ,, ,, ,, ...	370 —		14,6
From tip of nose to occiput	124 —		4,9
Fore limb ,, ,, ,, about....	170 —	or about	6,7
Hind limb ,, ,, ,, about....	330 —		13,0
From head to the end of nail of 4th toe	142 —		5,6
Length of the ear..................	44 —		1,7
Circumference of tail near base......	124 —		4,9

Colour of the fur. The head, back and external sides of the limbs dark grey. The underside of the body from the chin to the end of the tail of light grey colour.

Muffle bare.

Tail slender, on the under side nearly bare, on the upper covered with short dark hair. No white tips to the tail.

I have already mentioned, that I had the opportunity of examining the skull of M. Jukesii, but unfortunately, the skin before it arrived in Sydney had been preserved in common salt, which mode of preservation had the result, that the bones and teeth of the specimen were covered with a thick layer of some white stuff, which, though not interfering with the general shape of the skull, rendered the examination of the sutures as well as other minor osteological details of the same very difficult. Wishing to get rid of this white interfering cover, I tried to dissolve it in boiling water but not having succeeded, I went to Dr. A. Leibius to find out about its chemical nature. It proved to be magnesia (*), which could only be dissolved by boiling the skull in a solution of muriatic acid.

Fearing however, that even a very weak solution of acid would destroy the thinner bones, I preferred to abstain from the experiment and to remove as much as possible the white crust mechanically by scratching it off with a scalpel. I succeeded only partly, some of the suture remained still not distinct and the molars could not be made free from the incrustation of magnesia, without destroying them.

The *skull* is elongated ; examined from above (Fig. 2) shows two very marked ridges running from the orbital margin of the frontal bone, along the parietalia, to the external corners of the imparietal bones.

Examined from the side, (Fig. 1) the skull appears not of great height in the region of the fronto-parietal suture and shows a very marked bending of the premaxillary region downwards. The apex of the angular process of the inferior margin of the zygoma is opposite the posterior cusp of the second molar. The palate

* Dr. A. Leibius who kindly examined the above-mentioned white substance, expressed the opinion that the magnesia crust on the skull was probably the result of *decomposition of magnesium cloride*, which is nearly always contained in the unpurified common salt, which had been used in this case for preserving the skin. The other product of this decomposition—chlorhydric acid—had the effect of softening the bones. I think this case shows sufficiently the unfitness of using unpurified ordinary salt for preserving Zoological specimens.

presents some strongly marked transversal folds, of the disposition of which, a glance on Fig. 3 can give a better idea than a long description. The anterior part of the palate, between the second lateral incisor and the first transversal fold is only half the width of the palate between the 3rd and 4th molar.

Dentition. $\frac{3}{1}$i, $\frac{1}{1}$pm. $\frac{3}{4}$m. (Fig. 3 and Fig. 4.)

Incisors. (Fig. 5 and 6.) The first, is a little longer than the other two, the second little smaller than the first and third and the third broader than the first and second. The lower margin of the third incisor is not a straight line but an angular one and presents on his posterior lower corner an indication of a fold which is rather easy to discern only when the skull is taken out. (Examining the incisors of the stuffed specimen, I was not at all sure about the existence of the fold and convinced myself of it only after having examined the skull.)

The third incisor inspected from below (Fig. 6), consists of two longitudinal, parallel edges, of which the interior is lower than the exterior. The third incisor of Macropus (Halmaturus Thetidis (*) is a little like the corresponding tooth of Macropus Jukesii.

Premolars. The upper premolar is not larger (broader) than the first molar. On the cutting edge of the upper premolar 2 anterior cusps and a 3rd longer and less pointed one are distinctly to be seen. The lower premolars are smaller than the upper and have also 3 marked cusps on the cutting edge.

The anterior cusps of premolars of both jaws are the most distinct and the most pointed. The incisors and premolars have suffered less from the effect of the salt than the molars, where the crust of magnesia could not be removed without destroying the teeth, *i.e.*, breaking also away pieces of enamel. Notwithstanding the crust the usual shape of the molars of Macropodidæ could however easily be discerned, as well as that the transversal ridges only of the first maxillar and of the first and second mandibular molars have been to a certain extent worn down.

(*) *Waterhouse.* Mammalia II., p. 194, pl. 3, fig. 2 c. and d.

On the lower jaw 3 molars on each side are to be found, with the tops of the crown of the 4th just appearing.

2. Macropus gracilis. n. sp.

(Fig. 7.)

♂. From the hills near Annabada (Port Moresby), on the South Coast of New Guinea. (Stuffed specimen at the Macleay Museum.)

Measurements.

From tip of nose to base of tail.....	725 mm.	or about	29,3 in.
Tail ,, ,, ,, ,, ...	385 —		15,2
From tip of nose to occiput	138 —		5,4
Fore limb ,, ,, ,, about....	220 —		8,7
Hind limb ,, ,, ,, about....	410 —		16,2
From head to the end of nail of 4th toe	162 —		6,4
Length of the ear.........	58 —		1,9
Circumference of tail near base	128 —		5,0

Muffle bare and split vertically in the median line.

Colour of the fur. Head, back, external side of limbs dark brownish-grey, the underside of the body, from the chin to the end of the tail, of light grey colour. On the head, from the upper lip to under the eye, a light coloured band is noticeable.

Nails long and sharp ; on the middle finger 17 mm. (about 0.7 in.) on the 4th toe 32mm. (about 1·3 in.) long.

Tail. One third of the upper side covered with dark grey hair, on the other two third hair scarce, on the under side nearly bare. The white tip of the tail is quite distinct.

As already mentioned, these two species present very slight differences: the fur of M. gracilis is a little browner than of M. Jukesii, the tail in proportion to the body and the distribution of hair on the same shows trifling differences. Therefore I am very sorry not to have had the chance of obtaining a skull of M. gracilis the examination of which could, I think, decide the question if these differences are specific or only sexual.

Not having the skull, all I know about the dentition of M. gracilis is restricted to the result of the examination of the incisors from the outer side and the fact of the absence of the d. canini (which fact as well as the direction of the hair on the neck authorise me to describe this animal as a Macropus.)

Fig. 8 represents the lateral view of the incisors of M. gracilis (four times the nat. size) and Fig. 5 the corresponding teeth of M. Jukesii (four times the nat. size).

The comparison of these two figures, shows very marked difference in shape which I do not think could be recognised as sexual differences only, and until it is proved, that the dentition of Kangaroos varies *to such an extent*, according to the sex, the described two species have to stand separate.

EXPLANATION OF PLATE XXXIX.

Fig. 1.—Lateral view of a skull of *Macropus Jukesii, Mcl.* (Nat. size.)

Fig. 2.—Superior view of the same. (Nat. size.)

Fig. 3.—Teeth of the upper jaw and the palate, with the transversal folds of *M. Jukesii.* (Nat. size.)

Fig. 4.—Teeth of the lower jaw. (Nat. siz.)

Fig. 5.—Lateral view of the incisors of *M. Jukesii.* (Four times nat. size.)

Fig. 6.—Under surface of the 3 right incisors. (Four times nat. siz.)

Fig. 7.—*Macropus gracilis, Mcl.* (Sketch after a stuffed specimen of the Macleay-Museum.)

Fig. 8.—Lateral view of the incisor of *M. gracilis.* (Four times nat. size.)

THE HOMOCŒLA HITHERTO DESCRIBED FROM AUSTRALIA AND THE NEW FAMILY HOMODERMIDÆ.

By R. v. Lendenfeld, Ph.D.

THE HOMOCŒLA.

The simplest of all Sponges doubtlessly, are the Asconidæ and the Physemaria.

The Sponge nature of the latter however, is not sufficiently acknowledged for them to be placed in the Class Spongiæ, and so those Sponges appear as the least developed, which possess a non-differentiated Entoderm, where flagellate cells cover the whole of the Entodermal surface.

I. SUBORDO HOMOCŒLA.

Polejaeff, 1884 (1.)

THE WHOLE OF THE INNER SURFACE COVERED BY THE SAME KIND OF FLAGELLATE CELLS, NO DIFFERENTIATION OF THE ENTODERMAL EPITHELIUM.

Polejaeff (l.c.) made this group, which I recognize here as a Suborder for the Asconidæ of Haeckel, because he justly considers the Lenconidæ, Syconidæ and Carter's Teichonellidæ much nearer related to one another than to the Asconidæ.

(1.) *N. Polejaeff.* Report on the Calcarea, Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 22.

If we were not to attach great importance to the chemical nature of the skeleton we would have to place the Physemaria—those that are Sponges—in this Suborder because they resemble the Asconidæ very closely. I think it very probable that this will be done in future, when the Embryology of these doubtful organisms is better known.

1. FAMILY. ASCONIDÆ. Claus (1.)

HOMOCŒLA WITH A PLAIN POROUS BODY WALL, WITHOUT ANY COMPLICATION OF THE INNER SURFACE.

The Asconidæ are identical with Haeckel's (2) Ascones. Polejaeff (l.c.), comprises all species in Bowerbank's (3) Genus Leucosolenia. Although the difference between the Genera of Haeckel may in many cases appear trivial, I shall nevertheless adopt them here. The soft parts of only very few have been studied, so that any classification must appear preliminary.

1. GENUS. ASCETTA. Haeckel, 1872.

Asconidæ possessing triradiate spicules only.

1. SPECIES ASCETTA PRIMORDIALIS. E. Haeckel.

Prosycum primordialis. E. Haeckel.
Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift fur Medicin und Naturwissenschaft, 1870. Band V., Heft. 2, p. 236-257.

Olynthus simplex. E. Haeckel.
Prodromus, l.c., p. 237.

Leucosolenia dictyoides. E. Haeckel.
Prodromus, l.c., p. 243.

Soleniscus loculosus. E. Haeckel.
Prodromus, l.c.. p. 244.

Clathrina loculosa. E. Haeckel.
Prodromus, l.c. p. 245.

(1.) *C. Claus*. Grundzüge der Zoologie, IV., Anflage. Seite 221.
(2.) *E. Haeckel*. Die Kalkschwämme, eine Monografie. Band II. Seite 11.
(3.) *T. S. Bowerbank*. On the Anatomy and Physiology of the Spongiadæ. Transactions of the Royal Society of London. Vol. 152, p. 1094.

Auloplegma loculosum. E. Hackel.
Prodromus, l.c., p. 250.
Thecometra loculosa. E. Haeckel.
Prodromus, l.c., p. 254.
Ascetta primordialis, E. Haeckel.
Die Kalkschwämme Eine Monopraphie. Band II., p 16.

Triradiate spicules regular, with equal angles and rays; rays straight, slender conic or cylindrical proximally, distally semi-spindle-shaped, tapering from the middle; point of rays simple, sharp, without bulbous terminal extension (not inflated.)

Size of spicules very variable, generally the rays 0·1—0·15 x 0·008—0·012.

Special description and figures in Haeckel (Monografie der Kalkschwämme l.c.)

Colour: Generally white, sometimes yellowish or reddish, rarely pure sulphur yellow, gold yellow, menning red, crimson or brown.

Locality: Mediterranean, Nice, Naples, Messina, Gibraltar, Lesina, Haeckel; Adria, Zara, Sebenna, Lesina, Lagosta, Oscar Schmidt; Lesina, Heller.

Atlantic Ocean, Rio Janeiro, Wendt; Algoa Bay, Poehl; Cape Town, Wilhelm Bleek.

Red Sea, Frauenfeld, Mikluho.

Indian Ocean, Singapore, Putnam.

Coast of Australia, St. Vincent's Gulf, Wendt; Sydney, Sonder. Bass Straits, Wendt.

Pacific Ocean, Philippines, Semper.

Viti Islands, Graeffe.

Valparaiso, Trautmann.

2. SPECIES. ASCETTA POTERIUM. E. Haeckel.

Ascetta primordialis var poterium. E. Haeckel.
Die Kalkschwämme eine Monografie. Band II., Seite 17.
Clathrina poterium. Ridley.
Proceedings of the Zoological Society of London, 1881, p. 133.

Leucosolenia poterium. Poléjaeff.

Report on the Calcarea. Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 35.

Spicules differentiated, of unequal size. The spicules on the surface form a dermal membrane, consisting of several layers of spicules, with thick rays, which are only 6-8 times as long as thick. The spicules of the inner surface with slender rays, which are 16-20 times as long as thick. The dermal spicules 1-2 times as long, but 3-4 times as thick as those near the inner surface. Gastral cavity not fan-shaped.

It appears in the Auloplegma form, and possesses peculiar triradiate spicules in the peristomial membrane.

Interior spicules with rays 0·12—0·18 x 0·006—0·01 mm., dermal spicules 0·3 x 0·035 mm. Some Sub-dermal spicules show an incipient fourth ray.

Special description and figures in Polejaeff, l.c.

Colour: White and yellowish.

Locality: Australia (St. Vincent's Gulf, Wendt? Sydney, Sonder? Bass' Straits, Wendt. Station 163, April 4, 1874. Lat. 36° 50′ S. long., 150° 30′ E., off Twofold Bay; depth 120 fathoms, Challenger); South America (Tour Bay, South-west Chili, Alert.)

3, SPECIES. ASCETTA CHALLENGERI. Von Lendenfeld

Leucosolenia Challengeri N. Poléjaeff. Report on the Calcarea. Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 38.

A special set of triradiate spicules covering the outer surface of the colony. These are all sagittal, while the triradiate spicules of the interior are all regular. Solemiscus form. The diameter of the tubes varies from 0·3—0·8 mm.; the pseudopores are still narrower, rarely exceeding 0·28 mm. in diameter; the Oscula sparsely scattered here and there possess the same dimensions, or they are slightly larger. The whole forms an irregularly oval body 30 mm. long and 20 mm. broad in its thickest part, presenting a compact web of minute tubes and terminating in a short (2 mm.) peduncle, which is solid.

Skeleton: Two forms of spicules are to be distinguished, regular and sagittal.

The regular spicules possess slender rays, which are 0·18 mm. long and 16-20 as long as thick, cylindrical with rounded end.

The basal ray is sometimes rather longer than this, some of them show an incipient fourth apical ray.

The sagittal triradiate spicules are on an average of the same size as the regular; their rays, compared with those of the latter, are more conical, although there is no want of intermediate stages, they are not constant in their outline. With some of them the irregularity consists only in their not being flat, the point of meeting of the rays not lying in the same plane as their ends, the basal ray being in this case either of the length of the lateral rays or rather longer; but such a form is comparatively rare. The greater part also show variation in their angles; the angle formed by the basal, and each of the lateral rays varying from 120° to 92°; the length of the basal ray is in this case variable (0·12-0·25 mm.); it is either straight or undulating, the lateral rays being horn-shaped and curved, more or less, one towards the other. There exists also on the outer surface of the colony another constituent part of the dermal skeleton, namely, large regular triradiate spicules; each ray attaining a length of 0·8 mm. and a diameter of 0·06 mm; but these spicules are so extremely rare that they are of no importance.

Special description taken from Polejaeff (l.c.) where the Sponge is figured.

Colour: Yellowish.

Locality: Australia. Station 186, September 8th, 1874, lat. 10° 30′ S., long. 142° 18′ E.; Cape York, depth 8 fathoms. Coral sand, Challenger.

2. GENUS. ASCALTIS. Haeckel.

Asconidæ, with triradiate and quadriradiate spicules.

4. SPECIES. ASCALTIS LAMARKII. E. Haeckel.

Lencosolenia Lamarkii. E. Haeckel.
Prodromus eines Systems der Kalkschwämme, Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870. Band V., Heft. 2, p. 243.

Aulorhiza intestinalis. E. Haeckel.
Prodromus l.c., p. 250.

Ascaltis Lamarkii. E. Haeckel.
Die Kalkschwämme, Eine Monographie. Band II., p. 60.

Lencosolenia Lamarckii. Poléjaeff.
Report on the Calcarea. Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 36.

Triradiate and quadriradiate spicules regular, with equal angles and rays. Some of the triradiate spicules much larger up to three times as thick and long as the quadriradiate spicules.

Forms irregular masses on seaweed, which attain a diameter of 5-20 mm., consisting of mouthless colonies, which are composed of a net work of tubes.

Skeleton.—The quadriradiate spicules possess straight, conic rays; the apical ray is as long or shorter than the facial rays. vertical to the plane in which they lie. Often slightly curved, Rays 0·08—0·12 x 0·004—0·006 mm.

The triradiate spicules are of two sizes, the smaller ones are regular with rays of equal length as in the quadriradiate spicules. The larger ones often form a membrane in the outer surface, their rays measure 0·2—0·3 x 0·015—0·02 mm., they are mostly regular, like the smaller kind, a few however have paired rays.

Polejaeff's specimens possessed spicules which showed a greater tendency towards sagittal differentiation. The rays of the large triradiate spicules attained a size of 0·5 x 0·06 mm.

Special description and figures in Haeckel (l.c., Monographie.)

Colour: White or red.

Locality: North Atlantic Ocean; Coast of Marocco (Magador, Haeckel); Gibraltar (Tenarifa, Haeckel); Florida (Alexander

Agassiz); East Coast of Greenland (North Shannon, Pansah.) Australia (163 A, off Port Jackson, depth 30-35 fathoms, bottom, rock, Challenger.

3. GENUS. ASCANDRA. Haeckel.

Asconidæ with acerate triradiate and quadriradiate spicules.

5. SPECIES. ASCANDRA DENSA. E. Haeckel.

Tarrus densus. E. Haeckel.

Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft. Band V., Heft 2, p. 244.

Nardopsis gracilis. E. Haeckel.

Prodromus l.c., p. 247.

Ascandra densa. E. Haeckel.

Die Kalkschwämme. Eine Monographie. Band II., p. 85.

Triradiate and quadriradiate spicules regular of equal size. All the rays straight and pointed, cylindrical; apical ray half as thick, straight. Acerate spicule straight, truncate at both ends; the exterior end thickened, club-shaped, three to four times as long and five to six times as thick as the rays of the triradiate spicules.

Colonies consisting of entwined tubes, 8—10 mm. in diameter in Auloplegma-form or with a proboscis to the mouth.

Skeleton: The greater number of spicules are triradiate and regular. The rays measure 0·1—0·12 x 0·006—0·008 mm.

The quadriradiate spicules are few in number, and of the same size and shape as the triradiate spicules, regular with slender rays.

The acerate spicules are large, 0·5—0·6 x 0·03—0·04 mm., and protrude from the outer surface their distal ends are thickened, club-shaped, and rounded.

Special description and figures in Haeckel (l.c. Monographie.)

Colour: (Dried) white.

Locality: South Coast of Australia (Glenelg? Schomburgk.)

2. FAMILY. HOMODERMIDÆ. Von Lendenfeld.

HOMOCŒLA, THE INNER SURFACE OF WHICH IS COMPLICATED SO AS TO FORM RADIAL SACK-SHAPED EXCRESCENCES SIMILAR TO THE RADIAL TUBES OF THE SYCONIDÆ. (CILIATED CHAMBERS.)

I constitute this family for a small Sponge, which combines characters of the Syconidæ, with those of the Asconidæ. The whole of the Entoderm consists of flagellate cells, and we find the same Epithelium on the inner side of the Oscular tube, in the hollow peduncle and even in the Entoderm of the hollow stolons, which connect the different individuals of one colony; as in the sack-shaped excrescences, the homologa of ciliated chambers. Pores lead from the outer water not only into the radial tubes but also direct into the Gastral cavity.

I place this family in the group Homocœla, because I consider the "homodermic" character more important than the "asconic."

Haeckel (1) has described two Sponges, namely, Ascaltis canariensis and Ascaltis Lamarkii which show a similar structure of the body wall. He describes papillæ growing from it into the gastral cavity, papillæ into which the *outer* ectoderm is drawn and which are situated in longitudinal rows. It is evident that this complication is similar to the canal system of the Syconidæ. If these two species are not to be considered as Homodermidæ they are in any case transition forms between it and the Asconidæ proper, with a simple or irregularly folded gastral cavity.

GENUS. HOMODERMA (2). Nov. Gen.

Homodermidæ, with acerate triradiate and quadriradiate spicules.

HOMODERMA SYCANDRA. Nov. Spec.

Shape: From a creeping hollow stem homologous to the Hydrorhiza of Hydroids, tubes grow up which are about twice as

(1). From ὅμοιον δέρμα, the same kind of skin throughout.

(2). *E. Haeckel.* Die Kalkschwämme, eine Monographie. Band II., Seite 53-54 and 61.

thick in the middle than at either end, and which therefore appear spindle-shaped. These attain a height of 4 and a thickness of 1·5 mm., and possess two frills of acerate spicules round the mouth.

Viewed with the magnifying glass the outer surface presents a hairy appearance, and the Oscular frill is found to consist of two sets of spicules, one set longitudinal, parallel to the axis and the other set divergent.

The hairy appearance is caused by acerate spicules, which are situated in tufts, one tuft at the end of each of the numerous protruberances, which give the whole a papillate appearance.

These spicules are turned towards the Osculum, they are longest in the central part and shorter towards the narrow ends. The surface of the Spongorhiza, as I propose to call the creeping stems is covered with vertically projecting spicules, shorter than the others.

Structure: In the central part of the Sponge, where it is thickest, we find that tubes extend from the central Gastral cavity radially, perfectly similar to the ciliated chambers of the Syconidæ On the dermal surface each radial tube is found to project a good distance. In the vaulted ends of these chambers, as well as in the body wall, where no chambers are developed, numerous pores can be detected.

One might from this be led to suppose that my Homoderma Sycandra is only a young Sycon.

I must state that I have examined a great many specimens of this Sponge, and that I never found any larger individuals than those of 4 mm., and that evidently this was the limit of growth, because the central ones of large colonies were all of this size throughout. I have repeatedly detected mature sexual products in these Sponges.

The Oscular tube is very wide, of the same diameter as the Gastral cavity; the walls of it are very thin, and the sarcode extends in good Osmic acid specimens far up the spicules of the two frills.

The ciliated chambers are simple sac-shaped, and in their proximal part cylindrical, and not contracted towards the circular opening into the Gastral cavity

The most interesting part of our animal is the Entoderm : It consists, as mentioned above, throughout of the same flagellate cells. This can be seen in the living Sponge, but still better in Osmic-acid specimens. The peculiar short cylindrical shape which the flagellate cells attain, when hardened, the large, highly colourable nucleus, and the regular network of boundary-lines between the cells is the same throughout the inner surface of the Sponge.

The cells correspond to the well-known shape of the flagellate, frilled Sponge cells.

It is particularly remarkable that the same cells also cover the inner surface of the Spongorhiza.

We find in our Sponge an Entoderm, which is not differentiated into different kinds of cells, whilst a higher development in the direction of the Syconidæ has already been attained by the Sponge, in consequence of the folding process which has produced the ciliated chambers. This would appear altogether exceptional. Generally the cells are differenciated first, *and then* Organs of a whole complex of such differentiated elements are formed.

The exception is, however, I think, not actual, but only apparent. I am inclined to believe that the *Mesoderm* is, in our case, the active part growing, more or less, in different parts, and so forcing the Entodermal layer to attain a complicated structure, which is not caused by the cells of the latter.

The Ectoderm consists of the ordinary flat cells, and is the same throughout.

The Mesoderm also presents no peculiar character.

The Skeleton consists of seven different kinds of spicules. 1. Gastric quadriradiates ; 2. Parenchymal Quadriradiates ; 3. Parenchymal triradiates ; 4. Dermal triradiates ; 5. Dermal acerates thick ; 6. Dermal acerates slender ; and 7, Oscular acerate spicules.

1. The gastric quadriradiate spicules are found all over the inner surface. Three tangental rays lie in one plane in the

surface which divides the Entoderm from the Mesoderm. They stand at equal angles, each ray measuring 0·04—0·05 x 0·004 mm. The fourth ray penetrates the Entoderm, and is situated radially. Like the former it is conic, and often slightly curved. The three tangental rays are at their base convex towards the axis, the radial ray concave towards the Osculum. The radial ray measures 0·02—0·04 x 0·0025 mm., and it is accordingly as long or shorter than the others.

2. The Parenchymal quadriradiate spicules are all parallel three short and equal rays tangental and one longer radial ray pointing outward. These spicules vary very much in size; the radial ray is straight, slender, and conic, measuring 0·03—0·05 x 0·002—0·003 mm. The tangental rays all have the same angle of 120° between each other, and are slightly curved at the base, the convex side towards the axis. They measure 0·0075—0·01 x 0·002—0·003 mm.; they are therefore much stouter than the radial ray.

These spicules are found throughout the Mesoderm, the larger ones towards the inner surface. In no case do they penetrate either the Entoderm or the Ectoderm.

3. The Parenchymal tri-radiate spicules are situated below the Ectoderm, and do not penetrate it. Their position is irregular, their rays lie at equal angles, and appear much curved and irregular, measuring 0·05 x 0·003 mm. These spicules are not nearly so numerous as the former.

4. The Dermal tri-radiate spicules are similar to the former in shape and size; the difference lies mainly in the fact that these always possess perfectly straight rays, one of which is always situated radially, and penetrates the Ectoderm. They are found in rings around the tufts of acerate spicules near the summit of the ciliated chamber, and also intermingled with the latter.

5. The thick Dermal acerate spicules in tufts of 15—25 on the summit of each ciliated chamber stand at an angle of 45 to the axis of the Sponge, and point upward toward the Osculum; they are pointed at both ends and spindle-shaped. The thickest part is nearer the proximal end, they measure 0·5—1 x 0·01 mm.

6. The slender Dermal acerate spicules are of the same length as the former, but only 0·003 thick. They are rare, and situated in the tufts between the others.

7. The acerate spicules of the Oscular frills are similar to those in the chamber tufts, but larger.

The upright ones are slightly curved, the convex side towards the axis ; they are pointed at both ends, and measure 1·5—2 x 0·015—0·02 mm.

The lower frill is composed of spicules similar to the slender acerate ones of the tufts ; these are slightly curved, the convexity towards the basis of the Sponge, and measure 0·5—1 x 0·004.

DEVELOPMENT.

I have traced the postembryonal development, or metamorphosis, as it may be termed, of Homoderma.

The young Sponge is cylindrical, with short acerate spicules distributed equally all over the surface, and presents, therefore, the same outer appearance as the Spongorhiza.

There is a slight trace of an Oscular frill visible.

It grows in size without changing its shape, but developes the two frills of the Osculum. All this time the inner surface is perfectly simple. Our Sponge is an Ascon.

With the development of the first excresences of the Entoderm, when in the centre of the Sponge, a few chambers make their appearnce ; tufts of spicules also appear on the surface

More chambers and tufts are developed ; the Sponge grows, and the Oscular frills attain the large size we find in the adult. The small, equally distributed spines of the young, are then only found in those parts of the Sponge which do not contain ciliated chambers.

The Sponge has attained the structure of the full-grown adult when it is 2 mm. high.

Colour : Light yellow.

Locality : South Coast of Australia, Port Phillip, Victoria.

ADDENDA TO THE AUSTRALIAN HYDROMEDUSÆ.

By R. von Lendenfeld, Ph.D.

Plates XL., XLI., XLII., XLIII.

In this paper a series of new or otherwise interesting species of Hydromedusæ from different Australasiatic localities, which I obtained after my papers on the Hydromedusæ were read, will be described, and a few erroneous statements corrected.

They are the following :—

I. SUBORDO HYDROPOLYPINÆ.

1. FAMILY. HYDRIDÆ.

1. GENUS. HYDRA. Linné.

2. HYDRA FUSCA. Linné.

This species must be struck from the list of Australian Hydromedusæ, because the specimens referred to it are identical with H. oligactis. Pallas.

5. FAMILY. BLASTOPOLYPIDÆ.

4a (70). GENUS. MONOSKLERA.

10b (231). M. PUSILLA. Nov. Spec.

An interesting representative of a new Genus from Port Phillip.

6. GENUS. LAFŒA.

18a (232). L. CYLINDRICA. Nov. Spec.

A new Species from the Bay of Islands, New Zealand, which is very similar to Lafœa parasitica Ciamician.

8a (71). GENUS. SYNTHECIUM.

21a (233). S. ELEGANS. Allman.

I obtained a specimen of this Species from Timaru, New Zealand.

9. GENUS. SERTULARIA.

63a (234). S. SIMPLEX. Nov. Spec.

An apparently new Species from Lyttleton, New Zealand.

10. GENUS. DIPHASIA.

69a (235). D. RECTANGULARIS. Nov. Spec.

An interesting new Species from Torres Straits.

14. GENUS. THUIARIA.

85. T. QUADRIDENS. Bale.

In a specimen from Timaru, New Zealand, I found the Gonophors which were hitherto unknown.

II. SUBORDO HYDROMEDUSINÆ.

9. FAMILY. ANTHOMEDUSIDÆ.

34. GENUS. SARSIA.

178. S. MINIMA. Von Lendenfeld.

I obtained the hitherto unknown adult Medusa of this Species in Port Jackson.

36a (72). PANDÆA.

180a (236). P. MINIMA. Nov. Spec.

A new Species of Haeckel's Genus Pandæa, from Port Jackson.

40a (73). GENUS. MARGELIS.

185a (237). M. TRINEMA. Nov. Spec.

A new species from Port Jackson.

11. FAMILY. LEPTOMEDUSIDÆ.

46a (74). GENUS. OCTORHOPALON.

197a (240). O. FERTILIS. Nov. Spec.

I obtained this interesting representative of a new Genus in Port Jackson.

49. GENUS. EUCOPE.

201a (239). E. HYALINA. Nov. Spec.

A large new Species obtained in Port Jackson.

50. GENUS. OBELIA.

203. OBELIA AUSTRALIS. Von Lendenfeld.

I obtained the hitherto unknown adult stage of this Medusa in Port Jackson.

12. FAMILY. CAMPANULINIDÆ.

59a (75). GENUS. CAMPANULINA.

214a (240). CALICULATA. Von Lendenfeld.

I have received specimens of Campanularia caliculata, Hincks, from Port Phillip, Victoria; and Lyttleton, New Zealand. I find, that this Species is not a Campanularia but a Campanulina.

The Species which are added to the Australian Fauna in this paper, bring the total number of Australian Hydromedusæ up to 240, which are distributed amongst 74 Genera.

I. SUBORDO HYDROPOLYPINÆ. Von Lendenfeld.

5. FAMILY. BLASTOPOLYPIDA. Von Lendenfeld.

III. SUB-FAMILY. CAMPANULARINÆ.

4a (70). GENUS. MONOSKLERA (1). Nov. Gen.

Campanularinæ, with erect unbranched stems, which bear alternate Trophosomes on the distal ends of each Internode on short annulated stalks. Internodes wedge-shaped, with a cylindrical tube along one side. Gonophor, unknown.

(1.) From μόνο one, one-sided; and σκλῆρα thick skin.

8b (231). MONOSKLERA PUSILLA. Nov. Spec.

Plate XL., Figs. 1, 2, 3.

The Hydrorhiza forms a network of minute threads, with elongate meshes, which adheres closely to the Thalloms of Macrocystis. The Hydrorhiza is thick-walled, and appears flattened onthe side which is in contact with the seaweed. No such broad extension, however, is formed as in Eucapella. The colour of the Perisarc is light yellow. The Cœnosark contains in the Entoderm of the single specimen, which I obtained, and which was hardened with chromic acid, numerous round cells, which take up Carmin very freely; they may, perhaps, be considered as young stages of ova.

From this Hydrorhiza, erect and unbranched stems arise, which attain a height of 10-15 mm. (Fig. 1.) They consist of a row of Internodes, which are wedge-shaped, and twice as broad at the distal-end than at the proximal termination. These joints are fixed to one another in this way that the narrow end of one is always inverted into the broad and flat end of the preceding one laterally. They are alternate, in as much as the third Internode grows out from the left margin of the second; the second out of the right margin of the first. (Fig. 2)

These Internodes consist of solid light yellow, and perfetly transparent Chitin. They are perforated by a cylindrical tube, which runs along the slanting side (Fig. 1 and 2), and therefore appears regularly zig-zag-shaped. Between the Internodes the tube is slightly constricted.

From the upper end of the tube in each Internode (Fig. 3), a process extends to the other side of the Internode, a small sac-shaped excrescence of the cavity. This sac is in communication with the cavity of the Hydrotheca, by means of a tube which perforates the short peduncle of the Trophosome. The part of the Internode which is solid, appears compressed, as a ridge connecting the main tube with the sac-shaped excrescence. The Trophosomes are attached to the free part of the flat end of the Internode. They are, therefore, alternate. (Fig. 2.) Generally there is one Trophosome to each Internode, but sometimes there are two, close together. The Peduncle consists of two spherical parts, with incisions dividing them from the Hydrotheca, each other and the Internode of the stem. Strictures in the Cœnosark tube correspond to these. The Hydrotheca is cup-shaped, bi-lateral, symmetrical, the outer margin a little higher than the inner, so that the oval aperture looks obliquely forward.

The Cœnosark of the stem does not contain the highly colourable cells found in the Hydrorhiza.

The alimentary zooids possess 10-15 stout tentacles and a short proboscis, but otherwise appear similar to other Campanularians or Leptomeduse-Polyps. There is a decided "floor" to the Trophosome.

Locality —Port Phillip.

6. GENUS. LAFOEA. Lamourroux.

18a (232). L. CYLINDRICA. Nov. Spec.

Plate XL., Figs. 4, 5.

Ciamician (1) described a species of this genus as L. Parasitica, from the Adriatic. I have recently obtained a similar Lafœa, which, however, is not identical with Ciamician's species.

The Hydrorhiza is creeping, and closely adnate to the stem of other Hydroids, mainly Sertularians. It appears very small and slender, and is not smooth. It runs in a straight line, and keeps to the same side of the Hydroid and is attached throughout, as is also the case with L. Parasitica. From this creeping stem large Hydrothecæ arise, which are borne on very short and extremely narrow peduncles. (Fig. 5.) The Hydrotheca is mainly cylindrical and thin walled, large as in L. Parasitica. The margin is recurved so that it attains a trumpet shape. Near the bottom, which appears semi-spherical we find a perforated disc, forming a ring near the base of the Hydrotheca. Although the Trophosome of Lafœa is considered always to be destitute of a floor, I do not hesitate to consider this species as a true Lafœa.

(1.) *T. Ciamician* Ueber Lafœa parasitica, n. sp. Zeitschrift für Wissenschaftliche Zoologie. Band XXXIII. Seite 673.

Gonophores unknown. The Hydranths are large, and possess about 20 stout tentacles.

It appears doubtful whether our species should be considered parasitic, as I failed to find any organs by means of which it might extract nourishing material from the Hydroid to which it clings. It appears to me rather as if the only use the Lafœa makes of the Sertularia on which it grows, was to use it as a support. Lafœa Cylindrica is therefore to be termed "climbing" rather than parasitic.

Locality : Bay of Islands, New Zealand.

IV. SUB-FAMILY SERTULARINÆ.

8a (71). GENUS. SYNTHECIUM. Allman.

Sertularinæ, with opposite alimentary zooids, and with Gonophors which appear to grow out from an ordinary Hydrotheca which surrounds the peduncle of the Polypostyl.

21a (233). SYNTECIUM ELEGANS. Allman.

Allman (1) describes this interesting Hydroid from New Zealand. It appears that Bale (2) had his doubts about it, as he does not mention it in the catalogue. I have, however, found a small fragment on a sea-weed from an unknown locality, which corresponds to Allman's description.

9. GENUS. SERTULARIA. Hincks.

63a (234). SERTULARIA SIMPLEX. Nov. Spec.

Hydrocaulus simple, Hydrothecæ opposite, a pair to each Internode, conic adnate throughout their whole length, and straight, the outer surface at an angle of about 30° to the axis of the stem ; aperture, simple oval ; margin, entire and smooth, lying in a plane vertical to the axis of the stem. The margin is prolonged into a short conic process, looking outward on the side everted from the stem.

(1.) *G. T. Allman.* A Monograph of the Gymnoblastic or Tubularian Hydroids. (Ray. Society for 1870, Vol. II., page 229)

(2.) *W. Bale.* Catalogue of the Australian Hydroid Zoophytes.

The stem is simple, unbranched, and rises from a reticulate Hydrorhiza to a height of 12-18 mm.

Gonophores oblong, rather large, on short peduncles.

Locality : Lyttleton, New Zealand.

10. GENUS. DIPHASIÆ. Agassiz.

69a (235) DIPHASIA RECTANGULARIS. Nov. Spec.

Plate XLI., Figs. 6, 7, 8.

From an anastomosing thick Hydrohiza, which is adnate to shells and other hard bodies, thick and rough, straight stems grow forth, which attain a height of 9 Cm. They taper towards the top. These stems bear alternate Pinnæ, which are shorter towards the end, and appear longest near the base, from 2 to 14 mm. in length. Towards the tops, where growth is going on rapidly, the Hydrothecæ stand at right angles to the stem. Pinnæ, and stem bear the Hydrothecæ which are close to one another, and appear biserial, but otherwise disposed in a very irregular manner. Further down the stem and Pinnæ they are disposed in a perfectly regular manner. Here they are distant and alternate. (Fig. 7.) They are tubular, and bent in the shape of a knee, at a right angle in the middle of their length. The proximal half is immersed in the stem, and nearly parallel to it, whilst the distal half is turned outward, and projects at right angles. The Hydrotheca has a circular transverse section throughout. The aperture is simple, smooth, oval, and looks obliquely outward and forward. (Fig. 7.)

The Gonophors spring from the stem at the bases of same of the Pinnæ. (Fig. 6.) The male Polypostyls are invested by a very pretty Gonangium. (Fig. 8.) It is conic, attached with the small end to a minute peduncle. the sides convex, and the base slightly raised towards the circular aperture in the centre. Eight or more ridges run from the aperture to the peduncle. The surface between them is depressed into as many valleys, which are particularly well marked on the sides. From serrate projections in the ridges transverse lines take their origin, which cross the valleys between the ridges. The ridges on the flat base of the cone are smooth.

Female Gonophores unknown.

Locality: Torres Straits.

14. GENUS. THUIARIA. Fleming.

85. THUIARIA QUADRIDENS. Bale.

Plate XL., Fig. 9.

This species has been described by Bale (1). The Gonophores have not been found hitherto. A specimen which I obtained from Timaru, New Zealand, bears Gonophores. (Fig. 9.) They are pretty large, barrel-shaped and annulated. Transverse ridges run round them like hoops. These are particularly well visible in the distal part and less distinct towards the rounded base, which is sessile on the stem.

II. SUBORDO HYDROMEDUSINÆ.

Von Lendenfeld.

9. FAMILY. ANTHOMEDUSIDÆ. Von Lendenfeld.

I. SUB-FAMILY. CODONINÆ.

34. GENUS. SARSIA. Lesson.

178. SARSIA MINIMA. Von Lendenfeld.

I described (2) this species in a former paper and have now obtained a series of small Medusæ, which lead up from the small young Medusæ which were produced by the Polypcolonies in my Aquarium to adult Sarsiæ. I obtained all intermediate stages with the surface net in early spring in Port Jackson.

The adult Medusæ, filled with ripe generative elements, is about four times the size of the larva at the time of liberation. The shape is the same with the exception of the gastral tubular Gonad. The Medusa is 2½ mm. broad and 3 mm. high. The manubrium slightly shorter in proportion than in the larva.

(1.) *William Bale.* Catalogue of the Australian Hydroid Zoophytes. page 119

(2.) *Von Lendenfeld.* The Australian Hydromedusæ, Part V. Proceedings of the Linnean Society of N.S.W., Vol. IX., p. 584. pl. XXI., fig. 34.

II. SUB-FAMILY. TIARINÆ.

36a (72). GENUS. PANDÆA. Lesson.

Tiarinæ, with numerous tentacles (8-16) or more in one row. Abaxial Ocelli, outside on the base of the tentacle. No peduncle to the stomach. Edges of stomach connected with the radial canals in the Sub-umbrella by four mesenteria. Four simple Gonads with smooth surface. Longitudinal lines of thread cells on the Ex-umbrella. Polypcolonies unknown.

180a (236). PANDÆA MINIMA. Nov. Spec.

Plate XLII., Figs. 10, 11, 12.

The Medusa is semi-ovate, higher than broad. It possesses eight tentacles of about the same length as the Umbrella. There are eight nettlecell-lines on the Exumbrella at equal intervals, which are situated in the Adradiis, but they do not appear continuous. They consist apparently of a series of elongate nettle-warts. (Fig. 11), which taper to a narrow line at each end. The line can be traced from one nettle-wart to another. All appear connected by it. Subjected to slight maceration the covering Exumbrella Epithel becomes loose and floats away when the cover glass is tapped. (Hardening with week osmic acid and macerating with week acetic acid, the time that is necessary for exposure to the latter re-agent depends on the temperature and varies from half an hour to twelve hours.) Then the Sub-epithelial layer becomes more clearly visible and with a high power. (Zeiss $\frac{1}{12}$, Fig. 12.) It is easy to recognize a nerve fibre in the thread which connects the nettle-warts with one another.

The nerve fibre consists of similar fibrils and bipalar ganglia cells as those which I described (1) in the homologous organ of Encopella Campanularia.

In another paper (2) I have pointed out that the Cnidoblasts

(1.) *Von Lendenfeld* Eucopella Campanularia. Zeitschrift für Wiss. Zoologie. Band XXXVIII. Seite 558.

(2.) *Von Lendenfeld*. Ueber Wehrthiere and Nesselzellen. Zeitschrift für Wissenschaftliche Zoologie, Band XXXVIII. Seite 368.

are connected by one thick fibre with the supporting lamella or gallert, and by a thin fibril, probably with the Sub-epithelial plexus of ganglia cells.

This hypothesis I tried to prove by additional facts (1) published in another paper.

Korotneff has recently (2) found a similar structure in the nettle-bulb of Praya, where, besides the thick peduncles, which he considers as muscular, fine and granulose Nerve-fibres are described, connecting the Cnidoblast with a Ganglia cell.

Although working at the unparalleled Zoological Station at Naples he is apparently unacquainted with my discovery, published in the papers mentioned above a year previously, he describes the same thing which I have discovered. He has, however, not been led to the very simple conclusion which I drew from the fact, and overlooks the great importance of it concerning the physiology of Thread-cells altogether.

The stomach of our Medusa is slender, and about half as long as the Umbrella. The Mesenteria which connect it with the Radial Canals are inconspicuous and transparent. The Gonads are four longitudinal, narrow folds, with smooth surface. There are four small lips to the mouth.

Size : Height of Umbrella, 3 mm. Breadth, 2mm.

Colour : Umbrella, light pink. The nettle-lines more intensely coloured. Stomach and tentacle-bulbs light brown.

Locality : Port Jackson.

Season : Spring, August, September.

III. SUB-FAMILY MARGELINÆ.

40a (73). GENUS. MARGELIS. Steenstrup.

Margelinæ, with ramified or composite mouthstyles, and with four perradial bundles of tentacles. Stomach small, without peduncle, with narrow basis attached to the point, where the

(1.) *V. Lendenfeld.* Zur Histologie der Actinien. Zoologischer Anzeiger. Band VI. Seite 189.

(2.) *A. Korotneff.* Zur Histologie der Siphonophoren. Mittheilungen der Zoologischen Station in Neapel. Band V. Seite 264. Tafel 18. Fig 80.

four Radical Canals meet. No elongated Manubrium. Mouth narrow. Mouth styles touching at the base. The Gonads do not extend to the Radial Canals. The Polypcolonies are branched; the alimentary Polyps possess one vertical of filiform tentacles, the Medusæ, bud on peduncles, which arise out of the Hydrorhiza.

185a (237.) MARGELIS TRINEMA. Nov. spec.

Plate XLI., Fig. 13.

Umbrella semi-spherical, a trifle higher than broad. Stomach short, cylindrical, nearly half as long as the Umbrella; not quite so broad as long. Gonads in the shape of four pair of oblique folds. The folds ascending towards the primary Radii. Mouthstyles about as long as the stomach, the margin of the mouth between the styles straight. Each style bears at its end three small eqal branches, about a third as long as the style. These mouth-styles are carried upward.

The Tentacle-bulbs are small, broader than high, and thick. From each bulb three tentacles take their origin, which are about half again as long as the Umbrella; also the tentacles are curved upwards terminally (Fig. 13.)

Colour: Medusa colorless. Entoderm of stomach and tentacle bulbs dark yellow.

Size: Diameter of Umbrella, 2-3 mm.

Ontogenesis: I have found some Bougainvillia's in Port Jackson, which are similar to B. ramosa. They are the only Hydroid Polyps resembling that Genus, which I have met with in Australian waters.

It seems therefore not unlikely that they are different stages in the cyclus of development of our Margelis trinema. Both however, Medusa and Polyp are rare, so that not much reliance can be placed on that assumption.

Locality: Port Jackson.

Season: Early Spring.

11. FAMILY. LEPTOMEDUSIDÆ. Von Lendenfeld.

I. SUB-FAMILY. THAUMANTINÆ.

46a (74.) GENUS. OCTORHOPALON (1.) Nov. gen.

Thamantinæ with four Radial Canals and four Gonads, eight tentacles, and eight clubs, in the intervals between the tentacles one in each Octant.

This new Genus belongs to Haeckel's Sub-Family Laodicidæ (2), and appears very nearly related to his Genus Octonema, from which it differs by the absence of Cirrhi, and by the small number (8) of the marginal clubs.

197a (238), OCTORHOPALON FERTILIS. Nov. spec.
Plate XLII., figs. 14-15.

Umbrella semiovate, much higher than broad. Stomach representing a double four-sided Pyramid, Octædral, widest in the middle. Tips of the mouth produced into four inconspicuous extensions at the corners. Intervening parts of the margin concave. Gonads very large and extending all about the Radial Canals. The four Gonads are joined around the stomach. They are richly folded transversely.

The tentacles about two-thirds of the length of the Umbrella. The perradial ones longer than the interradial ones. The bulbs at the bases of the tentacles not large, elongate. The clubs large, elongate-oval, a little longer than the tentacle bulbs.

Colour : Gonads reach orange yellow. Medusæ otherwise colourless.

Size : Height of Umbrella, 2·5 mm., breadth, 2 mm.

Ontogenesis : Unknown.

Locality : Port Jackson.

Season : Early spring.

(1.) ὀκτώ, eight ; ῥόπαλον, a club.
(2.) *Haeckel.* Das System der Medusen. Seite 125.

III. SUB-FAMILY. ENCOPINÆ.

49. GENUS. EUCOPE. Gegenbaur.

201a (239). EUCOPE HYALINA. Nov. Spec.

Plate XLII., Figs. 16, 17, 18.

Umbrella flat, nearly watch-glass shaped, more than twice as broad as high. Gallert in the centre, exceptionally thick. The stomach half as long as the Umbrella is high and a little broader than long. Margin extended, with irregular small flaps. The 4 Gonads are oval and grow out from the distal third of the four Radial Canals. Eight tentacles about as long as the Umbrella is high with conic basal tentacle bulbs. Eight adradial large vesicles. There are always three Otolithes on each vesicle. The vesicles (Fig. 18) are spherical and attached to the cushion of elongated sensitive cells with long ciliæ by a broad and short peduncle

Colour : Medusa extremely transparent. Gonads and stomach pale yellow.

Size : Diameter of Umbrella 6 mm. ; height 3 mm.

Ontogenesis : Unknown. I have found numerous different species of Campanularians which have not been decribed, because their Gonophores were not seen. There is no one of these more likely than any other, to be the Polypcolony belonging to our Eucope.

Locality : Port Jackson.

Season : Early spring.

50. GENUS. OBELIA. Péron et Leseur.

203. OBELIA AUSTRALIS. Von Lendenfeld.

Plate XLIII., Figs. 19, 20, 21, 22.

I (1) have described this species from the Polypcolonies and the young larvæ, which I obtained in Port Jackson. Since then I have obtained the adult Medusa, apparently belonging to this

(1.) *Von Lendenfeld.* The Australian Hydromedusæ. Part V. Proceedings of the Linnean Society of N.S.W., Vol. IX., p. 604.

species. The Umbrella is flat, and always reversed. I have examined hundreds of these Obelias lately, and have always found the Umbrella in this apparently abnormal state. But as these Obelias seemed perfectly healthy, and were obtained together with other Medusæ which never reverted the Umbrella, I am led to suppose that this is their natural position. All Obelias seem to have the extraordinary habit of reverting the Umbrella, and even of fastening themselves to foreign bodies by means of the mouth.

Whilst the other Australian species, O. geniculata, is often found with non-reverted Umbrella, and also the young larvæ of O. Australis present that appearance, I have never seen an adult Medusa of this species in another position from that represented in the figure. (Fig. 19.)

The Gonads are situated in the distal part of the Radial Canals, oval and thicker at the distal than near the proximal end. The Radial Canal widens at the proximal end continuously into the cavity of the Gonad. In the distal end the Radial Canal enters and widens abruptly into the fundus of the cavity. (Fig. 21.)

The male genital products are produced by a continual division and subdivision of the cells in the Subumbral wall of the Gonad. A thin layer of Ectodermal Epithelium covers the Gonad. It appears as if the Spermamother cells were Entodermal. The division of the cells goes on more rapidly towards the cavity, so that these cells always appear smaller (fig. 21e) than the outer ones (g). From the inner surface lines extend centrifugally (fig 27f), and it appears that these lines are minute channels in connection with the Gastral cavity, through which nourishing material flows to the growing Spermatozoa.

The stomach (fig. 19) is spherical, and we find attached to it a short Manubrium, with four short, cylindrical Moutharms in the Perradii. Looked at from above the stomach appears quadrangular. (Fig. 20.)

The tentacles are from 30 to 40 in number, and inserted in the margin of the Umbrella by means of a plug-shaped (fig. 22a) centripetal process (1).

Eight adradial Otolithes at the side of adradial tentacle-bulbs.

12. FAMILY. CAMPANULINIDÆ. Von Lendenfeld.

No Australian representatives of this family were known hitherto. I have had occasion to examine the Gonophors of some Hydroids, which are apparently identical with Campanularia Caliculata Hincks; and I find that they are Medusostyles. Therefore I consider myself justified in placing this well-known Hydroid in this family.

59a (75.) GENUS. CAMPANULINA. Von Lendenfeld.

Campanulinidæ, which consist of Polycolonies invested by a chitinous Perisarc, and containing alimentary zooids, with one verticil of filiform tentacles, invested by a radially symmetrical cup on a peduncle, Polypostyles, which grow from the Hydrorhiza in the shape of trumpet-like tubes, and Medusostyles budding at their sides.

Connected by Eucapella with Eucope.

214a (240). CAMPANULINA CALYCULATA. Von Lendenfeld.

Var. Makrogona.

In my paper on Eucopella (2) I referred to a Hydroid from Port Phillip, which is very similar to Eucopella, and which I believed to belong to the above species. I have since obtained specimens with Gonophors, and find that it is identical with Campanularia Caliculata, Hincks (3) and Allman (4), and with

(1.) Compare *Allman*. Monograph of the Gymnoblastic or Tubularian Hydroids. Vol. I. Page 142.

(2.) *R. von Lendenfeld*. Eucopella Campanularia. Zeitschrift fur Wissenschaftliche Zoologie. Band XXXVIII., Seite 499.

(3.) *T. Hincks*. On some new British Hydroids. Annal and Magazine of Natural History, 2nd series, March, 1836.

(4.) *G. T. Allman*. On the structure of the Reproductive Organs in certain Hydroid Polypes. Proceedings of the Royal Society of Edinburgh for 1857-58.

Campanularia Breviscyphya, Sars (1), Agassiz (2) describes it as Clythia poterium.

In the variety Makrogona—all Australian specimens belong to it—the Gonophors are nearly as high as the Hydrocaulus of the Trophosome, and 8-10 times as large as the Hydrotheca.

Medusoid buds are produced in the Gonophor, which do not become free, in fact they do not possess a properly developed Umbrella at the time when the sexual products are matured. Judging from Hincks's (3) figure, the European Campanulina caliculata produces similar Medusoid buds, and I therefore do not hesitate to place this species in this family. It appears, as I have often taken occasion to mention, extremely likely, that many other species will wander from the Hydropolypinæ to this Subordo, so particularly the Genus Sertularia.

EXPLANATION OF PLATES XL. TO XLIII.

Fig. 1.—Monosklera pusilla, R. v. L. A small Colony in Natural size.
Fig. 2.—Monosklera pusilla, R. v. L. Part of a shoot. AA., Oc, 1.
Fig. 3.—Monosklera pusilla, R. v. L. An Internode with two Hydrothicæ. C., Oc. II.
Fig. 4.—Lafœa cylindrica, R. v. L. A , Oc. II.
Fig. 5.—Lafœa cylindrica, R. v. L. C., Oc. I.
Fig. 6.—Diphasia rectangularis, R. v. L. Natural size.
Fig. 7.—Diphasia rectangularis, R. v. L. Part of a pinna. AA., Oc. II.
Fig. 8.—Diphasia rectangularis, R v. L. A male Gonophore. AA., Oc. II.
Fig. 9.—Thuiaria quadridens, Bale. With a Gonophore. AA., Oc. I.
Fig. 10.—Pandæa minima, R. v. L. A., Oc. III.
Fig. 11.—Pandæa minima, R. v. L. An Exumbral Meridianal-line. C., Oc., II.
Fig. 12.—Pandæa minima, R. v. L. Part of the Exumbral Meridianal-line treated with osmic and acetic acid. $\frac{1}{12}$, Oc. I. The outer Epithel removed from the upper part of the Figure.

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(1) *G. O. Sars.* Campanularia Breviscyphia. Bidrag til Kundskaben om Middelhavet's Littoral-Fauna, 1857, 49, pl. 1, figs. 12, 13.
(2) *L. Agassiz.* Clytia poterium Contribution to the Natural History of the United States Acalephæ. Vol. IV., p. 297, pl. XXVIII.
(3) *T. Hincks.* A History of the British Hydroid Zoophytes, Vol. II., pl. XXXI, fig. 2d.

(*a*) Ordinary flat Epithel-cells.
(*b*) Nervefibre.
(*c*) Nettle cells.
(*d*) Bipolar Ganglia cell.
(*e*) Irregular Ganglia cell of the nettle-wart.
(*f*) Subepithelial cell producing nettle capsules.
(*g*) Nerve fibrills radiating out from the fibre to the different parts of the nettle wart.

Fig. 13.—Margelis trinema, R. v. L. A., Oc. III.

Fig. 14.—Octorhopalon fertilis, R. v. L. A., Oc. III.,

Fig. 15.—Octorhopalon fertilis, R. v. L. The Medusa seen from below. AA., Oc. II.

Fig. 16.—Eucope hyalina, R. v. L. A., Oc. III.

Fig. 17.—Eucope hyalina, A. v. L. Longitudinal section through the stomach and the commencement of a Radial Canal, osmic acid, alum-carmin. F., Oc. II.

Fig. 18.—Eucope hyalina, R. v. L. An acustice vesicle with three Otolithes. A fresh compressed specimen. DD., Oc. II.

Fig. 19.—Obelia Australis, R. v. L. AA., Oc. II. A Medusa with reverted Exumbrella.

Fig. 20.—Obelia Australis, R. v. L. The mouth seen from below. AA., Oc. II.

Fig. 21.—Obelia Australis, R. v. L. Longitudinal section through a growing male Sexual Organ, osmic acid, picra carmin. DD., Oc. I.
(*a*) Proximal part of Radial Canal.
(*b*) Granulose part of the Umbrella Gallert just below the Sexual Organ.
(*c*) Ordinary Entoderm on the upper side of the Sexual cavity.
(*d*) Distal part of the Radial Canal.
(*e*) Mass of small, indistinct cells, with Protoplasme which does not refract the light very strongly.
(*f*) Minute Canal leading from the cavity into this mass of cells.
(*g*) Larger and well separated cells, filled with highly refracting Protoplasme near the outer surface.
(*h*) Ectodermal Epithel.

Fig. 22.—Obelia Australis, R. v. L. Base of one of the Tentacles. A fresh specimen compressed. C., Oc. I.
(*a*) Plug-shaped transparent mass inserted into the margin of the Umbrella.
(*b*) Proximal wall of the Ring canal.
(*c*) Ring canal.
(*d*) Distal wall of the Ring canal.
(*e*) The rudimentary rest of the Velum.
(*f*) Large Ectodermal cell of the tentacle-bulb.
(*g*) First Entodermal cell of the Axis of the Tentacle.
(*h*) Conic extension of the cavity of the Ring canal into the Tentacle.

LOCAL COLOUR-VARIETIES OF SCHYPHOMEDUSÆ.

A New Species Produced in Forty Years?

By R. von Lendenfeld, Ph.D.

The colours of the large Medusæ are as variable as they are brilliant, and we generally find the same species appearing in a long series of finely toned colour-varieties.

I have observed two species of large Medusæ, Cyanea Annaskala, R. v. L., and Crambessa mosaica H., which although they vary very much in their colour do not appear in a series of connecting varieties, but rather as "beginning species" in as much as the colour in these varieties is quite constant in the different coloured Medusæ met with in different localities.

I have found these two species in Port Phillip, South Coast, and in Port Jackson, East Coast. Although these two places are not far apart, still the water is very much warmer in the latter harbour than in the former. This is owing to the nature of the Ocean Currents. A warm equatorial current which passes along the Eastern Coast of Australia, supplies Port Jackson with warmer and probably salter water than that with which Port Phillip is filled. A cold Polar current flows past the entrance to Port Phillip.

I have found occasion to draw attention to the fact, that Crambessa mosaica in Sydney was brown, whilst in Melbourne the same species always appeared deep blue. The brown colour is not always of the same depth and of similar hue all over the surface of the Medusa, but varies from the colour of white bread to that of coffee. The cause of this colour is to be found in yellow cells, which appear in more or less dense clusters throughout the gallert. These cells are parasitic Algæ, known as Zooxanthella. Such Zooxanthellæ are very common in Jelly-fish, Sponges, &c.,

in all parts of the world. Also, in Port Phillip, I obtained numerous Actiniæ, which were infested by them. The Crambessa mosaica of Melbourne however, never shows a trace of a Zooxanthella, and consequently retains its original blue colour. In the harbour of Sydney on the other hand, Zooxanthellæ, which appear identical with those in Melbourne are found in great masses in *all* Crambessæ. In Sydney as well as in Melbourne I had occasion to see many thousand specimens, and I found that the Melbourne variety was always blue, but that the Sydney species was not absolutely always quite brown.

With the trawl we sometimes brought up Crambessæ from depths of 10 or 20 metres, which did not show the brown colour very distinctly, and it appeared that only few heaps of Zooxanthellæ could be detected with the magnifying glass. In every case some yellow cells were present.

I think that I might be justified in considering the difference between the Sydney and Melbourne specimens as sufficient to make two varieties of them.

In the cold water of Port Phillip, it appears not to be advantageous for the Medusa or the Algæ to live symbiotic, whilst this does appear to be the case in the warm water of Port Jackson. The Melbourne variety which I name

CRAMBESSA MOSAICA CONSERVATIVA

is blue and has apparently retained the habits of its ancestors. The Sydney variety which I shall name

CRAMBESSA MOSAICA SYMBIOTICA,

has given up this mode of life and has taken to live together with a Zooxanthella. The difference between the two is evidently the same as that between Fungi and Lichens. Should the variety Symbiotica adapt itself in the ordinary course of natural selection so wholly to this Symbiotism so as not to be able to live without the Zooxanthella a new species will have been formed, which may perhaps be the case already.

Crambessa mosaica has been described by several authors (see for reference my former paper the Scyphomedusæ of the Southern

Hemisphere.) All the specimens were collected near Sydney, and the species is described as blue to gray. No one mentions the bright brown colour, which is so very striking. The latest of these observers was T. Huxley in the year 1845. Has the change taken place since that time? Have we to assume that a new species or variety has been produced within the last forty years?

If this paper should be read by anyone who has access to the original type specimens of Quoy et Gaimard or Huxley, it would be well worth while to examine them so as to find out whether they can detect any Zooxanthellae in them or not.

Two years ago I described a most beautiful Medusa of Port Phillip as Cyanea Annaskala, R. v. L. Although this species appears in millions in the place mentioned there is no record of its having been found anywhere else, and also I have not found it in any other locality until lately. In September a few specimens appeared in Port Jackson, which although slightly different in colour and size must doubtlessly be referred to my species Cyanea Annaskala. Whilst the Melbourne specimens appeared never to grow beyond 10 Cm. in diameter, the Sydney specimens attain a diameter of 20 Cm. and more. There is hardly a doubt that this Medusa grows to a larger size in the warmer water of the equatorial current than in the cold water that comes from the South Pole, the Fauna of which is comparatively poor. There exists also a difference in the colour of the mouth-arms. The Melbourne specimens possess mouth arms, which are deep purple throughout, whilst the purple colour in the Sydney specimens is found only at the *margin*.

The margin, which is much thicker than the proximal parts of the mouth-arms, consists of a number of cells in the Ectoderm, which here is composed of many layers. The pigment is found in these cells exclusively and not also in the supporting lamella as in the Melbourne specimen.

Among the thousands of specimens which I examined at Melbourne I did not find a single form which might be considered as a transient variety. The moutharms of all had quite the same colour, a fact to which I drew attention at the time. As also the few Sydney specimens which I found were constant in this particular. I consider myself justified in setting up provisionally two varieties of this species :

CYANEA ANNASKALA PURPUREA

found as yet only in Port Phillip, with moutharms which are richly purple throughout, and

CYANEA ANNASKALA MARGINATA

found as yet only in Port Jackson with moutharms, which are purple at the free margin, but otherwise appear colourless.

The purple colour in the moutharms is very similar to the brilliant purple "Sehpurpur" in the sensitive apparatus of the Retina of some animals, particularly the lizard. When the Cyanea is placed in a glass aquarium this colour fades in less than an hour to a dirty brickred. When the Medusa is sick even in the open sea it is always this colour, which is affected first and turns into a dirty coffee colour long before the tentacles begin to drop off, which is always a sign of approaching death.

In my paper on the structure of Cyanea Annaskala, I pointed out that no pigment occurs in the marginal bodies and that therefore the organs of sight of this species, if to be found in the marginal bodies at all were not nearly so highly developed as in other Medusæ, nor even as in the other species of the same genus, which *do not possess purple moutharms.*

Sensitive cells are very numerous, particularly in the purple margin and *contain* the purple substance. Ganglia cells are also met with there. The pigment in the other parts might be considered as reserve material for that, which may perhaps be used up by the sensitive cells.

I do not go so far as to draw the conclusion which the reader will have inferred from the preceding lines, but I should like to hint at the possibility of the moutharms of our Medusa being able to perceive light.

THE METAMORPHOSIS OF BOLINA CHUNI. Nov. Spec.

By R. von Lendenfeld, Ph.D.

Plates XLIV.-XLV.

The extreme delicacy of Ctenaphoræ in general must in a great measure be considered as the reason why so few of these Cœlenterata have been described from Australian waters. Nevertheless they really appear to be rare. During my three years stay in the colonies, a great part of which time was devoted to the investigation of marine animals I have only met with two species one of which was very abundant in Port Jackson. The swarms consist apparently of Bolina and Cydippidæ, but I found after I had examined a great number of specimens, that the Cydippidæ were nothing else than the young stages of the Bolina.

The metamorphosis of this Genus has been studied by A. Agassiz (1), and Chun (2) describes the development of Eucharis multicornis. In both these cases as well as in a few other species of Lobatæ, the young stages are similar to Cydippe.

The metamorphosis of our Bolina is nevertheless slightly different from that of Bolina alata described by Agassiz (l.c.)

The larvæ possess for a long time a perfectly circular transverse section. (Fig. 5), and are depressed neither in the Gastral nor in the funnel-plane. The paddle-lines are in the young larva much longer than in corresponding stages of other Lobate. The apical Gallert masses protrude far beyond the sense organ.

I shall first describe the adult animal

(1.) *A. Agassiz.* North American Acalephæ. Illustrated Catalogue of the Museum of Comparative Zoology. No. II, 1865.

(2.) *C. Chun.* Die Ctenophoren des Golfes von Neapel. Fauna und Flora des Golfes von Neapel. Band I.

BOLINA CHUNI. Nov. spec.

Body slightly compressed. Lobes when expanded about as long as the body. Surface smooth. Auricels long and triangular with straight sides and a sharp-pointed end. Bulges above the nerve-center high, paddles not large and rather numerous. Adradial canals join the proximal part of Meridional vessels. Curves of the lobe-vessels simple.

Size: Length 11 Cm., breadth of lobes 9 Cm.

Colour: Perfectly transparent. Lobe-vessels in the adult violet.

The most striking feature of this Bolina is the great bulk of the lobes, which are thicker than the body, and nearly circular. The lobe-vessels are extremely simple and show the characteristic arabese-shaped curves only when the lobe is contracted. The muscles in the lobe are clearly visible forming an extremely delicate network of radial and circular fibres, which however, are by no means so distinct as those in Eucharis multicornis. The body appears in its upper end decidedly truncate. The stomach is rectangular and much broader than in other species.

The sense organ is situated about 1 Cm., below the aboral end of the body.

The specific name needs no explanation.

DEVELOPMENT.

The youngest Bolina Chuni, which I obtained was a globular larva with about 3 mm., in diameter. (Fig. 3). Decidedly pear-shaped it differs from the larvæ figured by Agassiz and Chun in shape very much, as the narrow part is the oral, whilst the broad part, the aboral end of the animal.

The sense organ lies more than half way below the aboral end of the body, a peculiarity which is met with in very much younger larvæ of Eucharis and Bolina alata. I have mentioned before that the transverse section of this, as well as of later stages, is circular. It appears that the larva of Eucharis is compressed in another direction than the adult animal. (Chun l.c., p. 122.) Agassiz (l.c., p. 15) states that Bolina is compressed in the same direction throughout. It appears, therefore, that this character is subjected to greater changes than has been supposed.

The gastro-vascular system of our larva resembles one stage of Eucharis very closely. (Chun l.c., Tafel. IX., fig. 7.) The two tentacles are very long. (Fig. 3), extended up to ten times the length of the body.

A later stage, measuring 8 mm. in diameter, is represented in figures 4 and 5.

The difference between it and Eucharis larvæ of a similar size mainly consists in the greater width of the canals in the former, and in the peculiarity that the tentacles arise very much further from the point where the main channel branches, so that a continuation of the perradial canal stem is formed which extends as far beyond the branches as these are distant from the centre (Fig. 5.)

The paddle-lines are long, and lines can already be traced connecting them with the aboral pole. (Fig. 4.)

The lobes are very small, about the same size as in a 6 mm. larva of Eucharis. When the animal attains a length of about 3 Cm., all its parts are developed and it presents the same appearance as the largest.

The lobes of the smaller species are carried much further apart, more horizontally than in the larger individuals.

EXPLANATION OF PLATES XLIV. AND XLV.

BOLINA CHUNI.

Fig. 1.—Large specimen in natural size, painted from life. Seen from the funnel-plane.

Fig. 2.—The same from the Gastral-plane.

Fig. 3.—Youngest larva, magnified four diameters, painted from life.

Fig. 4.—Older larva, magnified about four diameters from the Gastral-plane, painted from life.

Fig. 5.—The same from above.

REVISION OF THE MARINE TÆNIOGLOSSATE AND PTENOGLOSSATE MOLLUSCA OF NEW ZEALAND.

By Captain F. W. Hutton, F.G.S., Hon. Memb. Linn. Soc., New South Wales.

TÆNIOGLOSSA.

Family. Tritonidæ.*

Triton tritonis. Linnæus, Syst. Nat., 2nd edition, 1222. *T. variegatus*, Lamarck, Anim. sans Vert., 2nd edition. Vol. IX., p. 623; Reeve, Conch. Icon., fig. 3. Tryon Man. Conch. Vol. III., p. 9, pl. 1; fig. 1, pl. 3; fig. 16, pl. 4; fig. 25.

Habitat.—Northern parts of the Auckland Province. (Buller.) Found also through the whole Indo-pacific region.

Triton nodiferus, Lamarck, Anim. sans Vert., 2nd edition. Vol. IX., p. 624. *T. australis*, Lam. l.c. Vol. IX., p. 625; Reeve, Conch. Icon, fig. 12. *T. saulice*, Reeve, l.c., fig. 17. Tryon, Man. Conch. Vol, III., p. 10, pl. 1, fig. 2-3, pl. 3, fig. 17, pl. 4, fig. 23.

Habitat.—North Island as far as South Napier, and at Chatham Island. Found also in Australia, Japan, and other places.

Triton olearium. Linnæus, Syst. Nat., edition. XI., p 748; Reeve, Conch. Icon., fig. 32. *T. succinctum*, Lamarck. Anim. sans. Vert., 2nd edition. Vol. IX., p. 628; Homb.

* The following species has been omitted:—
Triton fusiformis, Kiener; inhabits Australia.

and Jacquinot, Voy. Pole Sud., pl. 25, fig. 3 . Tryon Man. Conch. Vol. III., p. 11, pl. 3, fig. 19, pl. 4, fig. 24 ; pl. 5, fig. 27-29 ; pl. 6, fig. 37. *T. acclivis*, Hutton, Cat. Marine Moll. of New Zealand, p. 13.

Habitat.—Auckland.

Found in Australia, Polynesia, and various parts of the world.

Triton spengleri. Lamarck, Anim. sans Vert., 2nd edition, Vol. IX., p. 627, Reeve, Conch. Icon., fig. 36 ; Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. II., p. 583, pl. 40, figs. 1-2 ; Tryon, Man. Conch., Vol. III., p. 16, pl. 9, fig. 61.

Habitat.—Throughout New Zealand, and at the Chatham Islands.

Found also in Australia and Tasmania.

Ranella leucostoma. Lamarck, Anim. sans Vert., 2nd edition. Vol. IX., p. 542 ; Reeve, Conch. Icon., fig. 4 ; Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. II., p. 546, pl. 40, figs. 3-5. Tryon, Man. Conch., Vol. III., p. 42, pl. 23, figs. 53-54.

Habitat.—North Island of New Zealand, and Martin's Bay in the South Island.

Found also in Australia and Tasmania.

Ranella argus. Gmelin ; Reeve, Conch. Icon., fig. 12 ; Tryon, Man. Conch., Vol. III., p. 44, pl. 24, figs. 61-65. *R vexillum*, Sowb. Pro. Zool. Soc., 1841, p. 51 ; Reeve, Conch. Icon., fig. 13. Hombron and Jacquinot, Voy. Pole Sud. Zool., Vol. V., p. 115, pl. 25, figs. 38-39. *Bursa proditor*, Franenfeld, Reise der Novara, Moll., pl. 1, fig. 1. *B. tumida*, Dunker, Novit. Conch., pl. 11, fig. 8.

Habitat.—Auckland to Stewart's Island.

Found also in Tasmania, Chili, St. Paul's Island, and the Cape of Good Hope.

Family. Doliidæ.

Dolium variegatum. Lamarck, Anim. sans Vert., 2nd edition. Vol. X., p. 143 ; Reeve, Conch. Icon., fig. 7.

Habitat.—North Cape to Tauranga.

Found also in Australia.

CASSIS PYRUM. Lamarck, Anim. sans Vert., 2nd edition. Vol. X., p. 33; Reeve, Conch. Icon., fig. 29. *C. striatus*, Hutton, Cat. Tertiary Moll. of New Zealand, p. 8 (Young.)

Habitat.—North Island of New Zealand and Martin's Bay in the South Island.

Found also in Australia and Tasmania.

CASSIS ACHATINA. Lamarck, Anim. sans Vert, 2nd edition. Vol. X., p. 33; Reeve, Conch. Icon., fig. 28.

Habitat.—North parts of Auckland Province.

Found also in Australia and the Cape of Good Hope.

Family. LAMELLARIIDÆ.

CORIOCELLA OPHIONE. Gray, Pro. Zool. Soc., 1849, p. 169.

Habitat.—Auckland.

LAMELLARIA CEREBROIDES. Hutton, Trans., New Zealand Institute, Vol. XV., p. 122 (1883.)

Habitat.—Dunedin.

Family. NATICIDÆ.

NATICA NEOZELANICA. Quoy and Gaimard, Voy. Astrolabe, Zool. II., p. 237, pl. 66, figs. 11-12; Reeve, Conch. Icon., fig. 90.

Habitat.—Throughout New Zealand.

NATICA AUSTRALIS. Hutton, Jour. de Conch., 1878, p. 23 (Lunatra.)

Habitat.—Auckland.

The operculum is calcareous (Cheeseman, M.S S.)

NATICA VITREA. Hutton, Cat. Marine Moll. of New Zealand, p. 21 (1873.) *N. amphiala*, Watson, Linn. Soc. Jour., Zool. XV., p. 261 (1881.)

Habitat.—Stewart's Island and the Chatham Islands.

The operculum is horny.

Family. TURBONILLIDÆ.

TURBONILLA NEOZELANICA. Hutton (Chemnitzia) Cat. Marine Moll. of New Zealand, p. 22 (1873.)

Habitat.—Throughout New Zealand.

Perhaps identical with *Turbonilla nitida*, Angas, from South Australia.

ACLIS (RISSOPSIS HYALINA. Hutton, New Zealand Journal of Science II., p. 173 (1884.) Shell thin, hyaline, white or brownish, darker at the apex, smooth, polished; apex blunt, whorls 5 or 6, rather flattened, the suture well washed, Aperture ovate, acuminate posteriorly; columella smooth, slightly recurved anteriorly.

Length, 0·1 inch.

Habitat.—Stewart Island.

ODOSTOMIA LACTEA. Angas, Pro. Zool. Soc., 1867, p. 112, pl. 13, fig. 11.

Habitat.—Throughout New Zealand.

Found also in Australia.

Family. PYRAMIDELLIDÆ.

OBELISCUNS ROSEUS. Hutton, Cat. Marine Moll. of New Zealand, p. 22 (1873.)

Habitat.—Stewart's Island.

Family. CYPRÆIDÆ.*

TRIVIA AUSTRALIS Lamarck, Anim. sans Vert., 2nd edition. Vol. X., p. 545; Reeve, Conch. Icon., fig. 138. Gray, Figs. Moll. Anim., Vol. I., pl. 34, fig. 7.

Habitat.—North Island of New Zealand.

Found also in Australia and Tasmania.

TRIVIA EUROPÆA. Mont. *C. coccinella*, Lamarck, Anim. sans Vert., 2nd edition. Vol. X., p. 544; Reeve, Conch. Icon., fig. 129.

Habitat.—North Island of New Zealand.

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* The following species have been omitted:—
Cypræa punctata, Linnæus; inhabits the Philippines.
Cypræa annulus, Linnæus; inhabits Polynesia.

Found also in Europe, &c., and fossil in the miocene beds at Table Cape, Tasmania.

Family. CANCELLARIIDÆ.*

CANCELLARIA TRAILLI. Hutton, Cat. Marine Moll. of New Zealand, p. 26 (1873.)

Habitat.—Stewart's Island.

Family. TRICHOTROPIDÆ.

TRICHOTROPIS INORNATA. Hutton, Cat. Marine Moll. of New Zealand. p. 26 (1873). *T. clathrata*, Sowerby in Reeve's Conch. Icon., fig. 10 (1874); Voy. Erebus and Terror, Moll., pl. 1, fig. 21 (1874.)

Habitat.—Throughout New Zealand, and at the Chatham Islands.

Family. CERITHIIDÆ.†

BITTIUM TEREBELLOIDES. Martens, Critical List of the Moll. of New Zealand, p. 26 (1873.) *C. cinctum*, Hutton, Cat. Marine Moll. of New Zealand, p. 27 (1873.)

Habitat.—Throughout New Zewland.

BITTIUM EXILIS. Hutton, Cat. Marine Moll. of New Zealand, p. 27 (1873), and Trans. New Zealand Inst. Vol. XVI., p. 214.

Habitat.—Auckland and Stewart's Island.

TRIPHORIS ANGASI. Crosse, Jour. de Conch., 1865, pl. 1, figs. 12-13. *C. minimus*, Hutton, Cat. Marine Moll. of New Zealand, p. 27 (1873.)

Habitat.—Throughout New Zealand.

Found also in Australia.

* The following species has been omitted:—
Cancellaria ampullacea, Lesson.

† The following species have been omitted:—
Cerithium bicolor, Hombron and Jacquinot.
Cerithium striatum, Hombron and Jacquinot.
Cerithium nigrum, Homb. and Jacq.; no description.
Cerithium australe, Quoy and Gaimard.

TRIPHORIS GEMMULATUS. Adams and Reeve, Voy. Samarang, Moll., p. 46.

Habitat.—New Zealand (Martens).

I have seen no specimens.

CERITHIDEA ALTERNATA Hutton, Cat. Marine Moll. of New Zealand, p. 26, (1873).

Habitat.—Tauranga.

CERITHIDEA BICARINATA. Gray, in Dieffenbach's New Zealand, Vol. II., p. 241 (1843); Voy. Erebus and Terror, Moll., pl. 1, fig. 20. *C. lunulentum*, Kein, Mon. Cerith., pl. 23, fig. 1.

Habitat.—North Island, and Bank's Peninsula.

CERITHIDEA TRICARINATA. Hutton, New Zealand Journal of Science. Vol. I., p. 477 (1883); Trans. New Zealand Institute, Vol. XVI., p. 214, (1884).

Habitat.—Tauranga.

CERITHIDEA SUBCARINATA. Sowerby; Reeve, Conch. Icon., fig. 28 (1866). *C. australis*, Gray, in Dieffenbach's New Zealand. Vol. II., p. 241 [not of Lamarck].

Habitat.—Throughout New Zealand, and at the Chatham Islands.

Family. APORRHAIDÆ.*

STRUTHIOLARIA PAPULOSA. Martyn, Univ. Conch., pl. 54 (1784). *Murex pes-struthiocameli*, Chemnitz, Conch. Cab., Vol. X., figs. 1520-21 (1788). *Murex stramineus*, Gmelin, 13th edition Linné's Syst. Nat. *S. nodulosa*, Lamarck, Anim. sans Vert., 2nd edition. Vol. IX., p. 524. *S. papulosa* and *S. vermis*, Reeve, Conch. Icon., figs. 3 and 4 [not of Mavtyn]. *S. gigas*, Sowerby, Chenu, fig. 1651.

Habitat.—North Island of New Zealand, and Cook's Straits.

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* The following species are omitted:—
Struthiolaria tricarinata, Lesson; not recognised.
Struthiolaria scutulata, Martyn; inhabits Australia.

STRUTHIOLARIA VERMIS. Martyn, Univ. Conch., pl. 53 (1784). Kiener's, Mon. Struth., pl. 2, fig. 3. *S. australis*, Gmelin, in 13th edition, Linne's Syst. Nat.: Reeve, Conch. Icon., fig. 1. *S. crenulata*, Lamarck, Anim. sans Vert, 2nd edition. Vol. IX., p. 533; Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. II., p. 430, pl. 31, figs. 7-9. *S. inermis*, Sowerby, Thes., Conch,, Vol. I., fig. 12.

Habitat.—North Island of New Zealand, and Cook's Straits. Very rare south of Cook's Straits.

Family CALYPTRIDÆ.

GALERUS NEOZELANICUS. Lesson (Sigapatella), Voy. Coquille, Zool., Vol. II., p. 395 (1830). *Crepidula maculata*, Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. III., p. 422, pl. 72, figs. 6-9; Reeve, Conch. Icon., fig. 15.

Habitat.—Throughout New Zealand.

GALERUS SCUTUM. Lesson (Sigapatella), Voy. Coquille, Zool., Vol. II., p. 395 (1830). *Trochita tenuis*, Gray, Pro. Zool. Soc., 1867, p. 735.

Habitat.—Throughout New Zealand.

CREPIDULA COSTATA. Sowerby, Genera of Shells, fig. 3. Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. III., p. 414, pl. 72, figs. 10-12; Reeve, Conch. Icon., fig. 21.

Habitat.—North Island of New Zealand.

CREPIDULA MONOXYLA. Lesson, Voy. Coquille, Zool., Vol. II., p. 391. *C. contorta*, Quoy and Gaimard, Voy. Astrolabe, Zool., Vol. III., p. 418, pl. 72, figs. 15-16. *Crypta profunda*, Hutton, Cat. Tertiary Moll. of New Zealand, p. 14 (1873).

Habitat.—Bay of Islands to Auckland.

CREPIDULA UNGUIFORMIS. Lamarck, Anim. sans Vert., 2nd edition, Vol. VIII., p. 642; Reeve, Conch. Icon., fig. 1.

Habitat.—Throughout New Zealand. World wide.

HIPPONYX (AMALTHEA) AUSTRALIS. Lamarck, Anim. sans Vert. Vol. VI., p. 335. Quoy and Gaimard, Voy. Astrolabe, Zool. Vol. III., p. 434, pl. 72, figs. 25-34.

Habitat.—Throughout New Zealand, and the Chatham Islands. Found also in Australia.

Family. TURRITELLIDÆ.

TURRITELLA ROSEA. Quoy and Gaimard, Voy. Astrolabe, Zool. Vol. III., p. 136, pl. 55, figs. 24-26 (1834); Reeve, Conch. Icon., fig. 41.

Habitat.—Throughout New Zealand, and in the Chatham Islands.

TURRITELLA VITTATA. Hutton, Cat. Marine Moll. of New Zealand, p. 29, (1873).

Habitat.—North Island of New Zealand.

TURRITELLA FULMINATA. Hutton, Cat. Marine Moll. of New Zealand, p. 29 (1873).

Habitat.—Northern part of the Auckland Province.

TURRITELLA CARLOTTÆ. Watson, Linn Soc. Jour. Vol. XV., p. 222 (1880).

Habitat.—Queen Charlotte's Sound.

TURRITELLA PAGODA. Reeve, Conch. Icon., fig. 60 (1849).

Habitat.—Northern Part of the Auckland Province.

TURRITELLA TRICINCTA. Hutton, Cat. Tertiary Moll. of New Zealand, p. 13 (1873). *Eglisia symmetrica*, Hutton Cat. Marine Moll. of New Zealand, p. 30 (Young). *Turritella rosea*, Mantell, Quar. Jour. Geol. Soc., Vol. VI., pl. 28, fig. 16, (1850).

Habitat.—Lyttelton Harbour; Stewart's Island.

EGLISIA PLICATA. Hutton, (Rissoa) Cat. Marine Moll. of New Zealand, p. 29 (1873).

Habitat.—Auckland and Stewart's Island.

Family. Rissoidæ.*

Rissoina (Eatoniella) olivacea. Hutton, (Dardania), Trans. New Zealand Institute. Vol. XIV., p. 147, pl. 1, fig. k, (1882).

Habitat.—Lyttleton.

Shell ovate, smooth, very dark brown when dry; aperture not continuous.

Length, 0·08 inch.

Rissoina annulata. Hutton, New Zealand Jour. of Science. Vol. II., p. 173 (1884).

Habitat.—Auckland

Shell ovate, smooth, brown, often with a paler band just below the suture. Whorls 5, slightly rounded, the suture well marked Aperture rounded, continuous in the adult.

Length, 0·08 inch.

Distinguished from *B purpurea* by its shape and better marked sutures.

Rissoa rugulosa. Hutton, Cat. Marine Moll. of New Zealand, p. 28 (1873.) *Eulima chathamensis*, Hutton, l.c., p. 23.

Habitat.—Throughout New Zealand and at the Chatham Islands. According to Mr. Justice Gillies it is the same as *R. variegata*, Angas, from Australia.

Our largest species, elongately curved, white or yellowish white. The spire whorls are longitudinally ribbed, but the body whorl is smooth.

Length, 0·3 inch.

Rissoa purpurea. Hutton, Cat. Marine Moll. of New Zealand, p. 29 (1873.) *R. subfusca*, Hutton, l.c., p. 28.

Habitat.—Stewart's Island.

Shell subulately elongated, yellowish with a purple spire, and a white band below the suturs, apertures rounded, continuous.

Length, 0·12 inch.

* The following species has been omitted:—
Rissoa fasciata, Adams; inhabits Australia.

RISSOA IMPOLITA. Hutton, Cat. Marine Moll. of New Zealand, p. 29 (1873.)

Habitat.—Stewart's Island.

Shell conoidal, white, whorls flattened, finely spirally striated; sature small.

Length, 0·1 inch.

RISSOA NANA. Hutton, Cat. Marine Moll. of New Zealand, p. 28 (1873.)

Habitat.—Stewart's Island and Auckland.

Shell oval, spire short and blunt; whorls longitudinally ribbed.

Length, 0·1 inch.

RISSOA ROSEA. Hutton, Cat. Marine Moll. of New Zealand, p. 29 (1873.)

Habitat.—Stewart's Island.

Shell ovate, pink; whorls rather flat; mouth not continuous.

Length, 0·07 inch.

RISSOA FLAMMULATA. Hutton, Jour. de Conch., 1878, p. 28.

Habitat.—Auckland.

Shell turbinately conical, polished red with oblique white rays; aperture not continuous.

Length, 0·25 inch.

RISSOA LIMBATA. Hutton, New Zealand Journal of Science. Vol. I., p. 477 (1883); Trans. New Zealand Institute. Vol. XVI., p. 214 (1884).

Habitat.—Auckland.

Shell turbinately conical, polished; ashy brown with white spots at the suture.

Length, 0·11 inch.

Family. LITTORINIDÆ.*

LITTORINA CINCTA. Quoy and Gaimard, Voy. Astrolabe, Zool. II., p. 481, pl. 33, fig. 20-21 (1833); Reeve, Conch. Icon.,

* The following species have been omitted:—
Littorina vilis, Menke.
Littorina novæ-zealandiæ, Reeve.
Risella melanostoma, Gmelin; inhabits Australia.
(*R. Kielmansegge*, Frankf.)

fig. 53. *L. angulifera*, Gould, Otia Conch., p. 55 (1846.) *L. luctuosa*; Reeve, Conch. Icon., fig. 65 (1857.)

Habitat.—Throughout New Zealand, and the Chatham Islands.

LITTORINA MAURITIANA. Lamarck, Anim. sans Vert. *L. dimenensis*, Quoy and Gaimard, Voy. Astrolabe, Zool. II., p. 479, pl. 33, fig. 8-11; Reeve, Conch. Icon., fig. 94 (1833). *L. antipodum*, Philippi, abbild. a Berch. Conch. Littorina, p. 195, tab. Vol. IV., fig. 2 (1847).

Habitat.—Throughout New Zealand and at the Chatham Islands.

Found also in Tasmania, Australia, and the Mauritius.

This species is quite distinct from *L. neritoides*, L, and I suppose therefore that Tenison-Wood is wrong in uniting it with *L. cærulescens*. Lam.

FOSSARINA VARIUS. Hutton. Cat. Marine Moll. of New Zealand, (Aderorbis) p. 35 (1873).

Habitat.—Throughout New Zealand, and at the Chatham Islands.

Family. VERMETIDÆ.

VERMETUS (BIVONIA) NEOZELANICUS. Guoy and Gaimard, Voy. Astrolabe, Zool. Vol. III., p 293, pl. 67, figs. 16-17 (1833).

Habitat.—Throughout New Zealand.

VERMETUS (SIPHONIUM) LAMELLOSUS. Hutton, Cat. Marine Moll. of New Zealand, p, 30 (1873).

Habitat.—Cook's Straits in deep water.

VERMETUS (STREPHOPOMA) ROSEUS. Quoy and Gaimard, Voy. Astrolabe, Zool. Vol. II., p. 300, pl. 67, figs. 20-24.

Habitat.—Hauraki Gulf.

SILIQUARIA AUSTRALIS. Quoy and Gaimard, Voy. Astrolabe, Zool. Vol. II., p. 302; Chenu, Man. Conch., figs. 2, 3, 10.

Habitat.—Hauraki Gulf.

Found also in Australia. Doubtfully identified.

PTENOGLOSSA.

Family. Scalaridæ.

Scalaria zelebori. Frauenfeld, Reise der Novara, Moll., p. 1, fig. 6 (1867.)

Habitat.—Auckland, Stewart's Island.

Varices 12-13 ; distinct spiral ribs, body whorl keeled.

Scalaria jukesiana. Forbes, Voy. Rattlesnake, App., p. 383, fig. 7. *S. wellingtonensis*, T. W. Kirk, Trans. New Zealand Inst. Vol. XIII., p. 307 (1882.)

Habitat.—North Island of New Zealand.

Found also in Australia and Tasmania.

Varices 17-20 ; no spiral ribs, no ridges on the body whorl ; pure white.

Scalaria tenella. Hutton (1885.) *S. lineolata*, Cat. Marine Moll. of New Zealand, p. 22 [not of Keiner.] *S. Gra.*, Man. New Zealand, Moll., p. 70 [not of Sowerby.]

Habitat.—Auckland.

Varices about 20 in the body whorl ; no spiral ribs ; white with a pale brown band on the anterior part of the body whorl. Not so acute as the last species,

Family. Onustidæ.

Xenophora conchyliophora. Born ; *Phorus agglutinans*, Lamarck, Anim. sans Vert. Vol. IX., p. 161.

Habitat.—Hauraki Gulf (Cheeseman).

Found also in the West Indies.

Family. Solariidæ.

Solarium luteum. Lamarck, Anim. sans Vert., 2nd edition. Vol. IX., p. 100 ; Reeve, Conch. Icon, fig. 14.

Habitat.—Auckland (Mathews), Wellington (Kirk.)

Found also in Australia and the Mediterranean Sea.

Family. JANTHINIDÆ.

JANTHINA COMMUNIS. Lamarck, Anim. sans Vert 2nd edition. Vol. IX., p. 4 ; Reeve, Conch. Icon.. fig. 5.

Habitat.—North Island of New Zealand.

Found also in Australia.

JANTHINA IRICOLOR. Reeve, Conch. Icon., fig. 23.

Habitat.—North Island of New Zealand.

JANTHINA EXIGUA. Lamarck, Anim. sans Vert., 2nd edition. Vol. IX , p. 5 ; Reeve, Conch. Icon., fig. 21.

Habitat.—Throughout New Zealand and at the Chatham Island. Found also in Australia.

NOTES AND EXHIBITS.

Dr. Cox read the following letter from Mr. Benjamin Hinde, R.N., of H.M.S., Diamond, on the poisonous effects of the bite inflicted by the *Conus Geographicus*, Linn. on the natives of New Britain :—

"H.M.S. DIAMOND,

"*At Sea, Lat. 10° 14′ S., Long. 155° 34′ E.*

"The following facts which I have learned partly by hearsay, and partly by personal observation, concerning the shell, known as *Conus Geographus*, of Linnæus, may be of interest.

"What first drew my observation to this curious power of *C. Geographus* was, a native of Nodup, New Britain, an interpreter on board H.M.S. Diamond, seeing me with a specimen of *C. Geographus* in my hand, remarked, "suppose he bite he kill man." Thinking this to be an exaggeration on the part of the native, but at the same time thinking that he must have *some reason* for so saying, I enquired of him more particularly as to how the shell would harm any one, as at the time I fancied that he meant if the edge of the shell cut a person by accident it would cause blood poisoning, however, he described how that the fish would *bite* and that the *bite* was poisonous, and that it always killed people if they did not cut themselves to let the blood run, all round the place bitten, he also promiseed to procure me a live specimen and shew me how it bit.

"This promise he carried out as nearly as he could for he brought me the shell, but said when he went to take it up the animal had retired or rather, commenced to retire into its shell when he cut off the head, which he brought me separated from the shell. The shell he brought was about 5 inches in length.

"Some time afterwards being in conversation with a Mr. R. Parkinson, a New Britain Cotton Planter, I enquired if he knew any thing of this man's statement about this *Conus*. He told me that he believed it to be perfectly true, and that he had written about it to some one in Sydney.

"I should have taken no more notice of the statement but for the fact, that *I saw myself*, a native, on the Island of Matupi, Blanche Bay, New Britain, who had been bitten by one, and who had at once cut small incisions with a sharp stone all over his arm and shoulder from which the blood had flowed freely, and he explained to me that if he had not taken these precautions that he would have died. He explained to me also the shell and how he had been bitten (there was a small mark about the size of a threepenny piece) between his finger and thumb, but upon close examiantion there were two small incisions in the centre but from which evidently *no blood* had come.

"I may mention that to stop the bleeding of the numerous cuts in his arm and shoulder, *hot* wood ashes had been put on them, and the arm seemed to be stiff and useless for the time. But whether this was the effect of the *bite* or the *cure* I really am unable to state.

"Many natives whom I questioned, (shewing them the shell at the same time) said that the bite was deadly.

"Hoping that these few observations may be of use either as information, or conformation to Conchologists generally.

"BENJ. HUGH HINDE, R.N."

Dr. Cox stated that an instance had been recorded by Mr. Arthur Adams of a poisoned wound produced by the bite of *Conus aulicus*, Linn. The Rev. W. Wyatt Gill had recorded the fatal effects of the bite of the *Conus textilis*. Linn., and Mr. Brazier had informed Dr. Cox that he had known severe effects caused by the bite of the *Conus tulipa*. Linn. This was the first instance Dr. Cox had heard of the poisonous effects of *Conus Geographicus*.

Dr. Cox exhibited a collection of Fibres, obtained by maceration from the bark of indigenous trees growing on the Northern rivers of N.S.W. Also, two distinctly banded specimens of *Helix Angasiana* collected by the President on the Barrier Ranges; and a new species of Land Shell from New Britain, which he had obtained from Mr. Hinde of H M.S. Diamond, and which he proposed to call *Cochlostyla Hindei*. The type specimen is in the Australian Museum.

Mr. H. Gilliat exhibited a Stone Implement which had been found near the Darling above Wilcannia. It is 17 inches long and 1¾ inch in diameter, one end being pointed and the other nearly flat, slightly concave. The use of this implement is not understood by the natives at present living in the district; but it is believed to have been employed as a roller or pestle for crushing the nardoo seed. It is somewhat similar in shape to the one which was recently exhibited from the Walgett district.

The President exhibited several interesting specimens of Argentiferous Lead Ores and Chloride of Silver from the lodes in the Barrier Ranges.

Mr. Masters exhibited specimens of six extremely rare Australian Beetles, viz.:—*Aulacopsis Reichei*, *Schizorhina Digglesii*, *Cacostomus squamosus*, *Stigmodera Chevrolati*, *Megamerus Kingii*, and a species of *Mecomastix*.

Mr. Gervase F. Mathew, F.L.S., of H.M.S. Espiegle exhibited a number of remarkably perfect and beautiful specimens of *Papilio Godeffroyi*, Semp. from Samoa, and of *P. Schmeltzi*, Herr. Schaff., from Fiji, which he had reared at sea from larvæ obtained at these Islands, and fed on the leaves of a species of *Aralia*. He exhibited also the ova, pupa, and larva of each insect, and mentioned that these stages had not previously been observed.

WEDNESDAY, 29TH OCTOBER, 1884.

The President, C. S. Wilkinson, Esq., F.L.S., F.G.S., in the chair.

The Rev. T. Wyatt Gill, H. B. Brady, Esq., F.R.S., F.L.S., J. Harris, Esq., and T. W. David, Esq., B.A., F.G.S., were introduced as visitors.

MEMBERS ELECTED.

Leopold F. Woolrych, Esq., of Newtown; Mons. Jean Lison, Analytical Chemist, of Noumea, New Caledonia.

DONATIONS.

"Reistochen naar de Geelvinkbaai op Nieuw Guinea in den Jahren 1869-70, door G. B. H. von Rosenberg," 4to, 1875. From Baron N. de M-Maclay.

"Science," Vol. IV., Nos. 78 to 84, August 1st to September 12th, 1884. From the Editor.

"Bulletin of the Museum of Comp. Zool., at Harvard College, Cambridge, Mass." Vol. XI., No. 10. From the Museum.

"Karte des Tasman Gletscher von Dr. R. von Lendenfeld," 1884. From the Compiler.

"Zoologischer Anzeiger," Jahrg. VII., Nos. 174, 175, 176, 18th August to 15th September, 1884. From the Editor.

"Journal of the Royal Microscopical Society," Ser. II., Vol. IV., Part 4, August, 1884. From the Society.

"Annali del Museo Civico di Storia Naturale di Genova." Volumes VI to XX., inclusive, 8vo, 1874 to 1884. From the Director.

"Proceedings of the Zoological Society of London." Part 2, for 1884. "List of Fellows," 1884. From the Society.

"Journal of the Linnean Society of London." Botany, Vol. XX., Nos. 130-131, Vol. XXI., Nos. 132-133, April 26th to 30th, 1884. Zoology, Vol. XVII., Nos. 101-102, October 20th, 1883, and February 29th, 1884. Also "Proceedings," November, 1882, to June, 1883, and "List of Fellows," 1883.

"Notiser ur Sallskapets pro Fauna et Flora Fennica Forhandlingar." Parts III., IX. to XIV. and XVIII., 1857 to 1882. "Acta," Vol. I., 1875-77. "Meddelanden," Parts I. to VIII., 1876 to 1881. From the Society.

"Victorian Naturalist," Vol. I., No. 9, September, 1884. From the Field Naturalists Club of Victoria.

"Tijdschrift voor Entomologie." Vol. XXVII. Parts 1 and 2, 1884. From the Entomological Society of the Netherlands.

"Feuille des Jeunes Naturalistes." No. 167, September, 1884. From the Editor.

"Illustrations of the Nueva Quinologia of Pavon." By W. Fitch, F.L.S., and J. E. Howard, F.L.S., 1 Vol., folio (with coloured plates), 1882. From E. C. Merewether, Esq.

"Course of Instruction in Zootomy," (Vertebrata.) By Prof. T. Jeffrey Parker, B.Sc., 8vo, 1882. From W. A. Haswell, Esq., M.A., &c.

"Report on the Zoological Collections made in the Indo-Pacific Ocean during the voyage of H.M.S. 'Alert,' 1881-82," 1 Vol., 8vo, 1884. From the Trustees of the British Museum.

A large and valuable collection of lichens made by Dr. Knight in New Zealand. Presented by the Rev. William Woolls, Ph. D., F.L.S.

"The Higher branch of Science, or Materialism refuted by facts." By H. J. Browne, pamphlet, 8vo, 1884. From the Author.

"Mittheilungen aus der Zoologischen Station zu Neapel." Band. V., Heft. 2, 1884. From the Director.

SUGGESTIONS AS TO THE MODE OF FORMATION OF BARRIER REEFS IN BOUGAINVILLE STRAITS, SOLOMON GROUP.

By H. B. Guppy, M.B., Surgeon, R.N.

[Plate LVIII.]

A broken line of barrier-reef skirts the eastern extremity of the large island of Bougainville at a distance of about fifteen miles from the coast, and incloses a wide expanse of water, forty to fifty fathoms deep, dotted by an archipelago of islands and inlets, mostly of volcanic formation. This line of reef fringes the edge of a sub-marine platform which may be described as the submerged extension of the adjacent coast of Bougainville. On its seaward side the slope of the reef descends rapidly beneath the sea at an angle varying between 15° and 20°, the "hundred fathom" line being removed to between one-quarter and one-third of a mile from the outer edge. Reserving a general description of the reefs of these Straits until the completion of the survey, I will at present confine my remarks to a sub-group known as the Shortland Islands, a collection of islands which have been upheaved along the line of the barrier-reef at the south-west corner of the submerged platform above alluded to.

Viewed from seaward the Shortland Islands have a low-lying level profile never probably attaining an elevation much in excess of 400 feet above the sea. They consist of one main island named Alu (ALU), eight to ten miles in length, the coasts of which, more especially those on the weather sides, are skirted by lines of smaller islands and islets. Alu—the main island—is composed in great part of a soft calcareous deposit containing numbers of the shells of pteropods, foraminiferous tests, and other organic remains, and overlaid by a crust of coral-limestone which probably rarely exceeds a hundred feet in thickness: whilst the lines of islands, which skirt its coasts, are in reality elevated lines of barrier-reefs formed of the coral-rock. The most interesting feature, however, of the geology of this small group of islands—a subject to which I can only briefly refer in connection with the subject of this paper—is the occurrence of volcanic formations in the north-west corner of the main island of "Alu," the volcanic portion passing into the calcareous region of the island without any indication shewn in the profile and surface-contour of such a change of formation.

My examination of the Shortland Islands has led me to the conclusion that they have been formed during a movement of elevation by the advancement of successive lines of barrier-reefs in a prevailing south-eastern direction from the north-west corner of the main island of "Alu," where the volcanic formations occur. The ancient lines of barrier-reefs are still preserved in the interior of this Island by ridges of coral-limestone, which usually have a constant trend at right angles to the prevailing trade-wind The more recent lines of barrier-reefs, which have also experienced elevation, are represented by the broken lines of islands and inlets, some of which rise over a hundred feet above the sea, that skirt the weather coasts of "Alu." The accompanying diagram, which represents a section drawn N.W. to S.E., may make the foregoing remarks more clear. I have purposely drawn it on an exaggerated scale, since on the true scale the more characteristic features could not be delineated.

On the opposite side of Bougainville Straits, a broken line of barrier-reef skirts the western extremity of Choiseul Island inclosing a lagoon-channel known as Choiseul Bay, which has a breadth varying between half and three-quarters of a mile, and a depth in the deeper parts between thirteen and eighteen fathoms, where a sheltered anchorage is obtained. (Vide plan of this locality.) The submarine slope on the outer side of the barrier-reef has a more gradual descent than that which prevails among other reefs of this character in the Solomon Group, the "hundred fathom" line lying about three-fifths of a mile from the edge of the reef and representing a general inclination of about 10°. The gradual character of the submarine slope of this barrier-reef is a feature on which I lay a particular stress: I have previously referred, in the instance of the long line of barrier-reef on the Bougainville side of the Straits, to the more rapid submarine slope (15° to 20°) as indicated by the nearer approach to the coast of the "hundred fathom" line.

On the line of barrier-reef which incloses Choiseul Bay five wooded islets have been formed. They are for the most part formed of materials thrown up by the waves at the present sea level; but the presence in some of the larger islets of elevated coral-rock in mass affords evidence of the whole line of reef having been upheaved recently some six feet or more. An islet of coral-limestone, which rises up in the midst of the lagoon-channel to between 20 and 25 feet above the high-tide level, affords testimony of a recent movement of upheaval to that extent. To the northward this line of barrier-reef meets the coast at the head of the bay where it joins the shore-reef; to the southward, it is continued as a sunken line of reef covered by five or six fathoms of water with a channel thirty fathoms deep inside.

The interior of the adjacent portion of Choiseul Island displays long level ridges with intervening valleys running parallel to the coast—a surface-contour resembling that of the interior of the Shortland Island before described. An examination of the hills near the coast has shown that the geological features are much the same as those of the Shortland Island; a soft calcareous deposit containing pteropod-shells, foraminiferous tests, and other organic remains, forms the bulk of these hills, being itself encrusted by the coral-limestone. Here then, as in the Shortland Island, barrier-reefs have been formed in a region which has been undergoing upheaval during a prolonged period: but in neither locality was I able to find a clue to the problem of their formation until I had taken a series of soundings off the outer edge of the Choiseul Bay reef, a subject to which I will immediately refer.

The profile, which I have appended, of the seaward slope of this barrier-reef, has been drawn on a true scale, partly from my own soundings which extended to forty fathoms, and partly from those made by the officers of the survey as far as the " hundred fathom line." As shewn in this section, the submarine portion of the reef at first slopes gradually to a depth of four or five fathoms, when it plunges down by a steep declivity another nine or ten fathoms, from the foot of which there is a less precipitous talus-like slope to a depth of about twenty fathoms from the surface. Beyond, there extends a broad ledge covered by from 23 to 25 fathoms of water which terminates in another rapid slope to a depth of a hundred fathoms, which is the limit of the section. Living corals flourish on the upper part of the submarine slope down to the cliff or declivity above referred to. In depths of fifteen to twenty fathoms at the foot of this submarine cliff there appeared to be very little living coral, since out of twelve casts in these depths the armings brought up calcareous sand and gravel on eight occasions. Carrying the soundings further seaward on the broad ledge previously described, I found that the armings of my lead gave much less frequent indications of the occurrence of sand and gravel, whilst the greater proportion of the casts shewed the presence of living coral. Out of eleven soundings in depths between 23 and 40 fathoms, seven shewed a perfectly clean indentation on the arming as of living coral ; but on account of the swaying movement of the lead only two of these impressions were recognisable : from a depth of 23 fathoms the prints of the contiguous stars of an Astræa were preserved ; and in a subsequent cast of 31 fathoms the impressions of a rounded knob of a Porites with its characteristic small cells were similarly displayed. A reference to the section in profile of this reef will explain this distribution of the detritus and of the living coral.

Sand and gravel, derived from the constant action of the rollers breaking on the edge of the reef-flat, would naturally tend to collect at the foot of the first declivity in depths of fifteen to twenty fathoms ; in such a situation living coral would be scarcely expected to thrive ; but in the more level region beyond, as the sand and gravel thinned away, conditions more suitable for the growth of coral would be found, and this is the conclusion towards which my soundings pointed. There would thus appear to exist on the outer submarine slope of this barrier-reef, in depths of fifteen to twenty fathoms, a belt of detritus dividing into two portions the zone in which the reef-building corals thrive. (I have marked the position of this belt in the section by a cross.) Had my soundings been confined to the upper of these two sub-zones, I should have been justified to a great extent, on reaching the belt of sand and gravel, in concluding that coral did not thrive in depths beyond fifteen fathoms; but by subsequently extending such soundings seaward across this band of detritus into the lower or outer sub-zone, I should have exposed the fallacious character of such a conclusion.

The results of these soundings supplied me with an explanation of the growth of barrier-reefs in a region of elevation, which I will briefly review in the light of numerous observations I have made in this group on the growth of coral-reefs during the past two years.

If we imagine an Island, originally formed from the materials ejected from some volcanic vent and bare of coral-reefs, to afford, after the extinction of the subterranean fires, the conditions for growth on its coasts for reef-building corals, a fringing reef of varying width according to the degree of inclination of the submarine slope will ultimately invest its shores. In course of time, the detritus of the corals will collect in a band of calcareous sand and gravel on the outer slope of the reef, marking the apparent limit of the depths in which the reef-corals are usually stated to thrive. But the vertical and horizontal extension of such a band of detritus will be mainly determined, as my observations on the Choiseul barrier-reef have shewn, by the presence and position of submarine declivities and by the degree of inclination of the slope. In such a zone of sand and gravel corals will not thrive; but if the submarine slope has a very gradual inclination, as in the case of the barrier-reef of Choiseul Bay, the lower limit of this zone of detritus may lie within the depths in which reef-building corals flourish, and a line of barrier-reef begin lying parallel with the fringing reef, but separated by a deep channel.

On the other hand, should the submarine slope have a more rapid descent, the lower limit of the belt of detritus may extend far beyond the depths in which reef-corals can thrive: in such a case no barrier-reef will form, and the original fringing-reef will continue to grow outwards on its own talus. On this view the occurrence of barrier-reefs and of fringing-reefs on different parts of the coast of the same island may be readily explained as due to the different degrees of inclination of the submarine slope.

Keeping in view the foregoing explanation of the formation of a barrier-reef in a district which may for a long period have experienced no change in the relative positions of land and sea, we can perceive how in an area of elevation line after line of barrier-reef will be formed as from time to time fresh portions of the sea-bottom, previously below the reef-coral zone, are brought up within the depths in which reefs commence their growth; line upon line of barrier-reef will be thus advanced, each growing up along the lower limit of the belt of detritus derived from the line of reef inside it. In process of time the elevating movement assisted by the accumulation of sediment, the growth of branching corals, and the reclaiming agency of the mangrove, will bring about the filling up of the passages or lagoon-channels between the lines of reef, until at length a tract of land is produced rising gradually from the sea-border to the interior but with the ancient lines of barrier-reef still indicated by ridges of coral-limestone on its surface. Such in fact is in my mind the history of the formation of the Shortland Islands and I opine of the western extremity of the Choiseul Island. In the former locality we have the original Island of volcanic formation in the North-west corner, from which, as from a nucleus, line after line of barrier-reef has been advanced in a south-easterly direction, forming ultimately, during the continuance of the elevation, the large Island of "Alu." Should this elevating movement be at present suspended, as would appear to be indicated by the great width of the reef-flats still over-flowed by the sea on the weather coasts of the outlying islands, there yet remains a considerable addition to be made to the sea-border of "Alu" by the filling up of the passages between the lines of islands which represent elevated barrier-reefs on its weather coasts. Such a process is in actual operation at the present time in the passages, the encroachment of the mangrove on either side and the upward growth of coral in the channels being the agencies at present effecting this operation. These remarks may be made more clear by a reference to the section of the Shortland Islands.

It follows from this view of the formation of barrier-reefs in this region that the lagoon channels inside the reefs should never be deeper than the zone in which reef building corals are stated to thrive, a depth from which my soundings in different parts of the Solomon Group I place at fifteen fathoms, but which has been variously estimated in other parts of the world, where coral reefs occur, at from ten to thirty fathoms. The passages inside the reefs of the Shortland Islands and Choiseul Bay, comply with this condition. Depths however of forty to fifty fathoms occur, as stated in the commencement of this paper, inside the line of barrier reef that skirts the eastern extremity of Bougainville. Similar depths are not uncommon in the lagoon channels of barrier-reefs in other regions of the Pacific; and thus this view of the formation of barrier-reefs apparently breaks down. There, however, appears to be no "a priori" reason why reef-building corals should not thrive beyond the belt of calcareous sand and gravel that apparently marks the limit of their zone, and therefore in depths greater than those which are usually accepted as favouring the growth of reefs. Soundings off the outer edge of barrier-reefs have rarely been extended (in the Pacific at least) much beyond fifty fathoms, the presence of the sand and gravel, which I hold to be merely gathered together into a belt, having been considered as marking the lower limit of the reef coral zone. I refer not to the soundings taken in a nautical survey which fail to particularize the nature of the bottom with sufficient accuracy, but to such lines of soundings as are taken by observers with a specific object before them.

My observations on the recently elevated calcareous formations of this group enable me to approach this subject by another road; and in passing from the consideration of a probable cause of the origin of barrier-reefs to the study of such reefs when upraised, with their foundations above the sea, I at once enter a domain of greater certainty. These investigations have shown that coral-reefs are based usually on a partially consolidated calcareous ooze, often foraminiferous, generally abounding with recent shells, and now and then laden with pteropod-shells in considerable numbers, the thickness of the overlying coral-rock rarely exceeding a hundred feet. That the reef-corals commence to grow on such a bottom, and not on a layer of detritus of sand and gravel, is shewn by the fact of my finding at Santa Anna two massive corals of the Astræidæ, the largest four feet in diameter, imbedded in the position of growth, at a height of forty feet above the sea, in the base of a coral-limestone cliff where they almost rested on the subjacent partially consolidated ooze. It is a noteworthy circumstance that in my numerous soundings off the outer edge of reefs in this group, l.c., extending to fifty fathoms, the armings never brought up any other indication of the nature of the bottom, outside the usually accepted coral-zone, than that of calcareous sand and gravel. In truth my soundings down to depths of fifty fathoms failed to reach the ooze. It would therefore appear that such reefs as those of the Shortland Island commenced to build in depths greater than fifty fathoms. If elevation had brought the ooze within these depths uncovered by the calcareous detritus, the armings would probably have recorded such an occurrence amongst some of my numerous soundings. The following question then seems pertinent to the subject in hand. How is it that since coral-reefs base their foundations on calcareous ooze, it is necessary to go far beyond the depths in which reef-corals are usually stated to thrive to reach the ooze. The reply to such a query may furnish a more satisfactory explanation of the depths of forty and even sixty fathoms, which have been found in the lagoon channels of barrier-reefs and in the lagoons of atolls, than those which have been hitherto advanced. Mr. Darwin admitted that an objection to his theory of subsidence might be found in " the circumstance of the lagoons within atolls and within barrief-reefs never having become in any one instance during prolonged subsidences of a greater depth than 60 fathoms, and seldom more than 40 fathoms" but he met it with the explanation that such lagoons are being filled up, *pari passu* with the downward movement, by the growth of corals and the accumulation of sediment (Coral Reefs, edit., 1842, p. 115.) In the second of two papers by Prof. Arch. Geikie, published in "Nature"[1] (Dec. 6th, 1883) on "The Origin of Coral Reefs," where the arguments for and against the theory of subsidence are fully examined, the more recent views advanced by Mr. Murray and Prof. A. Agassiz are dwelt upon at some length. My observations on the raised calcareous formations in this Group go far to support the modification in Mr. Darwin's theory which appears to have become necessary; but since these observations and my collections are now in the hands of Mr. Murray, I must at present forbear from further remarks on the subject. It may not however, be out of place to observe that amongst the reefs I have examined in this group I have not found evidence of the solution of the coral-rock taking such an important part in the formation of lagoons as is implied in Mr. Murray's description of the reef at Tahiti.

The leading points of my paper I may briefly summarise as follows:—

(1). That reefs of the barrier class exist in Bougainville Straits, a region which has been undergoing upheaval during a prolonged period.

(2). That these reefs may be arranged in two classes, (*a*) those which have been formed at the present sea level; and (*b*) those, which having experienced upheaval, are now represented by lines of islands and islets of coral limestone, varying in elevation between a few feet to over a hundred feet above the sea, their lagoon channels being still preserved but often very shallow.

(3). That the Shortland Islands have been produced by the successive advancements of lines of barrier-reefs from a nucleus of land of volcanic formation during a period of upheaval, a process which resembles that by which, according to the observations of Professor A. Agassiz, the southern extremity of Florida is growing westward, but with this distinction, that in Florida the area seems to have remained stationary for a long period, the lagoon channels between the concentric lines of reef being merely silted up into dry land.

(4). That the calcareous detritus, which covers the outer slopes of reefs in this group in depths usually of twenty fathoms and beyond, is probably a band dividing the zone of reef-building corals into two sub-zones where the slope is gradual, but where the slope is of a more rapid character extending far beyond the coral zone.

(5). That in the case of reefs which possess such a gradual slope that the lower margin of this band of detritus lies within the zone of reef building corals, a line of barrier-reef will be ultimately formed beyond this band with a deep channel inside: but that in the case of reefs, which possess a more rapid submarine slope so that the lower limit of the band of detritus extends far beyond the depths in which the reef corals thrive, no such line of barrier-reef will be formed.

(6). That where the area is undergoing elevation, a succession of concentric lines of barrier-reefs would thus originate, line after line being advanced, as fresh portions of the sea bottom are brought towards the surface, each line growing upward along the lower margin of the belt of detritus derived from the line of reef inside it.

(7). That inasmuch as my observations go to show that the elevated reefs in this group repose on a partially consolidated calcareous ooze which is not found in depths under fifty fathoms on the outer slopes of the present reefs, it is probable that coral reefs may commence to build in depths greater than those usually assigned.

(8). That on such a view may be readily explained the circumstance, that the depths of the lagoons inside barrier-reefs and atolls so frequently exceed the depths in which reef corals are stated to thrive.

An apparent objection here presents itself with reference to the last two conclusions. If reefs begin to build their foundations in depths greater than those which are usually assigned to them, the thickness of the elevated coral formations I examined ought to have been far in excess of a hundred feet. But fringing reefs themselves are restricted to shallow waters around the coast, and their seaward extension in localities where the submarine slope is steep must be extremely slow. Whilst, on the other hand, in an area of elevation, such as that in which the Solomon Islands are included, barrier-reefs, which begin to grow in depths not less than fifty fathoms, may owe their approach towards the surface as much to the elevating movement as to the very slow upward growth of the coral. It should also be borne in mind that the rapid subaerial denudation to which these regions of heavy rainfall are subjected would be an important agency in the thinning away of the raised coral formations.

In conclusion I may observe that the preceding remarks, although in the main suggestive, are founded on observations not only of reefs as they skirt a coast, but of those whose foundations have been exposed by upheaval. After having failed to account for the origin of the barrier-reefs of Bougainville Straits by the views at present held of the growth of coral reefs, I offer the foregoing explanation of their formation.

RECORD OF AN UNDESCRIBED *CORREA* OF NEW SOUTH WALES.

By Baron Ferd. Von Mueller, K.C.M.G., M.D., Ph.D., F.R.S.

Correa Bauerlenii.

Branchlets thinly covered with dark brown stellular hair ; leaves of thin consistence, almost lanceolar, gradually upwards narrowed or occasionally verging into an ovate form, quite flat, above dark green and almost glabrous, beneath pale-green and very scantily star-hairy, shining on both sides, much transparently dotted ; flowers solitary ; stalklet about as long as the calyx or somewhat longer ; the latter comparatively large, about as broad as long, glabrous, enlarged near the almost truncate base by an horizontally expanding soon somewhat reflexed appendicular membrane, throughout considerably wider than the corolla-tube, usually terminating into two nearly semi-orbicular lobes, occasionally irregular, ruptured, or lobulated, or denticulated ; corolla cylindrical, about three times as long as the calyx, pale yellowish green, thinly stellular-hairy outside, its lobes hardly spreading, many times shorter than the tube, filaments conspicuously exerted, slightly broader towards the base ; anthers dark green, several times longer than broad ; style glabrous ; fruitlets hairy, becoming glabrescent, almost truncated ; valves of the endocarp upwards dilated ; seeds shining, dark brownish ; cotyledons nearly as long as the radicle.

On stony banks of rivulets of the Upper Clyde ; *Wilhelm Baeuerlen.*

The plant to which specific rank is here assigned, accords best in its characteristics with *C. Lawrenciana* ; that is however, not a real highlands plant, and does not exceed 6 feet in upward growth ; the leaves are constantly flat, almost membranous, never tomentose beneath, and are more gradually narrowed into the pointed summit, than in any other congener ; the flowers are always solitary, while the often almost bilabiate calyx with its invariable basal expansion is quite aberrant within the genus, nor otherwise to be found in allied *Rutaceæ*, it being moreover large, lax, and never tomentose ; but a variety of *C. Lawrenciana* found by me on the banks of the Genoa, shows also a glabrous calyx, although cylindric, appressed and acutely four-lobed. The characteristics of *C. Baeuerlenii*, as above pointed out, prove uniform in the considerable number of specimens, available for examination. The remarkable expansion, which encircles the base of the calyx, and which is pale greenish above but darker green beneath, must therefore be regarded as a normal appendicular organ, not as a casual deformity, nor is it connected with the hypogynous disk, although both are in close approach to each other.

This seems a fitting opportunity for continuing the records of far southern localities of various plants in New South Wales, as commenced in these pages previously.

Drimys dipetala. Shoalhaven.

Palmeria scandens. Shoalhaven.

Citriobatus multiflorus. Shoalhaven.

Cedrela australis. Bateman's Bay.

Melia Azedarach. Shoalhaven.

Zieria pilosa. Shoalhaven.

Hibiscus tricuspis, var Collieii ; (possibly a distinct sp.) Mount Dromedary.

Dodonæa pinnata. Clyde.

Ficus Muelleri. Shoalhaven.

Laportea photinophylla. Bateman's Bay.

Pseudomorus Brunoniana. Shoalhaven.

Peperomia reflexa. Shoalhaven.

Peperomia leptostachya. Shoalhaven.

Piper hederaceum. Shoalhaven.
Polygonum orientale. Shoalhaven.
Gompholobium glabratum. Clyde.
Oxylobium scandens. Clyde.
Acacia binervata. Shoalhaven.
Rhodamnia trinervia. Shoalhaven.
Astrotricha floccosa. Clyde.
Polyosma Cunninghami. Shoalhaven.
Quintinia Sieberi. Shoalhaven.
Banksia ericifolia. Shoalhaven.
Choretrum Candollei. Shoalhaven.
Helichrysum collinum. Shoalhaven.
Symplocos Thwaitesii. Mount Dromedary.
Diospyros Cargillea. Bateman's Bay.
Logania pusilla. Shoalhaven.
Polymeria calycina. Clyde.
Duboisia myoporoides. Shoalhaven.
Eranthemum variabile. Mount Dromedary.
Styphelia amplexicaulis. Shoalhaven.
Dendrobium teretifolium. Clyde.
Dendrobium linguiforme. Mount Dromedary.
Bulbophyllum Shepherdi. Shoalhaven.
Bulbophyllum minutissimum. Shoalhaven.
Sarcochilus Hillii. Shoalhaven.
Acianthus fornicatus. Shoalhaven.
Ptychosperma Cunninghami. Conjola.
Trichomanes digitatum. Broger's Creek.
Gleichenia Hermanni. Milton.
Lindsaya trichomanoides. Milton.
Adiantum affine. Milton.

Of these the perhaps new *Hibiscus* was collected by the Rev. R. Collie, F.L.S.; *Symplocos Thwaitesii, Eranthemum variabile* and *Dendrobium linguiforme* by Miss Mary Bate; all the others were gathered by Mr. M. Bäuerlen.

ON VOLCANIC ACTIVITY ON THE ISLANDS NEAR THE NORTH-EAST COAST OF NEW GUINEA AND EVIDENCE OF RISING OF THE MACLAY-COAST IN NEW GUINEA.

By N. de Miklouho-Maclay.

During my first stay at Maclay-Coast in 1871 and 1872 I recorded in my Meteorological Journal not less than 13 shocks of earthquakes (1). Some of them were strong enough to shake the books out of the shelves and make some old trees in the forest fall down. On my return to the same coast in June 1876, I was struck by the change in the aspect of the tops of Mana-Boro-Boro (Finisterre Mountains), which were before my departure (in Dec. 1872 covered with vegetation to the highest summits, but appeared now in many places quite denuded of trees. The natives told me that during my absence they had experienced on the coast and the mountains several earthquakes, on which occasions some natives were killed by the falling of cocoanut trees in the villages, which in falling destroyed the huts. The villages on the coast suffered more on account of unusually big waves which followed soon after the earthquake, breaking down the cocoanut trees and sweeping away a few huts nearest to the beach. In revisiting the coast villages, I found many not unimportant changes: stretches of destroyed forest by tidal waves after the earthquake; alteration in the

(1) *N. de Maclay* Notice Météorlogique concernant la Côte-Maclay en Nouvelle-Guinée, in Natuurkundig Tijdschrift. Deal XXXIII. Batavia, 1874. Accounts about earthquakes in the Northern (near Doreh) and South-western portions of New Guinea have been published in the Description of the Expedition of the steamer "Etna" in 1858, (Bijdragen to de Taal-Land en Volkenkunde van Nederlandsh Indie. Deel V., 1862. p. 78), and are mentioned also in the report of travels of Beccari, D'Albertis and Meyer.

direction of some small streams, the old mouths of which had been closed by bars of sand left behind by waves ; a great number of old pathways in the forest, between the villages, which I knew well, having used them daily during 15 months in 1871 and 1872, were impassable on account of many large trees which had come down during the earthquake.

On the hills, the natives showed me in many places long crevices 1-3 feet wide and 3 or 4 feet deep, as the remaining marks of the "*tangrin-boro*" (1). The depth of the sea near the coast in some places has been also altered, so that, for instance in Port Constantine the old soundings made by the officers of H.I.R.M.S. "Vitiaz" in Sept. 1871, proved in many details incorrect as well as the outlines of the harbour (Port Constantine).

Talking about earthquakes, the natives informed me, that on a former occasion, before my arrival on the coast in 1871, a village named Aralu (situated on the coast between the rivers, *Gabeneu* and *Koli*) had been completely swept away by the waves after an earthquake. All the huts, and the cocoanut trees surrounding them, were broken down and carried away by the tidal waves, and the inhabitants, men, women, and children were drowned (it occurred during the night.) A few men belonging to the village and who happened to be away at the time on a visit to some neighbouring village, would not attempt to rebuild their huts on the old place, but went to live at Gumbu, also a coast village but which had escaped destruction being built further inland. The destruction of Aralu was well remembered by not very old people and it took place I suppose (2) about the year 1856. The natives on the Maclay-Coast complained about the sickness in the villages on the coast which appeared soon after the destruction of Aralu. The sickness amongst them, I believe, was the result of decomposition of animal

(1) In the dialect of the Bongu of the Maclay-Coast *tangrin* means earthquake and *boro*, big.

(2) I found the approximate year of this event by the inquiry : which of the young men of the village was born at the time of the earthquake. The man shown to me as being born soon after the destruction of Aralu, could not be more (in August 1876) than about 20 years of age.

and vegetable matter left behind on shore after the inundation produced by the high tidal wave, as has been observed on some Islands of the Pacific (1).

During my second stay at the Maclay-Coast, in 1876 and 1877, I noticed only a few slight shocks of earthquake. In November, 1877, however, I could distinctly hear during some calm nights, a rolling noise in the distance similar to discharges of heavy artillery, as by a bombardment, and a kind of trembling of the ground. Leaving the coast about a fortnight later I found the two Volcanoes on the Island Vulcan and Lesson Island in full eruption, the noise which I heard during the night on my coast, and the slight shaking of the earth were, I suppose, forerunners of these eruptions.

Arrived at Singapore in January, 1878, I heard that some vulcanic disturbances occurred also on the north-east end of New Britain, and in comparing dates I found that that they took place about the same time as I saw the eruptions of the volcanoes on Vulcan and Lesson Islands.

On my way to the Maclay-Coast for the third time, in March, 1883, I saw the volcano on Lesson Island still in activity, and the natives on the Maclay-Coast again complained to me about earthquakes. A few weeks later, when at anchor on the north coast of the Great Admiralty Island, I witnessed the eruption of a volcano on the south coast of the island or on one of the small islands south from the big island (2). It was during the night of March 28th, and I could see a large halo as from an immense fire, and two or three times heavy thunderlike rolling noises were heard, followed by distinct flashes like columns of fire on the horizon.

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(1). A case of great sickness and mortality on the Island Lub (or Hermit Island), in 1875, after the inundation of some low islands of the group by a tidal wave, has been communicated by me, in a letter about the Island Lub, to the Imp. Russ. Geogr. Soc. (Investiya of the Imp. Russ. Geogr. Soc., Vol. XV.) I have heard about a similar case which happened on the Island Mafia (or St. David's Island), some twenty or thirty years ago.

(2). It might, very likely, have been the volcano on the small island called by the natives Loo, and from which they obtain the obsidian for their weapons and implements.

Evidences of Rising of the Maclay-coast in New Guinea.

Besides the already mentioned changes from shocks of frequent earthquakes, I have noticed in many places on this coast proofs of the gradual rising of the coast. A large extent of the same is nothing but uplifted coral banks, and in the greenish sandy clay (1) which forms the nearest hills to the coast (from 100-400 feet high), I found some layers with remains of marine animals, (Anthozoa, Echinodermata, Mollusca and Crustacea), the appearance of which seemed to prove that the rising of the coast was quite of recent date.

I noticed these remains imbedded in clay in a great many places at different heights over the sea, but always neglected to make a systematical collection of them. At one place, however, near the village Bongu, the layers appeared particularly rich and the specimens well preserved, not broken. Having taken there a few handfuls of the sandy clay, I washed them carefully out and obtained a small collection of shells which, at my request has been kindly examined by Mr. J. Brazier. The shells (38 different species) belong to the following 18 genera :—*Ranella*, *Nassa*, *Mitra*, *Oliva*, *Terebra*, *Conus*, *Strombus*, *Bulla*, *Atys*, *Dendalium*, *Cultellus*, *Corbula*, *Mactra*, *Tellina*, *Venus*, *Cytherea*, *Leda* and *Arca* (2.)

All the shells, *without one exception*, belong to species at present living on the Coasts and Islands of the Pacific.

Amongst debris of different *Echinoidea* and *Crustacea*, I obtained in the clay only one unbroken specimen of *Laganum* (Spec. ?), and the carapace of a small Crustacean (*Myra*, Spec. ?)

Many of the shells from the clay-layers look as fresh as if they had been gathered alive on the shore and well preserved afterwards. But the above mentioned layers of sandy-clay of

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(1.) Mr. C. S. Wilkinson, to whom I showed some of the clay, expressed his opinion that this "greenish calcareous sandy clay of Bongu, Maclay-Coast, resembles in lithological character the Miocene Tertiary clay of Yule Island on the south coast of New-Guinea."

(2.) *J. Brazier.* List of some recent shells found in layers of Clay on the Maclay-Coast, New-Guinea. (Proceed. Lin. Soc., Vol. 9, part 4.)

Bongu, are followed by many others, as layers of small boulders and marine detritus of different kinds (mostly coral fragments), imbedded in other layers of clay, and all covered over with a stratum of dark-brown humus of variable thickness, which is the ground for a luxuriant, tropical primeval forest, where trees many centuries old are not uncommon.

Besides the above mentioned layers at different levels above the sea, I have seen large blocks of corals (mostly of the genera, *Meandrina* and *Astraea*), in some isolated spots, where the dense vegetation and the cover of humus has been removed (by man, or accidentally), and the deeper layers of soii, under the humus, left bare. I have noticed such blocks in and near villages many hundred feet above the sea. Once I obtained a piece of coral (*Prionastraea*, spec. ?) amongst small stone in the bed of the river Koii, near Sangdinbi-Mana, not less than 1,200 feet above the level of the sea, and from all appearance the piece was brought down by water (1) from some place higher up. (2.) Another proof that the coast is still rising is the existence of numerous reefs of dead corals which are left quite dry at each low tide.

Considering the facts, that the elevation of the raised coral reefs on different portions of the Maclay-Coast, as well as on the Islands of the *Archipelago of contented men*, presents the same level above the sea, and like the layers of the greenish clay are, as far as I have observed, horizontal, it appears to me not unlikely, that besides the occasional upheavals, there exists a gradual steady rising of this part of the North-Eastern Coast of New Guinea.

(1.) Some rivers of the Maclay-Coast as for instance the river Koli presents during the dry season, but a narrow band of running water in a very large bed filled with stones of all dimensions and some bands of sand. After heavy rains in the mountains the water rushes with great velocity bringing down more stones and trees, which are left behind in the bed of the river when the water falls to wait for the next rain and the next flood.

(2.) I confess, that the finding of a loose piece of coral cannot be regarded as a decided proof of the origin of the same, from a coral bank raised to over 1000 feet. It might have happened (which however is not very likely,) that the piece of coral has been brought there and dropped by some passing native.

NOTES ON A BEROID OF PORT JACKSON.

By Dr. R. v. Lendenfeld, Ph.D.

On March the 18th, 1827, a Beroë was captured by the "Coquille" in Port Jackson, which Lesson (9, p. 103) describes in the following manner :—le nouveau genre de zoophyte a cils, est remarquable par son corps aminei sur ses deux faees en coin, obcordé au pôle supériéux, et largement ouvert au pôle natateur. L'axe cavitaire est allongé, étroit, bordé sur ses deux faces de eils unis en haut et libres en bas, et de deux rougeós sur tous les boids, soit des pôles soit des eôtes.

This description is accompanied by a very fair illustration (9, pl. XVI., fig. 2), which enabled me to identify an animal found by myself with Neis eordigera, Lesson, without difficulty.

I consider myself justified in redescribing this Ctenophore, because Chun (3, p. 306) very correctly remarks that the Beroids not examined by himself have hitherto not been adequately described ; and the more so as the histologieal examination of it has furnished results which are of some interest.

Whilst L. Agassiz (1, p. 89) considers Lessons Genus Neis, as a representative of a separate Sub-family, Chun (3, p 307), thinks that Neis is identical with Beroë.

I will pass over the question of the propriety of making a special Sub-family for Neis as unripe for discussion, but wish to remark that I cannot coincide with Chun's plan of placing all the Beroids in one Genus, viz :—Beroë. The good plate of Neis in the Atlas of the Coquille Zoologie (9, pl. XVI.), should have, I think, convinced him that Neis is no Beroë. Here in the colonies I have often had the opportunity of observing lower marine animals which have been deseribed by former authors, and I should like to state that in general these descriptions are by no means so bad or insufficient as modern zoologists seem to think.

I cannot enter further into the classification of the Beroids, but I am quite sure that Neis represents a Genus distinct from Beroë, and in many points represents a transition from Beroë to the Lobatæ and even to the Tæniatæ.

For sixty years no one seems again to have observed Neis cordigera, perhaps the most beautiful animal in the rich Fauna of Port Jackson. I have repeatedly found single specimens of it, this spring, accompanying the swarms of flapped Ctenophore described by me as Bolina Chuni (8), in those parts of the harbour to which the currents bring great numbers of pelagic animals.

MORPHOLOGY.

Our animal differs from the Genus Beroë principally in two points. It has large flaps which extend far beyond the pole of the nerve centre, and the vascular system of the gallert in one half of the body is not separated from that of the other half as according to Chun (3, p. 57) in the case of Beroë.

Size.

The largest specimen attained a length of 200—250 mm. The animal is about 2—2½ times as long as broad and 4—5 times as long as thick.

Form.

In shape Neis is, in so far intermediate between Beroë and Lobatæ, as the nerve centre does not lie at the extreme end of the body but is overlapped by two flaps which are almost ¼ as long as the body. The body appears to be more compressed than in most of the species of Beroë. The flaps have an almost triangular transverse section as the paddle-ribs which form the edges are so near together on the inner side, that they almost touch each other. Viewed on the broad side the body appears almost square, setting aside the flaps. Slightly contracted in the oral third it widens slightly towards the end. The longitudinal section vertical to the stomach-plane has a nearly oval contour. Also the narrow sides are widest in the middle. Towards the top they diminish very rapidly in width whilst the edges are straight and but slightly converging towards the mouth-pole, so that the whole resembles a gothic arch. The surface of the broadsides is slightly retracted between every pair of paddle ribs, so that the six broad stripes thereof appear concave. The surface of the narrow side is convex.

Paddle-Ribs.

The eight paddle-ribs are not of equal length as the four which lie nearest to the stomach-plane, circumscribe the flaps whilst the four others diverge but slightly from the shortest meridian. They are convex in their distal part. Towards the mouth the eight paddle-ribs run almost parallel. Also herein Neis resembles the Lobatæ more than Beroë. The difference in length of the aboral parts of the paddle-ribs observed in the Lobatæ is even greater in Neis, so that it might, as far as the paddle-ribs are concerned, be considered as a transition form between Neis and Beroë.

Nerve Centre.

The organ of sense at the aboral pole does not show any particular peculiarity, it lies of course in the saddle between the flaps. The Pole fields with their fringes lean on the slopes of the flaps and turn their faces towards each other. They are 2 mm. long, $1\frac{1}{2}$ mm. broad and differ only in so far from the corresponding organ of Beroë as the fringes are ramified only in the proximal part and even there only slightly. The fringe on the distal part consist of simple finger-shaped excrescences. I have studied the minute structure of this organ by means of sections.

The results I have arrived at corroberate the statements of former investigators in particular those of Richard Hertwig (6, p. 339, ff) and Chun (3, p. 165-167). I find that the fringes in especial are clothed with a high Epithelium which consists of broader ciliated cells and slender nervous, sensitive elements. This Epithelium resembles that of the extreme zone in the mouth margin and we shall speak of it again below.

Gastrovascular System.

The stomach and the vascular system stamps our animal as a real Beroid. The *stomach* is in no degree influenced in its form by the flaps but has the simple shape of a cone or sack. I was able to observe the peristaltic movement of the stomach. Only one stricture occurs at a time. It begins above the mouth progresses quickly upwards and reaches the aboral end in about a second and a half. The stomach is thereby constricted to a fourth of its usual diameter. As soon as the contraction has reached the end, a fresh one commences at the margin of the mouth.

This peristaltic movement can be reversed and I consider this as very important. If the animal is not killed at once but is allowed to lie in slowly acting reagents this reversed peristaltic movement can easily be observed.

If a Neis dies slowly in a mixture of 16% alcohol, 16% glycerine, 0·5% corrosive sublimate and 67·5% sea water, the reversion of the movement of the stomach described above, sets in soon after the animal is placed in this preparation. The vomiting movement at first recurs rapidly and afterwards when the animal is near death it can be brought on again in a less degree by mechanical irritation.

The stomach is as Agassiz (1, p. 74) at length describes, extraordinary mobile and our Neis can without difficulty swallow animals larger than itself.

The Vascular System.

The Vascular System of the Gallert consists of eight stems which spring from the stomach in the same manner as Chun (3, p. 56 and elsewhere), describes it in the case of Beroë. The vascular reticulation differs in as far from that of Beroë (3, p. 57) that it forms a continuous network, and is not divided into two separate vascular systems.

The vascular reticulation of Neis is much more highly developed than that of Beroë. Whilst in Beroë the canals form a reticulation of scarcely more than one superficial layer, in Neis the network extends in three dimensions from the superficial, tangental canals, branches extend centripetally and pervade the gallert reaching to the stomach. These ramifications become finer and finer and end as fine capillaries outside the surface of the stomach. Towards the mouth the network is very fine and indistinct, but can be demonstrated by means of injection with osmic acid without difficulty.

The vascular reticulation of the flaps consists of nearly parallel longitudinal canals, which run upwards and end vertical to the surface, diverging accordingly in graceful curves. These stems are connected with one another by transverse canals of similar width so that a ladder-shaped network is formed which resembles the skeleton of Spongelia in shape.

In the middle between each pair of meridian canals, the vessels of the reticulation are much larger than near the stem, their diameter is here almost three times as great.

The Sexual Products.

Ripe sexual products are exclusively found in those parts of the vascular reticulation which are most remote from the meridian canals. The latter never contain ripe ova or spermatozoa.

In this aspect also, Neis differs essentially from Beroë (3, p. 62) and Idyia (1, p. 285), as in these it is just the meridian canals and the proximal part of the vascular reticulation which contain the sexual products, whilst the more distant parts of the vascular net work remain sterile. I have made no observation which would tend to prove an Ectodermal origin of the sexual product, which Claus (4, p. 299), and Richard Hertwig (6, p. 426) assume.

As compared with Beroë, Neis accordingly shows a greater differentiation ; the maturing area of the sexual cells is conveyed from the meridian canals to the reticulation.

According to Chun (3, p. 191), the female sexual products are modified Epithel cells. I assent to this assumption, but I believe that the ova are Sub-epithelial and do not lie on the surface. In a transverse section through the meridian canal it can easily be observed, that cells lie beneath the Entodermal Epithelium as highly coloured (Alumn Carmin) nuclei lie in abundance between the canal Epithelium and the Gallert. Such nuclei are also found beneath the Epithelium of the canals of the network, which originate from the meridian canals. The latter are a little larger than those in the meridian canals. At a greater distance from these canals, ova are clearly seen, which increase in size the further they are removed from the meridian canals.

In those parts of the vascular reticulation which occupy the middle of the fields, the canals appear thickly filled with ripe ova.

From these observations I think I must draw the conclusion that the place of germination of the ova lies in the meridian canals, whilst their maturing place in Neis is removed to the canals of the reticulation.

Single Entoderm cells of the meridian canal epithel sink down into the sub-epithelium and wander along it into the vascular reticulation. During this migration they increase in size. At length they remain in those parts of the network vessels, furthest removed from the meridian canals and there develope into mature ova. The spermatoza are found united in balls also in the reticulation canals.

As to the origin of male products I have arrived at no satisfactory conclusion. It is of course not impossible that the ova-germs migrate from the Ectoderm, first into the subepithelium of the meridian canals, and then continue their migration in the manner described above. But this I do not consider probable. The whole process appears somewhat analogous to the formation and migration of the ova in many Hydromedusæ. (11.) The same cause which Weisman ascribes to the migration of these elements in the Hydroids cannot be accepted for our Ctenophore. I see in this process rather a further development of that met with in Beroë Forskalii.

The Margin of the Mouth.

The mouth-margin of Beroë is clothed by a highly developed Ectoderm which Chun (3, pp. 33, 159, 160, Taf. XV., fig. 19) and Richard Hertwig (6, pp. 333-337, Taf. XIX., figs, 11, 14, 15, 17) have described and figured.

The mouth-margin of Neis cordigera resembles that of Beroë in so far as below the free margin the same three zones are met with which the authors mentioned describe. The figures of Richard Hertwig resemble this part of Neis so closely that I consider it unnecessary to describe it more minutely. The zone of the gland cells is not embedded in the Gallert, as Chun represents. The only essential difference, in this respect, between Neis and Beroë is met in the zone of the ciliated cells.

This is mainly supported by excrescences of the Gallert, which are ring-shaped. The ciliated cells radiate from the Gallert-ridges, and remind us in this respect of the so often described appearance in other Cœlenterata. These ciliated cells agree with those of Beroë, which Richard Hertwig describes (6, p. 334,) *but between them are found slender granulated sensitive cells,* which resemble the homologous elements in the fringes of the Pole-fields very closely, and possess the type of the ectodermal sensitive cells of other Cœlenterata.

Between the ciliated and sensitive cells on the one side and the Gallert on the other, are found in this zone exclusively, numerous pear-shaped Ganglia-cells which appear connected with the sensitive cells by very fine nervous threads. Towards the aboral pole they are continued into a thick granulated nerve which can be traced for some distance without difficulty on longitudinal sections and on surface preparations.

Style-cells.

Concerning the sensitive cells with styles of Cestus, Eucharis and Beroë, described by Richard Hertwig, I have arrived at a conclusion which differs essentially from that adapted by him and by Chun. I consider these elements not to have a mainly sensitive function. As well in the Papillæ of Eurachis multicornis as in those of Cestus and in the homologous zone of Beroë these large styles which differ by their thickness and the different refractive power from ordinary sensitive cilia, are very striking, they are always found thickly surrounded by gland-cells. In other Cælenterata such styles are never to be found. The Palpocils of the Sarsia-polypes (10) alone can be compared with them, and these are very different in shape and of unknown function. The sensitive cilia of other Cœlenterata are much finer and resemble the cilia of those sensitive cells, which are found on the sensitive pole and on the mouth-margin of Neis. I have in vain looked for ganglia-cells below the style-cells and I cannot find any notice in literature that below these the ganglia-cells are more numerous than elsewhere, which must necessarily be the case if these cells really are sensitive.

I think, therefore, that I am justified in assuming that these styles are *poison thorns* and not sensitive bristles. Accordingly I suppose the glands surrounding these cells to be poison glands. The position of these elements in the Beroids and still more in Cestus and Eucharis appears to me to prove conclusively that they are *defensive weapons* which represent the thread cells.

In detail it is true that such an analogy cannot be traced, but the outer similarity in the arrangement, form and chemical behaviour with regard to re-agents which exists between these organs and the nettle-epithelia of other Cœlenterata is very striking.

The style-cells are often drawn out into a continuation downwards. This can just as easily be taken for a peduncle as for a nerve. And even were we to ascribe nervous functions to these style-cells, the other functions mentioned above might co-exist therewith. The recurved sabre-formed cilia of the stomach-epithel do not show any essential difference with the hooked teeth in Beroë.

The Color.

The Gallert and Epithelia are colorless, only those cells which cloth the vascular reticulation, especially when the animal contains ripe sexual cells, are slightly rose-coloured. Below the surface of the narrow sides there is a beautiful orange red reticulation formed by pigment cells. Just below the surface the threads of this reticulation are very thick, and are spread out tangentally. Fine radial ramification extend from this surface-net in a centripedal direction pervading the Gallert. This can be traced for a distance of about 8 mm. The meshes of this pigment reticulation are smallest just below the surface between the paddle-ribs, so that in the middle of the narrow side an indistinct orange stripe is produced. The yellow pigment is wanting on the ends of the narrow sides in the vicinity of the sensitive pole. Single groups of the *spindle-shaped* pigment cells are found also in other parts of the body, so on the paddle-ribs and the mouth margin.

As appears from this description of the colour my specimens are not exactly similar to those of Lesson (9, pl. XVI., fig. 2.) I should however, not consider this as of any importance, as the colouring of the plates in the Coquille Atlas is not very accurate.

I am at present so loaded with other work that I have not the leisure to examine all the organs of Neis in the same minute manner, and I have therefore directed my attention to those which seemed to me most interesting.

I have again endeavoured to prove a connection between the Sub-epithel nervous plexus with those Mesodermal threads which Eimer (5) has declared to be nerves, and to which also Richard Hertwig (6) is inclined to ascribe a nervous function. It is true I do not agree with Chun (3), who denies that these Mesodermal fibres are nervous, but I must confess that my endeavours to find this connection in Neis have been as fruitless as in Cyanea.

LITERATURE.

Concerning the complete literature I refer to Richard Hertwig's list (6.)

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THE HISTOLOGY AND NERVOUS SYSTEM OF THE CALCAREOUS SPONGES.

By R. von Lendenfeld, Ph.D.

Like other Sponges, the Calcispongiæ consist of Entoderm, Mesoderm and Ectoderm. The Mesoderm is the only layer which is highly differentiated. Ectoderm and Entoderm are formed by a single layer of cells. The outer surface of the Sponge doubtlessly is Ectodermal and the cells which line the Oscular tube, the ciliated chambers and the excretary canal system can with equal certainty be determined as Entodermal. The Epithelium of the introductory Canals is in all probability in the greater part Ectodermal, in a small portion Entodermal.

ENTODERM.

The Entoderm is very simple, but nevertheless shows a higher development than the Ectoderm. In some Calcareous Sponges it consists of one kind of cells only ; the ordinary flagellate elements with frills. In others again only part of the Entodermal Epithelium is composed of such cells, whilst another part consists of simple, low pavement cells. Where such a differentiation occurs, the flagellate fringe-cells are found in the outer and middle part of the body, lining the ciliated chambers or their homologa, whilst the pavement cells clothe the Oscular tube and the exhalent canals leading from the ciliated chambers to the Oscular tube.

Those Sponges, which Haeckel comprises in his Family Ascones, Leucosolenia Bowerbank, which possess a simple tube shaped gastral cavity and in which no ciliated chambers are developed, possess flagellate Entodermal cells only. The same is the case with an Australian Sponge which possesses ciliated chambers like the Syconidæ, recently described in these Proceedings.

I combine all these forms with non-differentiated Entoderm in one Group, for which I adopt Poléjaeff's term Homocœla, the meaning of which word I adapt to the view explained above.

All the other Calcareous Sponges possess a more highly differentiated Entoderm. Ciliated chambers clothed with flagellate cells are always present and the Oscular tube and adjacent canals are clothed with pavement cells. I combine all these to form one Group for which I likewise adopt Polejaeffs term, Heterocoela the meaning of which word is likewise modified.

MESODERM.

The Mesoderm, which forms the bulk of the Sponge, consists of Gallert of a pretty high degree of density.

In this the Mesodermal cells are imbedded. In Calcispongiæ the Gallert never shows a fibrillous structure as is the case in some others Sponges. (Gumminæ.)

Also the Skeleton of these Sponges is produced by the Mesoderm. The spicules always originate there and are always clothed with Mesodermal cells or a Mesodermal cuticle, however far they may protrude beyond its limits.

THE TISSUE CELLS.

In all calcareous Sponges numerous starshaped cells, with a spherical nucleus, are found in all parts of the Gallert, their protoplasmic processes are slender and vary in number from three to ten. Generally they are simple, only exceptionally they may be ramified. These cells are different in different Calcispongiæ in as much as in some they are all alike with about five irregular processes, whilst in others we find different kinds of these star-shaped elements in the different parts of the body. The first is the case in the Homocœla, the second in the Heterocœlia. Here we find that in the central parts of the Mesoderm these cells have numerous irregularly disposed processes, whilst they attain a greater regularity towards the surface. The nearer they lie to any free surface the more all their processes are influenced thereby in such a manner that they run parallel to the surface in a more and more tangental direction. In most parts of the Sponge these processes at the same time diminish in number till we finally arrive at structures which no longer can be termed star-shaped, but which are already decidedly bipolar, spindle-shaped. Such bipolar tissue cells are very frequent in other Sponges. In the Calcispongiæ they are comparatively rare, and met with only in the Heterocœlia. They are here perhaps to be considered as muscular element throughout. It is in the Calcispongiæ still more difficult than in others to discern between contractile cells and ordinary tissue elements.

In the Homocoela the movements (closing of Pores) are doubtlessly caused by contractions of the Processes extending from the star-shaped tissue cells.

SKELETON.

Spicules, with two, three and four axis, comparable to the axis of crystals, are always found in great abundance in the Calcispongiæ. They consist of carbonate of lime, mixed with organic substance. They often protrude beyond the Mesoderm. But they are, as mentioned above, always covered by a mesodermal cuticule. The structure of the spicules can best be studied in specimens treated with chloride of gold-potassium. (Twelve hours.) By means of the appliance of this re-agent we see that the whole spicule consists of a great number of small prisms, parallel to one another, radiating from the axis. Under ordinary circumstances no such structure can be detected, but by the appliance of the gold solution we can readily isolate these prisms. A spicule exposed to this re-agent represents melting glacier ice in appearance. Like the latter it is composed of parallel prisms.

Furthermore we find that the radial structure first makes its appearance in the interior, close to the inner axis, which is a cylindrical chord of organic matter without lime. The whole spicule soon commences to be dissolved by the gold solution if the latter is strong, and always from the axis outward. The outermost layer remaining intact whilst the central parts are split up into prisms and dissolved. These new observations, together with those of other authors, point to the fact that the inner part, the part produced first, of the spicule is softer and contains more organic matter, whilst the outer layers, the youngest part, is harder and resists the action of re-agents ; the whole spicule is composed of prisms formed as cuticular productions by the cells clothing the spicule from without.

With colouring re-agents it is easy to prove the existence of a highly colourable cuticle all over the spicule. On the part of the spicules which protrude beyond the surface of the Sponge, the cuticle is easily rubbed off, but always present, if the Sponge is captured with sufficient care. The existence of a cuticle on the protruding part can be proved without observation : were there no cuticle the spicule would very soon be dissolved by the sea-water and traces of a corrosive action thereof are never met with, unless in those spicules found on the bottom of the sea or taken up by other Sponges or Foraminifera to help to build up their skeleton.

This cuticle is slowly converted into spicule substance by an interposition of molecules of carbonate of lime. This is the cause of the lamella-structure of the spicules. Outside the Mesodermal cuticle flat, Endothel-cells are met with, covering the immersed part of the spicule, in the shape of a hollow tube. Also on the protruding part of the spicules such cells can be detected, but I believe the latter to be Ectodermal, and nothing else than a continuation of the Ectodermal pavement Epithelium.

The spicules firstly make their appearance within cells, and the axial rod (not canal !) is part thereof. The succeeding layers are cuticular productions of Endothel cells.

It is remarkable that the rays of the spicules are often curved in various ways.

THE MUSCULAR CELLS.

Although all the tissue-cells, particularly in the Homocœla are to be considered as contractile, still there are some Mesodermal elements which are developed in such a manner that their muscular nature is much more expressed than in in the ordinary tissue cell.

I have met with the elements I refer to in the Syconidæ, around the regularly disposed pores in the dermal layer. Here we find circular spindle-shaped cells, which form a contractile sphincter by the aid of which the pores can be more or less closed. In Leucones which have extensive Sub-dermal cavities there are longitudinal cells of this kind in the pillars which connect the outer membrane with the body of the Sponge.

AMŒBOID CELLS.

I have met with these elements in all calcareous Sponges. They represent like those of other Sponges, the lobate Amœbæ, and move about pretty rapidly in the Gallert. I have not observed that they are packed more closely together in one part of the Sponge than in another.

They seem equally distributed. Their number is subject to great variations. I have always found more in Leucones than in other Sponges.

SEXUAL PRODUCTS.

The ova are transformed Amœboid cells which are when matured, enclosed by an Endothel. Before that they creep about, and are distinguished by their size and granular Protoplasm from ordinary wandering cells a long time before they become sessile and enclosed by Mesodermal pavement cells and so surrounded by a Follicula.

Generally four or five ova lie together in separate Follicula closely packed together and surrounded by a common Follicula in the Heterocœlia. In the Homocœla the ova remain simple and no Follicula is formed as in their higher developed relations, although also here the indifferent star-shaped cells congregate around the ripe ova.

The first stages of development are passed through within the body of the mother.

The Spermatozoa are formed in numbers within transformed Amœboid wandering cells, Spermospores, which betray their nature a long time before Spermatozoa begin to make their appearance as small dots; the nuclei are derived from the nucleus of the Spermospore by continued fission.

THE GLAND CELLS.

Similar cells as those described from a few other Sponges, and to which a secretory function is attributed, are also met with in the Calcareous Sponges.

Either single or in small bunches they are attached to the inner side of the Ectoderm of the Leucones. They are pear-shaped, and their real nature can easily be detected by the presence of large highly refractive granules in their interior. They stand vertical to the surface with which they are in connection by a slender peduncle.

SENSITIVE AND GANGLIA CELLS.

Spindle-shaped cells of the Mesoderm, which lie just below the surface, and protrude beyond the outer coating of Ectodermal pavement cells are not rare in the Heterocœla. They stand vertical to the surface, the nucleus is oval and situated in the middle of the cell. The proximal part of such a cell is often produced into a long thread, which may be ramified and often can be traced to another cell lying further down in the Mesodermal Gallert. Such spindle-shaped cells have been observed by me in clusters scattered irregularly over the surface in Leucandra saccharata Leucandra meandrina and other species. Single and also scattered irregularly, but particularly numerous in the vicinity of the pores in Leucandra conica, n. s., and Leucandra sacharata, also in Leucetta and Leucaltis. As a ring surrounding the inner wall of the conic, widening canal leading down from the pores of Sycandra arborea into the inter canals. As clusters in the same locality in Grantessa sacca, n. s. Also, in Vosmæria gracilis, n. s., and Sycandra pila, n. s. I have detected similar structures in bunches around the pores, these latter are however, slightly different from the former, and I do not like to assert their nervous nature with the same confidence as that of the former organs.

It appears from this, that sensitive cells of this kind are met with in all Heterocœla. In Homocœlia I have not found any cells which may be considered as specially sen s tive

Ganglia cells have been observed in several of the species mentioned above. They are highly colorable (particularly their nucleus) multipolar cells. In Sycandra arborea they lie between the muscular fibres of the Sphincter and the sensitive elements, just above them. In Leucandra they are often found near the base of the clusters of sensitive spindle-cells.

They are here of the same shape as in Sycandra.

Also in connection with the solitary sensitive cells of Leucandra conica solitary Ganglia cells are found. Also these seem to be of the same multipolar kind as in the former cases.

THE ECTODERM.

In all Calcareous Sponges the Ectoderm consists of simple pavement cells, which cover the outer surface, the inhalent canals and often also extend over the spicules protruding from the outer surface. No differentiation of any kind can be detected. Many of the cells are flat (on the surface) or concave (in the pore canals) or convex (on the spicules), they always represent the same simple type of low plates filled only partially with protoplasm, which surrounds the compressed nucleus and adheres as a thick plate to the outer surface. From this plate threads extend, which pervade the cell cavity.

The question whether the nervous and gland cells really are Mesodermal, as I assume, or Ectodermal, seems worth discussing.

My assumption of the Mesodermal nature of these organs is mainly based on the fact that the Ectodermal Epithelium cells never show any tendency of higher development. There exists no transition forms between the pavement cells and gland or nerve cells. Such transition forms do however exist in great quantity between these elements and the indifferent, doubtlessly mesodermal star-shaped tissue cells, from which, muscles and probably nerves have been differentiated; whilst the gland cells may possibly be referrable to another and more recent kind of mesoderm cells, from which also the sexual cells originate the mesodermal wandering cells.

ADDENDA TO THE AUSTRALIAN HYDROMEDUSÆ.

No. II.

By R. von Lendenfeld, Ph.D.

I have lately examined some specimens of Hydroid polyps, and find that a few alterations are necessary in my classification.

1. The Genera Campanularia, Halecium and Sertularia should be placed in the Subordo Hydromedusinæ. Family Campanulinidæ.

2. The identity of Plumularia effusa, Busk, and Acanthella effusa, Allman, which has been stated by Allman (Report on the Hydroida of the Challenger. Part I., Plumularidæ), has not been accepted by me formerly. The differences between the two are however not of such valid a character as I had supposed, and we must therefore unite these two. I retain Allman's name, and eliminate the Plumularia effusa of Busk.

3. The Genus Azygoplon, Allman, is identical with Halicornopsis, Bale, and the name has to give way to the latter, which has the priority. Allman's Azygoplon rostratum, (Report on the Challenger Hydroida), must therefore be named Halicornopsis rostratum. Von Lendenfeld.

4. Campanularia simplex (Bale), Laomedea simplex, Lamouroux, has been omitted in the list, and must be placed in the genus to which Bale refers it.

5. I find that Sertularia divaricata, de Lamarck, is not identical with Sertularia rigida, Lamouroux, as de Lamarck and Bale supposed, and therefore add it to the list of Sertularians.

6. T. Hutton named a Sertularella, (Sertularella polyzonias, Lin.) Sertularia simplex (Transactions of the New Zealand Institute, Vol. V.) This is not similar to Sertularia simplex, von Lendenfeld. (Addenda to the Australian Hydromedusæ. Proceedings of this Society, Vol. IX.)

7. Bale enumerates in his catalogue two species of Sertularia under the same name, viz., tridentata, Sertularia tridentata, Lamouroux, (catalogue, p. 96) and Sertularia tridentata, Busk, (catalogue, p. 79.)

In my former papers I have accepted these two, the Lamouroux species of which seems doubtful, being not sufficiently described

I have lately obtained a Hydroid in Port Jackson, which I believe may be identical with Lamouroux species, which I propose to re-name Sertularia tridens, von Lendenfeld.

Stem slightly branched, irregularly pinnate with very short pinnæ. Cellules campanulate, adnate throughout their entire length, cylindrical or wider at the base than at the mouth, parallel to the pinnæ, very distinct, alternate. Aperture with two small rounded teeth in front, and one long and sharp spine on the outer margin. Height, one to two centimetres.

Port Jackson, New South Wales.

NOTE ON THE FLIGHT OF INSECTS.

By R. von Lendenfeld, Ph D.

In a paper (1) on this subject, which was published a few years ago, I opposed the view held by Marey and others, that the changes in the shape of the wing during the flight was caused by the mechanical action of the resisting air without any muscular action of the insect itself coming into play. I found that the radial nerves of the wings of the dragon fly are extended centripetally into the body, and that they are in connection with numerous muscles and a complicated articulating skeleton, by means of which arrangement each ray can be moved more or less independently of the rest, whereby the shape of the wing is changed. This view of the matter has recently been opposed by some Physiologists who apparently did not take the trouble to investigate the anatomy of the organs in question.

Apparatus were constructed to demonstrate the mechanical theory, but these by no means prove the correctness of it.

I have recently made some interesting observations bearing on this point, which are particularly well adapted to prove the fallacy of the mechanical theory, and can easily be repeated by everyone.

If the animals are treated with certain poisonous substances, very often a tetanus is produced. Such a poison is strychnine. Insects are affected by substances, which are not injurious to other animals in the way mentioned. The aromatic oil contained in the blossoms of Pyrethrum carneum, roseum and cinerariæfolium --the essential part of "Insecticide," and turpentine are such substances. If a fly comes in contact with one of these substances a tetanus is produced, the consequence of which is that the wings although remaining in the ordinary position, change their shape in an extraordinary manner.

(1). *Von Lendenfeld.* Der Flug der Libellen. Sitzungsberichte der Kaiserlichen Akademie der Wissenschaften in Wein, 1881.

When at rest the wings of Diptera are more or less askew. When a fly is immersed in turpentine it is immediately made insensible and lies motionless. Tetanic movements, after a short time, cause slight movements of the legs and then the wings, although remaining in the same position relative to the body, turn their face round in such a manner that they firstly become quite flat and then askew in the opposite direction to the original position. This movement is slow and can easily be observed. When the fly is dead the wings collapse again and return to their ordinary shape.

The same movement for which a mechanical action of the resistance of the air is considered the sole cause, is here executed in a manner which precludes the possibility of such a cause.

I think this proves my views in an equally simple and decisive manner.

In connection with this I would like to draw the attention of the reader to peculiar effect of the "insecticide" on the large viviperous flies. They invariably give birth to the maggots when under the influence of it at a time when the tetanus appears in other parts of the body. The maggots are not influenced by the insecticide to any great extent.

LIST OF SOME RECENT SHELLS FOUND IN LAYERS OF CLAY ON THF MACLAY-COAST, NEW GUINEA.

By J. Brazier, C.M.Z.S., &c.

About two months ago Baron Maclay brought me a small box of shells for determination, which he had obtained on the North-east Coast of New Guinea in the year 1877. The whole of the species seem to have been thrown from the bed of the Ocean by some volcanic or submarine agency. Having gone carefully through them, I find that they are species common to the Philippine Islands, China Sea and Torres Straits. Some of them are very much sea worn and past identification, others again are represented only by a single example and odd valves. A list of them is here given :—

1. Ranella albivaricosa.

Murex rana, Linn. Syst. Nat., p. 1216, No. 527.

Ranella albivaricosa, Reeve. Proc. Zool. Soc., 1844, p. 136. Conch. Icon., pl. 1, fig. 2. *Bursa rana*, H. and A. Adams. Genera of Recent Mollusca, 1853. Vol. 3, pl. 11, fig. 3, 3a.

2. Nassa Liquijarensis.

Nassa Liquijarensis, A. Adams. Proc. Zool. Soc., 1851, p. 97. Reeve, Conch. Icon., pl. 8, fig. 53.

3. Nassa. Sp ?

Only a single specimen of this species very much sea worn.

4. Mitra. Sp ?

Only a whorl and a half remain of this species.

5. Oliva neostina.

Oliva neostina, Duclos. Olives, pl. 19, figs. 9, 10.
One specimen of this species in good condition.

6. Oliva sidelia.

Oliva sidelia, Duclos. Olives, pl. 19, figs. 1, 2.
One specimen in good condition.

7. Oliva. Sp ?

All that remains of this species is about an inch of the columella.

8. Oliva lepida.

Oliva lepida, Duclos. Olives, pl. 25, figs. 15-20.

9. Oliva ispidula.

Voluta ispidula, Linn. Syst. Nat., p. 1188, No. 400.
Oliva ispidula, Sowerby. Thes. Conch. Oliva, pl. 16, fig. 250.

10. Oliva. Sp.

Only one specimen (not adult) resembles in markings *Oliva pintamella,* Duclos.

11. Oliva. Sp.

Piece of spine showing three whorls.

12. Terebra straminea.

Terebra straminea, Gray. Sowerby Thes. Conch., Vol. 1, p. 169, pl. 42, figs. 22, 23.

13. Conus (Dendroconus) glaucus.

Conus glaucus, Linn. Gmelin., p. 3382, No. 15. Sowerby Thes. Conch., pl. 11, fig. 237.

14. Strombus canarium.

Strombus canarium, Linn. Gmel., p. 3517, No. 24. Sowerby, Thes. Conch., Vol. 1, p. 33, pl. 8, fig. 69, 70.
Gallinula canarium, Brazier. Proc. Linn. Soc., N.S.W., Vol. 1, p. 292.

15. Bulla ampulla.

Bulla ampulla, Linn. Gmelin, p. 3424, No. 10. Sowerby, Thes. Conch., p. 575, pl. 122, fig. 59. *Bulla trifasciata*, Sowerby in Reeve. Conch. Icon., pl. 1, fig. 1. Brazier, Proc. Linn. Soc., N.S.W., Vol. 2, p. 83, No. 33.

This species is only represented by the dorsal surface showing two transverse bands. Mr. Sowerby figures it in the Thes. Conch. figure 59, as *Bulla ampulla*, Linn., but in Reeve's Conch. Icon., he re-describes it as *Bulla trifasciata.* I believe it to be only a variety of *ampulla.*

16. Atys cylindrica.

Bulla cylindrica, Helblings. Chem, fig. 1356, 1357.

Bulla cylindrica (Atys), A. Adams in Sowerby, Thes. Conch., pl. 125, fig. 114.

17. Atys cylindrica variety elongata.

Bulla elongata, (Atys), A. Adams in Sowerby, Thes. Conch., pl. 125, fig. 121.

18. Atys. Sp?

This species (a single specimen) may be a small variety of *Atys cylindrica.*

19. Dentalium longitrorsum.

Dentalium longitrorsum, Reeve. Proc. Zool. Soc., 1842, p. 197; Sowerby, Thes. Conch., Vol. 3, pl. 223, fig. 59, 60.

20. Cultellus. Sp?

Represented by a sea worn valve.

21. Corbula crassa.

Corbula crassa, Hinds. Proc. Zool. Soc., 1843, p. 55.

Represented by two odd valves.

22. Corbula albuginosa.

Corbula albuginosa, Hinds. Proc. Zool. Soc., 1843, p. 56.
Right valve.

23. Mactra. Sp ?

Represented by one sea worn valve.

24. Tellina (Tellinella) McAndrewi.

Tellina McAndrewi, Sowerby in Reeve Conch. Icon., pl. 23, fig. 122.

The eight valves, right and left, answer in every respect to the description given in the Conch. Icon.; it is quite clear that Mr. Sowerby's locality Madeira must be wrong.

25. Tellina (Arcopagia) pinguis.

Tellina pinguis, Hanley. Proc. Zool. Soc., 1844, p. 63; Sowerby Thes. Conch., p. 252, pl. 56, fig. 34.

26. Tellina (Phylloda) foliacea.

Tellina foliacea, Linn. Syst., p. 1117, No. 51; Hanley in Sowerby Thes. Conch., Vol. 1, p. 274, pl. 65, fig. 253; Reeve Conch. Icon., pl. 3, fig. 11.

27. Tellina (Angulus). Sp ?

Only two odd valves of this species.

28. Tellina (Tellinides) conspicua.

Tellina conspicua, Hanley. Sowerby Thes. Conch., p. 293, pl. 58, fig. 100.

29. Tellina (Tellinides.) Sp ?

A single valve of a pinkish tinge near to *T. coccinea*, Ch.

30. Tellina (Peronæa) scalpellum.

Tellina scalpellum, Hanley. Proc. Zool. Soc., 1844, p. 147; Sowerby, Thes. Conch., p. 310, pl. 59, fig. 116.

31. TELLINA (STRIGELLA.) Sp?

A single minute valve, sculptured very much like *Tellina splendida* and *pisiformis*.

32. TELLINA (METIS) SPECTABILIS.

Tellina spectabilis, Hanley. Proc. Zool. Soc., 1844, p. 141; Sowerby, Thes. Conch., p. 323, pl. 65, fig. 254.

33. VENUS (CHIONE) CALOPHYLLA.

Venus calophylla, Philippi in Wiegmanns Archiv. fur Naturgeschichte, 1836, Vol. 1, p. 229, pl. 8, fig. 2; Hanley, Desc. Cat. App., p. 361, pl. 16, fig. 26; Sowerby, Thes. Conch., p. 724, No. 64, pl. 160, fig. 176; *Venus tiara*, Reeve. Conch. Syst., Vol. 1, pl. 67, fig. 3. (Non Dillmyn); *Venus calophylla*, Hanley. Reeve Conch. Icon., pl. 23, fig. 114.

34. VENUS (CHIONE) IMBRICATA.

Venus imbricata, Sowerby. Thes. Conch., p. 715, pl. 156, fig 81, 82; Reeve, Conch. Icon., pl. 24, fig. 118.

35. DIONE BULLATA.

Cytherea bullata, Sowerby. Thes. Conch., p. 640, pl. 136, f. 192.

36. DOSINIA CANALICULATA.

Artemis canaliculata, Sowerby. Thes. Conch., p. 668, pl. 143, f. 58.

37. LEDA PULLATA.

Nucula pullata, Hinds. Proc. Zool. Soc., 1843, p. 100.

Leda pullata, Sowerby. Thes. Conch, p. 127, pl. 3, fig 94; Reeve, Conch. Icon., pl. 11, fig. 34.

38. ARCA. Sp?

One sea worn valve.

REVISION OF THE AUSTRALIAN LÆMODIPODA.

By William A. Haswell, M.A., B.Sc.

[Plates XLVIII.-XLIX.]

Since the publication of my "Catalogue of the Australian Stalk and Sessile-eyed Crustacea," two years ago, the appearance of Dr. Mayer's exhaustive monograph, "Die Caprelliden," has greatly added to, and brought into a convenient form, our knowledge of the structure and generic and specific forms of this group of Crustacea. On examining the Caprellidæ in my possession, I have found several new and interesting forms, and to the description of these add in the present paper a few notes on forms previously described.

The following is a list of the well-ascertained Australian species :—

1. *Proto Novæ Hollandiæ.* Haswell.
2. *P. condylata. n. sp.*
3. *P. spinosa. n. sp.*
4. *Protella australis.* Haswell.
5. *P. echinata.* Haswell.
6. *P. haswelliana.* Mayer.
7. *Hircella cornigera.* Haswell.
8. *Caprella aequilibra.* Say.
9. *Caprella attenuata.* Dana.
10. *Caprella inermis.* Haswell.

Proto condylata. N. sp.

[Plate XLVIII., figs. 1-4.]

Diagnosis. Head and body without spines. Flagellum of superior antennæ with twenty articuli. Inferior antennæ two-thirds of the length of the superior pair, the flagellum with nine articuli. Propodos of posterior gnathopoda in the male with a rounded process over the articulation of the dactylos ; palm defined by a bifid denticle.

Female.—The head of this species is without spines, about equal in length to the following segment. The second, third, and fourth segments are nearly equal ; the fifth and sixth are nearly equal in length, longer than the preceding three ; the last segment is about half the length of the fifth. The superior antennæ are as long as the head and following three segments ; the first and second segments of the peduncle are stout, the second the longer and somewhat narrower at the base than towards the extremity ; the third segment is rather more than half the length of the second, narrower, being broadest towards the distal end ; the flagellum is a little longer than the peduncle, with twenty articuli, of which the last is extremely small. The inferior antennæ are about two-thirds of the length of the superior pair, the second and third joints of the peduncle small, the fourth and fifth nearly equal, each nearly three times as long as the third ; the flagellum is once and a half the length of the last segment of the peduncle and is composed of nine joints

The propodos of the anterior gnathopoda is triangular in lateral outline; the palm is very slightly convex, defined by a short tubercle and ornamented with short hairs. The posterior gnathopoda are as long as the superior antennæ ($\frac{2}{5}$ths of an inch) ; the propodos is $\frac{1}{10}$th of an inch in length, and nearly $\frac{1}{3}$rd of that in breadth, of a long oval shape in transverse outline, the upper (dorsal) border is slightly angulated near the middle, but nearer the proximal than the distal end ; the lower (ventral) border has a well-defined palm which is slightly convex and is defined by two small tubercles, or more correctly, by one bifid tubercle, and has five serrations towards its distal end with a row of short setæ ; the dactylos is more than half the length of the propodos, geniculate at the junction of its proximal with its middle third. The first and second pereiopoda are slender, but as long as the others, (as long as the head and the two following segments—$\frac{3}{20}$ths of an inch), with long narrow branchiæ. The two posterior pairs are short the propodos and dactylos of the penultimate pair being rather larger than those of the last. The surface is dotted with minute black specs, and there are cross bands of similar dots on some of the appendages.

With the female specimens were a number of males, the majority of which differ from the female only (1) in having only seven segments in the flagellum of the lower antennæ (2) in having the first two pairs of pereipoda decidedly longer than the others, and (3) in having the last pair rather stouter than the penultimate. Among these, two, though resembling the rest in other respects differ from them in the form of the propodos of the posterior gnathopoda. In the first of these, which is otherwise like that of the female, the joint in question is relatively longer and narrower than in the latter. In the other, which I take to be the only completely adult male, the propodos (Pl. 48, fig. 3), is narrow at the base, broadening distally, with a strong rounded process at the dorsal and distal angle over the insertion of the dactylos, with a deeply concave palm defined by a double tubercle as in the female, with a quantity of fine hairs towards its middle and two very minute spines near its distal end; the dorsal process is ornamented with hairs; the extremity of the dactylos is slightly hooked.

PROTO SPINOSA. N. sp.

[Plate XLIX., fig. 1.]

Diagnosis. Head without spines: three following segments each with three spines; flagellum of superior antennæ with twenty-two or twenty-three articuli. Inferior antennæ equal in length to the peduncle of the superior pair; their flagellum with fourteen articuli. Propodos of posterior gnathopoda having the palm defined by two teeth an external and an interal, with a groove between them in which the extremity of the dactylos lies.

The head with the coalescent first segment, the second, third, and fourth segments of the thorax are all nearly equal in length, the last being the longest. The fifth segment is longer than the fourth; the sixth is much shorter. The head is without spines, but has a rounded eminence on its upper surface. The three following segments each bears three spines, a mesial dorsal, and two lateral, the latter placed immediately over the origin of the limbs; the spines of the first of these segments (second thoracic segment proper) are the most prominent, and are very acute and inclined forwards; the spines of the other two segments are conical, and are not inclined forwards. The fourth segment has also a short conical spine at its posterior end; the fifth has four short spines or tubercles in the same position as those of the fourth; the sixth and seventh have short, pointed spines over the insertion of the appendages. These posterior spines are not always present, the constant ones being those of the second and third segments. None of the rest of the segments possess spines. The superior antennæ are a little longer than the head and following three segments ($\frac{7}{20}$ths of an inch); the first segment is about half the length of the head; the second segment is twice the length ef the first, slightly narrower proximally than distally, the third segment about two-thirds of the length of the second, much narrower; the flagellum a little longer than the two last segments of the peduncle, and consists of twenty-two or twenty-three segments. The lower antennæ are about equal in length to the peduncle of the superior pair ($\frac{3}{20}$ths of an inch); the fourth joint of its peduncle is the longest; the flagellum is slightly longer than the two last joints of the peduncle, and has fourteen articuli. The anterior gnathopoda are a little longer than the head; the propodos is triangular in lateral outline, with a well-defined palm, the defining lobe of which is divided into two small teeth, each with two short, stout setæ. The posterior gnathopoda are as long as the head and two following segments ($\frac{1}{5}$th of an inch); the propodos is longer than the head, long ovate, the palm convex, obscurely toothed distally, and defined by two prominent acute teeth, an internal and an external, between which is a hollow, in which the point of the dactylos lies when folded up; the dactylos is more than half the length of the propodos, nearly uniformly curved. The first two pairs of pereiopoda are as long as the posterior gnathopoda, slender; the third pair are a little more than half the length of the preceding pairs ; the two last pairs are as long as the two first, and stouter ; their propodos has a well-defined palm.

The branchiæ are narrow, cylindrical, and very long, about two-thirds of the length of the basal joint of the appendage.

The total length of the head and body is three-fifths of an inch.

I have seen specimens of this species only in one locality—Port Western, Victoria.

Of well-established species of *Proto*, besides the Australian forms there are, according to Mayer, only two, viz., *P. brunneo-vittata*, Haller, and *P. ventricosa*. O. F. Müller. The following synopsis will assist in showing the relations of the species.

A. Body without spines.
- I. Limbs without spines.
  - *a.* Palm of posterior gnathopoda with a defining tubercle, but without other projections.
    - 1. A process on the large hand over the articulation of the dactylos. *P. condylata*. Haswell.
    - 2. No process on the large hand. *P. ventricosa*. O. F. Müller.
  - *b.* Palm of posterior gnathopoda armed with teeth. *P. Novæ-Hollandiæ*. Haswell.
- II. Third joint of the posterior gnathopoda with an acute spine. *P. brunneo-vittata*. Haller.

B. Body armed with spines. *Proto. spinosa*. Haswell.

Protella australis.

[Plate XLIX, figs. 2-4]

Protella australis, Haswell. Proc Linn. Soc. New South Wales, Vol. IV., p. 276, pl. XII., fig. 4.

This species is characterised by the presence of a pair of short, acute, forwardly-directed spines on the head and by the extreme length of the superior antennæ, which equal the body in length, their peduncle being equal in length to the head and the following three segments of the body ; the flagellum on the other hand is comparatively short, not exceeding the third segment of the peduncle in length : it is composed of seventeen articuli. The inferior antennæ are relatively short, being no longer than the first two segments of the peduncle of the superior pair: the fourth and fifth segments of its peduncle are of nearly equal length, the latter rather longer and more slender than the former; the flagellum is very short, not being half the length of the last segment of the peduncle; it is composed of six articuli. The propodos of the anterior gnathopoda has the "palm" undefined. The propodos of the gnathopoda is ovate; its palm is defined by an acute conical tooth, and it has two other teeth near its distal end, one proximal, acute, the other compressed. The branchiæ are long oval: the corresponding appendages are distinct, between a third and a half of the length of the branchiæ. The posterior pereiopoda have the palm defined by a tooth-like projection.

The length of the body is over half an inch.

I have only found this species in Port Jackson. It is a very well-marked species and quite distinct from *P. gracilis* of Dana, to which Mayer is inclined to unite it, both in the form of the head and of the gnathopoda. The gnathopoda are not unlike those of *P. dentata* but in other respects the two species are quite different.

PROTELLA ECHINATA.

Caprella echinata. Haswell, Proc. Linn. Soc., N.S.W. Vol. IV., p. 346, pl. XXIII., fig. 2. Cat. Aust. Crust., p. 312.

Protella echinata. Mayer, Caprelliden, p 32, figs. 6 and 7.

Mayer points out the presence of extremely reduced rudiments of anterior pereiopoda, the presence of which places the species in the genus *Protella*, of which, however, it must be regarded as an outlying member.

PROTELLA HASWELLIANA.

Protella Haswelliana. Mayer, l.c., p. 32, figs. 8-10.

I append Mayer's remarks on this species:—

"With Haswell's consent I here describe this Australian species (of which a male and a female are at my disposal), as on account of a peculiarity in its structure it may be regarded as of especial interest. This consists in the coalescence of the last segment of the thorax with the penultimate, the former being thus deprived of independent movement; at the same time it is so reduced that its pair of appendages lie close up to the base of the preceding pair.

In contradistinction to this the fifth segment is very long and slender. The rudimentary feet of the branchial segment almost equal the branchiæ in length. The spines of the dorsal surface of the head and body are more strongly pronounced than in the other *Protellæ*. Moreover, the basal segment of the anterior antennæ bears in its middle a small tubercle with one hair and the propodos of the posterior gnathopoda is also tuberculated on the dorsal side. The form of the abdomen I have not completely ascertained, but it does not seem to present any special peculiarities."

I have only found this species in Port Jackson.

HIRCELLA CORNIGERA.

Caprella cornigera, Haswell.

(?) *Proto cornigera*, Mayer, l.c., p. 25 fig. 3.

The following are Mayer's remarks on this species of which I forwarded him specimens for his Monograph :—

"The ten original specimens before me agree completely with Haswell's description, but they probably belong to the genus *Proto* as I was inclined to conclude on my first glance at the figure. This shows, to wit, three pairs of branchiæ arranged in the manner characteristic of *Proto*. * * * The three anterior pairs of pereiopoda were not figured by Haswell, and are also no longer present in my specimens. * * * The muscles going to these limbs which in true *Protos* are by no means weak are so feebly developed that they have quite produced upon me the impression that the limbs have become rudimentary ; one would then have to do with a form in which the reduction of the thoracic legs had gone even further than in the New Zealand genus *Caprellina*. Should this suspicion be borne out by the examination of fresh specimens the creation of a new generic name for (?) *Proto cornigera* would be unavoidable ; I should like in that case to have proposed the name *Hircella*."

CAPRELLA ÆQUILIBRA.

Caprella æquilibra. Say. Journ. Acad. Philad. I. ; Bate and Westwood, Vol. II., p. 71 ; Bate, p. 362, pl. LVII , fig. 5 ; Mayer, p. 45, pl. I., fig. 7 ; pl. II., figs. 1-11 ; pl. IV., figs. 20-25 ; pl. V., figs. 16-18 ; Miers, Collections of H.M.S. Alert, Crustacea, p. 320.

Caprella januarii. Dana. U. S. Expl. Expd., Crust., p. 819, pl. LV., fig. 2; Kroyer, Voy. en Scand., pl. VI., fig. 15.

Caprella monacantha. Heller.

Caprella laticornis. Boeck.

Caprella obesa. Haswell. Proc. Linn. Soc., N.S.W., Vol. IV., p. 348, pl. XXIV., fig. 1; Cat. Austr. Crust., p. 314.

This species is of very wide distribution, being found on the British and Scandinavian coasts, the Eastern coast of the United States and of South America; the coast of China and the coasts New South Wales and Victoria. Of the identity of the Australian with the European and American form there cannot remain the least doubt after the careful examination which Dr. Mayer has made of a considerable series of specimens.

Caprella inermis.

Caprella inermis. Haswell. Proc. Linn. Soc., N.S.W., Vol. IV., p. 348, pl. XXIII., fig. 3; Cat. Austr. Crust., p. 314; Mayer Caprelliden, p. 71, figs, 26-29.

This species has been received by Dr. Mayer from Rio de Janeiro.

Caprella attenuata.

Caprella attenuata. Dana. U. S. Explor. Exped. Crust., p. 817, Pl. 55, fig. 1; Spence Bate, Cat. Amphip., p. 364, Pl. 57, fig. 7; Mayer, l.c., p. 67, figs. 24 and 25; Miers, Collections of H.M.S. Alert, p. 320.

This species has been found at Rio as well as in Port Jackson.

The species figured by Miers is very different from the adult *C. attenuata*, but may be an immature form.

EXPLANATION OF THE PLATES.

Plate, XLVIII.

Fig. 1.—Anterior portion of *Proto condylata.*
Fig. 2.—Posterior gnathopoda of adult male of *Proto condylata.*
Fig. 3.—Posterior gnathopoda of male specimen of *Proto condylata.*
Fig. 4.—Anterior gnathopoda of adult male of *Proto condylata.*

Plate XLIX.

Fig. 1.—*Proto spinosa.*
Fig. 2.—Anterior gnathopoda of *Protella australis.*
Fig. 3.—Posterior gnathopoda of *Protella australis.*
Fig. 4.—Pereiopoda of *Protella australis.*

A REVISION OF THE AUSTRALIAN ISOPODA.

By William A. Haswell, M.A., B.Sc.

[Plates L., LI., LII. and LIII.]

List of Species.

Fam. Idoteidæ.

1. *Idotea Peronii.* M. Edw.
2. *Idotea marina.* Linn.
3. *Idotea stricta.* Dana.
4. *Idotea longicaudata.* Spence Bate (= *Crabyzos longicaudata.*)
5. *Idotea margaritacea.* Dana.

Fam. Oniscidæ.

6. *Armadillidium subdentatum.* Haswell.
7. *Porcellio graniger.* White.
8. *Porcellio obtusifrons.* Haswell.
9. *Philougria (Philygria) marina.* Chilton.
10. *Ligia gaudichaudii, var australiensis?* Dana.

Fam. Cymothoidæ.

11. *Ceratothoa trigonocephala.* Leach.
12. *Ceratothoa imbricata.* Fabr.
13. *Codonophilus argus.* Haswell.
14. *Ourozeuktes owenii.* Milne-Edwards.
15. *Ourozeuktes pyriformis.* Haswell.

Fam. ÆGIDÆ.

16. *Æga cyclops.* Haswell.
17. *Cirolana multidigitata.* Miers.
18. *Cirolana Schiödtei.* Miers.
19. *Cirolana tenuistylis.* Miers.
20. *Cirolana lata.* Haswell.
21. *Rocinela orientalis.* Schiödte and Meinert.
22. *Rocinela vigilans.* Haswell.

Fam. SPHÆROMIDÆ.

23. *Sphaeroma gigas.* Leach.
24. *Sphaeroma quoyana.* Milne-Edw.
25. *Sphaeroma verrucauda* White.
26. *Sphaeroma (?) anomala.* Haswell.
27. *Sphaeroma laevis.* Haswell.
28. *Sphaeroma aspera.* Haswell.
29. *Cymodocea granulata.* Miers.
30. *Cymodocea (?) Gaimardii.* Milne-Edwards.
31. *Cymodocea longistylis.* Miers.
32. *Cymodocea aculeata.* Haswell.
33. *Cymodocea bidentata.* Haswell.
34. *Cymodocea coronata.* Haswell.
35. *Cymodocea tuberculata.* Haswell.
36. *Cerceis tridentata.* Milne-Edwards.
37. *Cerceis bidentata.* Milne-Edwards.
38. *Cerceis acuticaudata.* Haswell.
39. *Cerceis trispinosa.* Haswell.
40. *Cilicaea tenuicaudata.* Haswell.
41. *Cilicaea Latreillii.* Leach.
42. ,, ,, *var. crassicaudata.* Haswell.
43. ,, ,, *var. longispina.* Miers.
44. *Cilicaea antennalis.* White.
45. *Cilicaea hystrix.* Haswell.
46. *Cilicaea spinulosa.* Haswell.
47. *Cilicaea curtispina.* Haswell.

48. *Cilicaea crassa.* Haswell.
49. *Zuzara diadema.* Leach.
50. *Zuzara armata.* Milne-Edwards.
51. *Zuzara integra.* Haswell.
52. *Zuzara emarginata.* Haswell.
53. *Haswellia carnea (Calyptura carnea.)* Haswell.
54. *Amphoroidea australiensis.* Dana.

Fam. ARCTURIDÆ.

55. *Arcturus longicornis.* Haswell.
56. *Arcturus brevicornis.* Haswell.

Fam. ANTHURIDÆ.

57. *Paranthura australis.* Haswell.
58. *Paranthura crassicornis.* Haswell.
59. *Paranthura diemenensis.* N. Sp.
60. *Anthura Miersii.* N. Sp.
61. *Haliophasma purpureum.* Haswell.
62. *Haliophasma maculatum.* Haswell.
63. *Eisothistos vermiformis.* Haswell.

Fam. TANAIDÆ.

64. *Tanais tenuicornis.* Haswell.
65. *Paratanais linearis.* Haswell.
66. *Apseudes obtusifrons.* Haswell.
67. *Apseudes australis.* Haswell.

Fam. ANCEIDÆ.

68. *Anceus ferox.* Haswell.

Fam. ASELLIDÆ.

69. *Stenetrium armatum.* Haswell.
70. *Stenetrium inerme.* Haswell.

Fam. CYMOTHOIDÆ.

Miers Zoological Collections of H.M.S. "Alert," (p. 300) adds a species—*Ceratothoa imbricata*, Fabr., of which there are specimens in the British Museum from Port Essington, Sydney, Murray River, and Western Australia, as well as from New Zealand and from Calcutta.

Fam. ÆGIDÆ.

Miers describes two new species of *Cirolana*—*C. multidigitata* from Albany Passage, Swan River and the Philippines; *C. schiodtei*, from Torres Straits; *C. tenuistylis*, also from Torres Straits, and a variety of *C. lata*, *mihi* from Albany Island.

Rocinela orientalis, Schiödte and Meinert is stated by Miers (l.c., p. 304) to have been obtained from Torres Straits and Moreton Bay, as well as from the Gulf of Suez, Ceylon, and the Philippines.

Fam. SPHÆROMIDÆ.

Miers (l.c., pp. 305-310) describes a new species—*Cymodocea longistylis*, from Torres Straits and from Singapore; a new variety of *Cerceis bidentata* of Milne-Edwards, which he calls *aspericaudata*: he notices the occurrence in Torres Straits and in Western Australia of *Cilicæa Latreillii* (*Sphæroma pubescens*) of Milne-Edwards; and describes an additional variety of that species (*C. longispina*) from Bass's Straits. He points out that an additional species of *Cilicæa* (*C. antennalis* of White) had been obtained from Swan River.

He also points out that the generic name *Calyptura*, which I applied to a curious form of this family having the last segment of the thorax produced into a broad plate, was pre-occupied and proposes to call it *Haswellia*.

I have to add the following remarkable new genus.

BREGMOCERELLA, N.G.

Oral region immediately in front of the epitsome (antennary sternum) produced forwards into a long horn-like process. Last segment produced, pointed. Uropoda with the outer (mobile) ramus rudimentary.

BREGMOCERELLA TRICORNIS N. Sp.

[Plate LIII., fig. 1.]

The oral process is considerably longer than the head, slender, cylindrical, curved upwards towards the distal end which is slightly dilated. The head is armed, a little in front of and internal to each eye, with a much shorter process, about a fifth of the length of the mesial one, directed forwards. The head is about the same length as the first segment of the pereion, but considerably narrower: the first segment has the pleural regions expanded and produced behind into a short acute process. The following five segments are nearly equal, slightly produced laterally: the seventh is rather larger, with two obscure teeth on each side of its distal border. The terminal segment is large, about a third of the length of the body, nearly triangular in outline, the apex produced into a bluntly pointed process with a slight notch on either side near the extremity: on the dorsal surface are two oval elevations covered with minute granulations. The anterior antennæ are slender, but as long as the head and first two segments. The posterior antennæ are much longer and stouter, more than half the length of the body, the peduncle and flagellum nearly equal in length, the latter with about thirty segments. The uropoda are narrow, about half the length of the terminal segment, not extending to near the apex, with a notch about the middle of the outer border in which is articulated the rudiment of a mobile ramus, and with two obscure teeth in the distal half. The length is $\frac{7}{10}$ths of an inch. The colour of the dried specimen is mottled red and brown, the horns red at the extremities: in the middle of the first body segment is an oval white spot with a light red mark in the middle of it.

Dredged at the "Heads" of Port Jackson. [Macleay Museum.]

Fam. Oniscoidea.

Ligia Australiensis.

Miers (l.c., p. 299) describes fully the species common on the Queensland coast, doubtfully referring it to *Ligia Gaudichaudii*, var. *Australiensis*, Dana.

Fam. Anceidæ.

Anceus ferox. N. Sp.

[Plate LII. Figs. 1—5.]

The body is very broad, the greatest breadth being nearly $\frac{1}{20}$th of an inch, and the total length, exclusive of the mandibles, being only about $\frac{1}{10}$th of an inch. The head is extremely large, more than half the length of the pereion; it presents in front a deep mesial excavation, at the bottom of which is a tooth; bounding the excavation on either side is a tooth-like projection. The pereion is as broad as the head in front, narrower behind; the hinder segments are slightly longer than the anterior. The pleon, with the telson, is about equal in length to the last four segments of the pereion; its length is rather more than thrice its breadth. The upper antennæ are shorter than the lower, considerably shorter than the head; the three joints of the peduncle progressively increase in length distally; the flagellum, which is nearly as long as the last joint of the peduncle, consists of a rudimentary proximal, a longer second, and a very small terminal articulation, the last ornamented with hairs. The inferior antennæ are longer than the superior, but shorter than the jaws; their flagellum is about the same length as the last segment of the peduncle, and consists of seven articuli. The jaws are very large, longer than the head; internally, near the base, each presents a bifid tubercle; at the apex each is divided into three teeth, of which one is rudimentary. The two anterior pairs of legs, which are a little larger than the following pairs, have the ventral borders of the merus and carpus each armed with two blunt spines; in the hinder pairs the place of these is taken by a series of very short spinules.

In the form of the jaws and their enormous size this species differs from any others, as well as in the great relative size of the head. Its nearest ally seems to be *Anceus maxillaris*, from which, however, it is very far removed.

I am indebted for the only specimen of this species I have seen to Mr. Thos. Hewitt. It was found in Port Jackson.

Fam. TANAIDÆ.

TANAIS TENUICORNIS.

[Plate L. Figs. 1—8.]

Paratanais tenuicornis, Haswell. Proc. Lin. Soc., N.S.W., Vol. VI., p. 194, pl. IV.

This species, of which only a short diagnosis has been published, presents two well-marked varieties—specimens from Port Western, Victoria, all presenting certain constant though unimportant peculiarities by which they differ from specimens from Port Jackson and Port Stephens. The following is a description of the Victorian form :—

The body is moderately stout. It is ornamented with a few scattered hairs on the dorsal surface, chiefly at the junctions of the segments. The head is nearly as long as the following four segments; between the upper antennæ it forms a low triangular lobe. The first three free thoracic segments are shorter than the rest—the first being the shortest of all. The abdomen is about equal in length to the two last segments of the thorax. The superior antennæ are stout, the first joint half the length of the the head, the second about a third of the length of the first and a little narrower, the third about two-thirds of the length of the second, narrower, with a minute lobe at its apex which may be a rudimentary fourth joint: the extremities of all three joints are ornamented with a few long hairs. The inferior antennæ are equal in length to the superior pair and slightly more slender, and consist of six joints; the first joint is short and stout; the second more than twice the length of the first; the third about a half to a third of the length of the second; the fourth as long or very nearly as long as the second; the fifth about two-thirds of the length of the fourth; the sixth very small, not much more than a quarter of the length of the penultimate joint; the terminal joints are ornamented with long delicate hairs. The fingers of the first pair of thoracic appendages have brown corneous tips; they are not denticulated; but there is a row of short fine hairs near the inner edge of the immobile finger. The second pair of thoracic appendages are more slender than the following, are not ornamented with spines, and terminate in a long, slender, two-jointed finger. The third and fourth pairs are shorter than the second and a little stouter; their dactyli are also slender and straight, but their meros and carpus are armed with short, stout spines, which are most numerous round the distal end of the latter segment. The three last pairs have the meros and carpus like those of the preceding two pairs, but the dactylos is hook-like and armed internally with a double row of acute spinules. The uropoda have a well developed ramus with from five to seven subequal articuli.

The surface of the body is irregularly mottled with blackish spots. The length is about a quarter of an inch.

In the Port Jackson specimens the terminal joint of the superior antennæ is relatively longer and narrower, and the second joint of the inferior antennæ relatively shorter.

PARATANAIS LINEARIS. N. Sp.

[Plate L. Figs. 9—16.]

The body of this species is extremely narrow—the length being about ten times the breadth. The head with the coalescent first segment is about twice as long as the second segment; it bears on either ends a strong tooth-like process directed backwards and downwards. The segments of the thorax are nearly equal, but increase a little in length and decrease slightly in height towards the posterior end. The abdominal segments are all equal, about a third of the length of the last segment of the thorax. The superior antennæ are stout and short, scarcely so long as the head and first segment; with only five joints, of which the second is the largest. The lower antennæ have four joints, of which the two proximal are the largest, with a strong tooth at the supero-distal angle of the second; the fourth joint is very small and scarcely half the length of the third. The first pair of thoracic appendages are very stout, as long as the head and following two segments; the meros, carpus and propus all stout, the carpus the largest; the immobile finger has a rounded tubercle ornamented with a few hairs. The following three pairs of appendages are slender, the propus considerably longer than the carpus, the dactylos slender, continued into a delicate hair-like point. The last three pairs of thoracic appendages are rather stouter than the preceding pairs; the meros, carpus and propus are each ornamented towards the distal end with a few conical or curved spines, of which two placed at the extremity of the propus assume the form of accessory dactyli. The dactylos proper is longer and stronger than these, a little less than half the length of the propus. The uropoda are very short, the inner ramus composed of one compressed joint which is about twice the length of the peduncle; the outer shorter and narrower, apparently one-jointed on one side, but on the other showing an articulation (or fracture) about the middle. The total length of the animal is $\frac{3}{16}$ths of an inch.

The only specimen I have was obtained with the dredge in Port Jackson.

STENETRIUM ARMATUM.

[Plate LI. Figs. 1—12.]

Stenetrium armatum. Haswell, Proc. Linn. Soc. N.S.W. Vol. V., p. 478.

The males of this species differ from the females in the form of the first pair of thoracic appendages (see P.L.S., N.S.W. Vol. V., pl. XIX., figs. 1c and 1c[1]), and also in having the flagella of the superior antennæ usually, though not invariably, longer. The number of articuli of the inner antennæ varies from eight to twelve, and the length varies considerably in different individuals; the extremity never quite reaches the end of the fourth joint of the peduncle of the inferior pair, and usually does not reach much beyond the distal end of the third joint. Connected with the second joint of the inferior antennæ is a movable scale or scaphicerite. The flagellum of the superior antennæ is very long, consisting of 115 very short articuli. As in *Apseudes*, *Tanais*, and *Anthura* the mandible has a well-developed palp; its cutting apex is bi-lobed, each lobe being divided into several teeth; behind the teeth is a row of strong curved spines. The first pair of maxillæ have two rami, of which the outer is the longest, both armed apically with stout, simple spines and hairs. The second pair of maxillæ have three lobes, each armed with long simple spines. In the first pair of maxillipedes the basal joint has articulating with it a long, un-jointed, scale-like, pointed, external appendage; the second joint is broad, and bears a plate-like appendage, which is armed internally with a row of four or five chitinous teeth, and distally with some short setæ; the following three joints are expanded, especially the fourth and fifth; the two terminal joints are narrower. The six posterior pairs of pereiopods each terminate in two claws, with a third claw or spine a little further back on the ventral border of the propodos; the third and fourth joints are each produced into a process tipped with one or two very long setæ. The ventral surface of the last segment of the abdomen frequently possesses an acute spine in the middle line behind, but this is sometimes rudimentary. The abdomen possesses three pairs of appendages besides the terminal uropoda. Of these the first pair are biramous, the exopodite being large and crustaceous, meeting with its fellow in the middle, and completely covering the posterior appendages; it is divided into two parts by an oblique articulation; its endopodite is much smaller and more delicate, tipped with a few setæ, and is placed behind the expodite. The second and third pairs of abdominal appendages are likewise delicate; the second is biramous, the third uniramous. The bases of the first pair of abdominal appendages are covered in both cases by a broad plate, with a bifid apex attached to the posterior border of the last thoracic segment. The eggs are borne in a brood pouch on the ventral surface of the first four segments of the pereion.

The specimens which I have at my command at present are not sufficiently well preserved to enable me to ascertain the position of the embryo in the egg, but I have little doubt on a careful re-examination of the subject that the present form (in spite of the direction of the four anterior pairs of thoracic appendages) finds its nearest allies among the *Asellidæ*, not among the "*Abnormalia*," as I was at first inclined to suppose. The grouping together in Dana's classification under the title of *Anispoda*, of a number of forms whose chief bond of connection is the direction of the thoracic appendages results an an extremely artificial arrangement.

Fam. ANTHURIDÆ

Paranthura dimenensis. N. sp.

[Plate LII., figs. 6-13.]

The head is rather smaller than the first segment of the pereion, compressed from above downwards, nearly square in outline, with the anterior border concave. The second and third segments are about equal, very little larger than the head; the following segments of the pereion are both longer and thicker than the first and second, except the last which is rather shorter. The pleon is nearly as long as the penultimite segment of the pereion; all its segments are quite distinct. Both pairs of antennæ are shorter than the head, the inferior pair rather longer than the superior, the latter has six segments, of which the last is very small and there seems to be the rudiment of a seventh: the former has five segments, the last small, ornamented with a fringe of hair. The first three pairs of thoracic appendages are all sub-cheliform, the first the largest with very stout carpus and propodos: the former triangular, produced so as to articulate with a considerable part of the ventral border of the carpus; the propodos with the palm oblique defined by a small spine: the following two pairs are of somewhat similar shape, but rather smaller, the palm undefined in the third, defined only by an obtuse angle in the second. The terminal appendages are rather pointed, ornamented with a small fasciculus of hairs: the telson has a minute notch in the middle behind. The length is half an inch.

Found at Hobart between tide marks.

Paranthura crassicornis.

[Plate LIII., figs. 8 and 9.]

Paranthura crassicornis, Haswell. Proc. Linn. Soc., N.S.W., Vol. V., p. 478, pl. XVIII., fig. 5 Cat. Aust. Crust., p. 305.

There is a considerable amount of variation in this species; particularly in the length of the antennæ. In the specimen originally described the inner pair were about half the length of the head: the outer were twice as long as the inner pair. In a second specimen the inner pair are as long as the head, composed of five segments of nearly equal size—the fourth the longest, the fifth shorter, ornamented at the extremity with numerous fine hairs; the outer are about half the same length as the inner; their flagellum very stout, a little longer than the peduncle, of eight articuli. In a third specimen the outer antennæ are nearly as long as the head and first two segments, the flagellum having thirteen joints; the inner pair are broken off.

I may add to the description originally given that the propodos of the first pair of peripods is ornamented on its palmar border with a few fine hairs: the dactyli likewise have a few very short hairs along their inner border. The "palm" of the second and third pereiopods is provided with short straight spines, and there are similar spines on the carpus and propus of the following pairs.

HALIOPHASMA PURPUREUM.

[Plate LIII., figs. 6 and 7.]

Haliophasma purpureum, Haswell. Proc. Linn Soc., N.S.W., Vol. V., p. 476, pl. XVIII., fig. 3; Cat. Aust. Crust., p. 305.

I give here an outline of the antennæ of this species. In the flagellum of the outer pair there are seven distinct segments, the first large with indications of subdivision into two; the last two very small.

PARANTHURA AUSTRALIS.

Paranthura australis, Haswell. Proc. Linn. Soc., N.S.W., Vol. V., p. 477, pl. XVIII., fig. 1; Cat. Aust. Crust., p. 304. Miers, Zooligical Collections of H.M.S. Alert, p. 311.

A very distinct variety of this species, or perhaps a distinct species, has been described by Miers (l.c.) as found at Dundas Straits by Dr. Coppinger.

PARANTHURA MIERSI. N. sp

[Plate LIII., figs. 2-5.]

The body is long and narrow; the first segment is longer than the head and projects like a hump behind; the segments of the pereion are of nearly equal length—the last being a little smaller than the rest; the pleon is a little longer than the last segment of the pereion; the segmentation is obscurely indicated. The inner (superior) antennæ are shorter than the head very slender, with a rudimentary flagellum. The outer are as long as the head, with stout basal joints and a rudimentary flagellum of four articuli with a dense fringe of extremely fine short hairs. The first pair of legs have the carpus produced into an infero-distal process which is armed with a few spinules; the propus is dilated, the palm presents a deep excavation the border of which is minutely serrulate, the dactylos has a tuberculated elevation near its base. The following pairs are short and stout, the carpus of each is a little produced infero-distally, and is here ornamented with a row of very minute spinules with a single larger spine and three or four fine hairs. The propus is likewise ornamented along its inferior border towards the distal end with minute spinules and has a stronger spine at the infero-distal angle; the dactylos is large, two-thirds of the length of the propus and is biarticulate. The rami of the uropoda are ovate. The telson is ovate, narrowing a little towards the apex.

The length is half an inch. Each of the segments is marked with a large patch of blackish purple.

Port Jackson.

EXPLANATION OF PLATES.

[Plate L.]

Fig. 1.—*Tanais Tenuicornis*, lateral view.
Fig. 2.—Superior antennæ of the same species.
Fig. 3.—Inferior antennæ of the same.
Fig. 4.—Terminal joints of first pair of pereiopods of the same.
Fig. 5.—Second pair of periopods of the same.
Fig. 6.—One of the posterior pairs cf pereiopods of the same.
Fig. 7.—Uropod of the same.
Fig. 8.—Lips of pincers of first pair of pereiopods.
Fig. 9.—*Paratanais linearis*.
Fig. 10.—Superior antennæ of the same.

Fig. 11.—Inferior antennæ of the same.
Fig. 12.—Terminal joints of first pair of pereiopoda of the same.
Fig. 13.—Second pair of pereiopoda of the same,
Fig. 14.—One of the posterior pairs of pereipoda of the same.
Fig. 15.—Terminal joints of one of the posterior pairs of pereiopods.
Fig. 16.—Uropod of the same.

[Plate LI.]

Fig. 1.—*Stenetrium armatum.*
Fig. 2.—Basal joints of inferior antennæ.
Fig. 3.—Apex of mandibles.
Fig. 4.—Base of the mandibular palpi.
Fig. 5.—Toothed edge of the mandibles.
Fig. 6.—Maxilla of the first pair.
Fig. 7.—Maxilla of the second pair
Fig. 8.—Maxillipedes.
Fig. 9.—Abdominal spine.
Fig. 10.—Pereipods.
Fig. 11.—Anterior pair of pleopods.
Fig. 12.—

[Plate LII.]

Fig. 1.—*Anceus ferox*, magnified.
Fig. 2.—Superior antennæ of the same.
Fig. 3.—Inferior antennæ of the same.
Fig. 4.—Distal joints of one of the anterior pereiopods.
Fig. 5.—Fourth and fifth joints of one of the posterior pairs of pereipoda.
Fig. 6.—Head of *Paranthura diemenensis.*
Fig. 7.—Posterior extremity of *Paranthura diemenensis*, from above.
Fig. 8.—Superior antennæ of the same.
Fig. 9.—Inferior antennæ of the same.
Fig 10.—Terminal joints of first pair of pereiopods of the same.
Fig. 11.—Terminal joints of second pair of pereipods of the same.
Fig 12.—Terminal joints of third pair of pereipods of the same.
Fig. 13.—Extremity of one of the posterior pairs of pereiopods of the same.

[Plate LIII.]

Fig. 1.—*Bregmocerella tricornis*, magnified.
Fig. 2.—Upper antennæ of *Paranthura Miersi.*
Fig. 3—Lower antennæ of the same.
Fig. 4.—Extremity of periopod of first pair of the same.

Fig. 5.—Extremity of one of the posterior pereiopods of the same.
Fig. 6.—Upper antenna of *Haliophasma purpureum*.
Fig. 7.—Lower antenna of the same.
Fig. 8.—Upper antenna of *Paranthura crassicornis*.
Fig. 9.—Lower antennæ of the same.

NOTES AND EXHIBITS.

E. P. Ramsay, F.R.S.E., &c., exhibited a Throwing Stone, used in warfare by the natives of Futuna, New Hebrides, which had been presented to the Australian Museum by Captain Geo. Braithwaite of the Dayspring. The stone was a cylindrical weapon, about two feet and a half long, and two inches in diameter, and had been cut out of a solid block of coral. Mr. Ramsay pointed out that the natives of Futuna were compelled to resort to coral for their weapons, as there were no stones or rocks on that island.

Mr. J. G. Griffin, C.E., exhibited some Oyster Shells, obtained from the cutting (adjacent to the Yarra River) now being made by the Melbourne Harbour Trust for improving the water approach to that city. These were taken at a depth of about 30 to 40ft. He also exhibited oyster and other shells, from the shaft of the Maryville Colliery, at Newcastle, about 40ft. from the surface. Mr. Brazier said the oyster-shells from the neighbourhood of Melbourne were identical with those of England, and are named *Ostrea edulis*, while those from Maryville, were *O. glomerata* var. *O. sub-trigona* of this colony.

Mr. Trebeck exhibited two samples of wool grown from the same ram in Victoria and in Mudgee. The longer sample, grown under high culture at Ercildoune, is nearly five inches long, and has every good quality for which the Victorian combing wool is celebrated; the shorter sample is of the same time of growth on the natural pastures of Mudgee, and is only about $1\frac{1}{2}$ inches long. Irrespective of the marked difference in length, the quality of that grown on the natural pastures of Mudgee appears to be very much inferior in many points. This is unaccountable, as the Mudgee district is well known to produce merino wools of the highest quality.

Professor Stephens exhibited the magnificent donation which the Society had lately received from the Rev. Dr. Woolls, consisting of a very large collection of New Zealand Lichens, all well preserved, mounted, and accurately named by Dr. Knight, of Wellington, New Zealand. For this donation a most cordial vote of thanks was accorded by the meeting.

Mr. Brazier exhibited a specimen of *Trigonia Lamarckii*, Gray, containing a beautiful flesh tinged Pearl, from Port Jackson.

Dr. von Lendenfeld exhibited specimens of the Ctenophora of Port Jackson, described by him as *Bolina Chuni*, in different stages of development, alive in an Aquarium. A live specimen of *Neis cordigera*, measuring a foot in length, was also exhibited by him.

Baron Maclay exhibited the shells,—identified in Mr. Brazier's Paper,—which he had collected on the Maclay-coast, many hundred feet above the sea level. He also exhibited a sample of dried clay, remarkable on account of its extreme hardness.

Mr. Layman M. Harrison exhibited a leg bone of a bullock, which had been fractured in such a way that the broken ends had been forced aside and completely apart. Notwithstanding this the bones had knit by very remarkable side growth.

WEDNESDAY, 26TH NOVEMBER, 1884.

The President, C. S. Wilkinson, Esq., F.L.S., F.G.S., in the chair.

MEMBERS ELECTED.

Dr. Louis Foucart, F.R.C.S., &c., 231 Macquarie Street, Sydney ; Albert K. Varley, Esq., Mount Gambier, South Australia ; Dr. H. Cooper Rose, F.R.C.S., Balmain.

DONATIONS.

"Proceedings of the Royal Society of London," Vol. XXXV., No. 227. Vol. XXXVI., Nos. 228 to 231, June 21st, 1883, to April 24th, 1884. From the Society.

"Bulletin de la Société Royale de Géographie d'Anvers." Tome IX., Fasc. 1, 1884. From the Society.

"Feuille des Jeunes Naturalistes," No. 168. October, 1884. From the Editor.

"Victorian Naturalist," Vol. I., No. 10. October, 1884. From the Field Naturalists Club of Victoria."

"Naturhistorisches Museum zu Hamburg, Bericht des Directors für 1883." "Ueber einige afrikanische Reptilien, Amphibien und Fische des Naturhistorischen Museums. Von Dr. J. G. Fischer." Two pamphlets, 8vo, 1884. From the Hamburg Museum.

"Midland Medical Miscellany," Vol. III., No. 34. October, 1884. From the Editor.

"Journal of Conchology," Vol IV., No. 7. July, 1884. From the Conchological Society of Great Britain and Ireland.

"Monatliche Mittheilungen des Naturwissenschaftlichen Vereins des Regierungsbezirkes Frankfurt." II. Jahrg., No. 5. August, 1884.

"Zoologischer Anzeiger." Jahrg. VII., No. 178. 6th October, 1884. From the Editor.

"Science," Vol. IV., Nos. 85-88. September 7th to October 10th, 1884 From the Editor.

"Leopoldina, Amtliches Organ der Kaiserlichen Leopoldino-Carolinischen Deutschen Akademie der Naturforscher, Halle." Part 19 for 1883. From the Society.

"Final Report of the South Australian Institute for the nine months ended June 30th, 1884." From the Director.

"Entomologisk Tidschrift." Arg. V., Haft. 1 and 2, 1884. From the "Entomologiska Foreningen, Stockholm."

"Journal of the Royal Microscopical Society of London." Ser. II , Vol. IV., Part 5. October, 1884. From the Society.

ON A NEW INSTANCE OF SYMBIOSIS.

By William A. Haswell, M.A., B.Sc.

Some time ago I had the pleasure of bringing under the notice of this society an instance of Symbiosis, in which the organisms were a minute Sea-Anemone and a Bryozoan. (1) The example which I have now to bring forward is not without analogy with this. Last year I described in a preliminary note (2) the general appearance of a new and remarkable species of *Phoronis*, the first that had been found to inhabit Australian Seas. I described the worms as inhabiting spaces or channels in the substance of a wide tube about six inches long, formed of felted threads and having a smooth interior—the heads of the Gephyreans projecting externally. The tube when first discovered was quite empty, and I could not even conjecture what the meaning of this singular structure could be. Fragments of similar colonies have been dredged repeatedly since, and Mr. W. H. Caldwell, who while at Naples made a special study of the Mediterranean *Phoronis hippocrepis*, has more than once obtained large pieces containing many individuals. It was only the other day however, that the mystery regarding this remarkable mode of growth of the *Phoronis* was solved. Mr. Ramsay obtained in a dredge a fortnight ago, specimens which proved not only to contain colonies of *Phoronis australis*, but also the inhabitant of the cavity of the tube in the substance of which the *Phoronis* grows. This proves to be a large Sea-Anemone, of the genus *Cerianthus*.

We have thus here a very remarkable instance of mutual co-operation in two animals belonging to widely different classes. A Sea-Anemone lives in the lumen of a tube the substance of which is inhabited by a colony of *Phoronis*. It is not an instance of mere parasitism or commenalism ; we have plenty of instances

(1.) Proc. Linn. Soc., N.S.W., Vol. VII., p. 608.
(2.) Op. cit., Vol. VII., p. 611.

in which one animal finds it advantageous to take up its abode in the walls of the dwelling of another. But here we have something more. The tube in which the Anemone dwells is not formed by the Anemone alone, but is partly manufactured by the *Phoronis*. This is proved by an examination of the texture of the tube, which is partly made up of gelatinous threads containing a large amount of the same dark purple pigment found in the integument of the tentacles and front part of the body of the *Phoronis*, and partly of much finer threads.

Among the meshes of the latter, which form the greater part of the thickness of the tube are numerous oval thread-cells, and the thick felt-like substance seems to consist of nothing else than the discharged flagella of these bodies (1). The *Phorones* inhabit transparent membranaceous tubes which run obliquely in the substance of the tube of the *Cerianthus*, projecting usually a little distance beyond the general outer surface of the latter—the mouth directed more or less upwards. The openings of these smaller tubes lie over the whole surface of the large tube; except a short space at the lower end, the tubes themselves form a substantial part of the thickness of the latter, and there can be little doubt from the way in which the threads which seem to be derived from the *Phoronis* are interwoven with those produced by the thread-cells of the *Cerianthus*, and from the intimate manner in which the smaller tubes are interwoven with the tissues of the larger one that the two structures—the colony of *Phoronis* and the protecting case of the sea-anemone—have grown simultaneously.

The symbiosis of a *Sagartia* with a *Pagurus* has been described by Eisig—the hermit-crab permitting the sea-anemone to live on the back of its shell, and the sea-anemone apparently preferring this situation to any other (2). The advantage derived from association with one of the *Actinidæ* in all such cases, is

(1). Thread-cells of similar shape occur (with others) in the ectoderm of the body wall of the *Cerianthus*, though not of the tentacles, the nematocysts of the latter being all along and narrow with a spiral thread.

(2). *Dromia excavata*, another of the Anomoura, found in Port Jackson, is almost always found with a colony of *Diazona*, a solid heavy compound Ascidian, growing on its back—the *Diazona* frequently being very many times the bulk and weight of the Crustacean.

dependent on the power which the latter possesses of killing or stunning by the action of its thread-cells small organisms that approach the neighbourhood of its tentacles—a plentiful supply of food being thus provided for the anemone itself and for any other animal, such as the hermit-crab or the colony of *Phoronis* that may live in association with it, and common enemies being at the same time warded off. In return for this the *Phorones* help to build and to strengthen the protecting case in which the *Cerianthus* lives.

ON THE PYCNOGONIDA OF THE AUSTRALIAN COAST, WITH DESCRIPTIONS OF NEW SPECIES.

[Plates LIV., LV., LVI., LVII.]

By William A. Haswell, M.A., B.Sc.

Very few Australian species of Pycnogonida have been described. In the list of the known members of the order given by Hoeck in his Report on the Pycnogonida of the Challenger Expedition (1881) there are only seven Australian species mentioned and of these seven, several are rather to be regarded as belonging to the deep-sea fauna than to the fauna of Australia.

The following is a list of all the Australian forms now known :—

Fam. Nymphonidæ.

Nymphon validum, n. sp. Port Stephens.
Nymphon aequidigitatum, n. sp. Port Jackson.
Nymphopsis armatus, n. gen et sp. Port Molle.

Fam. Colossendeidæ.

Ammothea longicollis, n. sp. Port Jackson.
Ammothea assimilis, n. sp. Port Jackson.

Ascorhynchus minutus, Hoeck. Off Port Phillip.
Colossendeis gigas-leptorhynchus, Hoeck. South of Australia.
Colossendeis tenuissima, n. sp. Port Denison.
Achelia lævis, var. australiensis, Miers. Port Jackson.

Fam. PALLENIDÆ.

Pallene lævis, Hoeck. South Coast.
Pallene chiragra, Milne-Edwards. Jervis Bay.
Pallene pachycheira, n. sp.
Pallene australiensis, Hoeck. South-East Coast.
Pallene languida, Hoeck. Melbourne.
Phoxichilidium tubiferum, n. sp. Port Jackson.
Phoxichilidium Hoeckii, Miers. Torres Straits.

Fam. PHOXICHILIDÆ.

Phoxichilus charybdaeus (?), Dohrn. Port Molle.
Pycnogonum australe, Grube.

The momenclature of the appendages and the definitions of the genera followed in drawing up the following descriptions have been mainly those of Dohrn (1).

Genus. NYMPHON. Fabr.

NYMPHON ÆQUIDIGITATUM, n. sp. [Pl. LIV., figs., 1—5.]

The length of the body is about four and a-half times its greatest breadth; the lateral processes are separated from one another by distinct intervals, and are about as long as the body is broad; the "neck" is half the length of the rest of the body and much narrower. The divisions between the segments are well-marked. The proboscis is rather longer than the neck, and is dilated at the base where it is considerably broader than the body; distally it narrows slightly and ends in a rounded extremity. The abdomen is about a fifth of the length of the body, deeply notched behind. The first pair of appendages are very large, their basal joint is as long as the proboscis, stout, rather thicker distally than proximally.

(1.) Fauna and Flora des Golfes von Neapel, III. Monographie: Pantopoda, von Dr. Anton Dohrn, Leipzig, 1881.

The second joint is also very long, though shorter than the first, it is ovoid and swollen ; the finger into which it is prolonged is about half the length of the rest of the joint, is provided with a series of denticles and ends in an extremely fine, curved point ; the movable finger resembles the immobile one. The second pair of appendages are of the same length as the first, but very slender ; the first joint is very short, the second is eight times as long, the third is a little shorter than the second ; the fourth is a little more than a third of the length of the third ; the fifth is considerably longer than the fourth, but shorter than the third. The third pair of appendages are long and slender ; the first joint is short, the second longer, the third twice as long as the second, and rather dilated distally, the fourth longer and more slender than the third, gently curved ; the fifth short, the sixth longer than the fifth, about a third of the length of the fourth, the seventh and eighth, ninth and tenth, nearly equal in length ; the number of spines on the tenth joint is over fourteen, but the appendage is damaged on both sides and some of the spines have been broken off ; the terminal claw is nearly as long as the tenth joint. The following four pairs of appendages are distinguished by their great length, being four times as long as the whole body inclusive of the proboscis ; the first joint is short and rather thick ; the second is more than three times the length of the second, narrower proximally than distally ; the third is slightly larger than the second ; the fourth is twice as long as the second, slightly swollen distally ; the fifth is a little longer than the fourth, and much more slender ; the sixth is the longest and slenderest of all, nearly as long as the fourth and fifth together ; the seventh and eighth are likewise very slender, the former the shorter of the two, a little longer than the first ; the eighth is not at all thicker than the seventh ; it has three terminal claws which are of nearly equal size, scarcely a fourth of the length of the joint.

The length, inclusive of the proboscis is $\frac{3}{16}$ths of an inch : of each leg $\frac{3}{4}$ths of an inch.

Dredged at Port Jackson, New South Wales.

A second specimen from the same locality has the proboscis rather larger, and the second joint of the first pair of appendages longer and less dilated; it has seventeen denticulated spines on the last joint of the third pair of appendages, fifteen on the ninth joint, about fifteen on the eighth, and eighteen on the seventh.

NYMPHON VALIDUM, n. sp. [Pl. LIV., figs., 6—9.]

The length of the body is about six times its breadth; the lateral processes are separated by distinct intervals; they are well developed, being rather longer than the breadth of the body; the neck is rather short and stout. [The proboscis and the abdomen are both lost.] The first pair of appendages are rather short, the first joint short and thick; the second ovid and swollen, produced into a long, rather slender, finger. The second pair of appendages are very short, much shorter than the first, the third joint the longest. The third pair of appendages are well developed; the first three joints are short and thick, the fourth longer, slightly curved, the fifth considerably longer than the third, provided at its extremity with a remarkable process; the sixth to the tenth joints are nearly equal, the ninth and tenth being the smallest; the last four joints are armed with denticulated spines of which there are five on the seventh, six on the eighth, four on the ninth and five on the tenth; there is no terminal claw. The last four pairs of appendages are of nearly equal length, more than twice the length of the body, stout, and ornamented with a few conical tubercles each capped with a small, simple spine; the first joint is short and thick, the second more than twice as long, narrow proximally, very stout distally; the third is shorter and has one or two low tubercles; the fourth is more than twice as long as the second and has two prominent conical tubercles at its distal end; the fifth is rather shorter than the fourth and has two prominent tubercles in its proximal half; the sixth is a good deal longer than the fourth and has two obscure tubercles in its proximal half and a pair at its distal end; the seventh segment is very small and is armed with a few stout spines; the eighth is strongly bent, it palmar border is deeply concave, and armed with a row of spines of which the proximal five are much shorter than the rest; the large claw is scarcely two-thirds of the length of the eighth joint ; the accessory claws are scarcely half the length of the large claw.

The length of the body is an eighth of an inch : of the posterior appendages a third of an inch.

Specimens of this species were obtained with the dredge in Port Stephens.

Genus. NYMPHOPSIS. Haswell.

First pair of appendages well developed, cheliform. Second pair well-developed, palpiform with nine joints. Third pair with seven joints, none of them provided with compound spines.

Nymphopsis armatus, n. sp.

[Pl. LV., figs. 1-4.]

The thorax of this species is about three times as long as its greatest breadth, a little narrower behind than in front ; the lateral processes are long, and are separated from one another by tolerably wide intervals ; the last pair are directed much more backwards than outwards, the thorax appearing to bifurcate behind and the two processes thus formed not diverging widely from one another. The abdomen is very long, being more than half the length of the thorax, narrow, cylindrical, armed near the extremity with two powerful acute spines. The ocular lobe is also very long, about half the length of the abdomen with two closely approximated eyes. The proboscis is as long as the thorax ; broad at the base and narrowing a little towards the apex which is truncate. The first pair of appendages extend a very little beyond the extremity of the proboscis ; the first joint is long and narrow, but a little expanded at the extremity where it is produced into a circular rim forming a cup at the bottom of which the second joint is articulated, apices of the fingers extending a little beyond it ; this rim is armed with one or two spines ; the fingers are slender, strongly curved, crossing at their tips, and leaving a wide space between when closed. The second pair of appendages are a little longer than the first, slender ; the first joint is short, the second and fourth long, the former being slightly longer than the latter which has a rounded tubercle on its outer margin near the extremity; the third very short: the last four joints are small, armed with numerous simple spines. The third pair of appendages are slender, with seven joints, of which the third is the longest, the fourth a little shorter and the rest small, the terminal joint being the smallest of all; none of them are ornamented with compound spines.

The fourth, fifth, sixth, and seventh pairs of appendages are about four times the length of the body, comparatively stout, ornamented with tubercles and numerous compound spines. The first joint is small and has only one or two simple spines; the second joint is more than twice as long as the first, narrow proximally, broader distally, with a very prominent tubercle and several spines, one very large; the third joint is smaller than the second; it is ornamented at its distal end with a few small, finely ciliated spines; the fourth joint is very long, four times as long as the third, and with three or four spiniferous tubercles; the fifth joint is nearly as long as the fourth and is ornamented along its anterior border with about ten to fifteen very large compound spines; the sixth joint is nearly the same length as the fifth, but a little narrower, and is ornamented with similar spines; the eighth joint is about four times as long as broad, bears on its inner ("palmar") border a row of about twenty slightly curved spines, of which the proximal two or three are stouter than the others; the dorsal border is beset with seven or eight longer and somewhat more delicate spines, each set in a little tubercle; the extremity has likewise a few slender spines; the claw is slightly shorter than the eighth joint, stout, nearly straight.

I obtained one specimen of this species in the dredge at Port Molle in Queensland, at a depth of 15 fathoms during the cruise of H.M.S. "Alert."

Genus. AMMOTHEA. Leach.

Ammothea assimilis, n. sp.

[Pl. LV., figs. 5-9.]

The body of this species is tolerably broad: the intersegmental lines distinct. The lateral processes are in contact with one another.

The proboscis is very large, about three fourths of the length of the body, as broad as the body in its middle part, constricted behind, narrowing somewhat in front and ending in a blunt apex, the outline being that of a long oval. The abdomen is exceedingly small, not a third of the length of the rest of the body, cylindrical, narrowing slightly towards the posterior extremity, which is obscurely notched. The first pair of appendages are very short, not a half of the length of the proboscis. The second pair are somewhat longer than the proboscis, slender; the first and second joints are small; the third is the longest, extending beyond the extremity of the first pair of appendages; the fourth very small; the fifth nearly half the length of the third; the sixth to the tenth all small; the tenth narrow oval, rather more than thrice as long as broad; the five terminal joints are ornamented with a few short and fine hairs. The seventh pair of appendages are rather smaller than the fourth, fifth and sixth: the latter are rather more than twice the length of the body exclusive of the abdomen: the first three joints are all short, the second the longest of the three, constricted proximally, and ornamented at its distal end with a very prominent process having a few small hairs; the fourth joint is rather longer than the second and third together; the fifth is slightly longer and narrower than the fourth; the sixth is rather longer and narrower than the fifth; the seventh is very small; the eighth about two thirds of the length of the sixth, the large claw not quite half the length of the eighth joint: the fifth and sixth joints are slightly constricted proximally; each bears a few longish hairs on its dorsal border; the palm on the eighth joint is not distinctly defined; the palmar border bears eight spines, of which the proximal three are longer than the others; the dorsal border of the eighth joint bears about ten bristles: the small claws are scarcely two-thirds of the length of the large.

I found specimens of this species on Clark Island, Port Jackson. It is very nearly related to *Ammothea Langii* of Dohrn; but the form of the terminal joint of the second pair of appendages and other minor points distinguish the two species.

AMMOTHEA LONGICOLLIS, n. sp.

[Pl. LVI., figs. 1-4.

The body of this species is rather long and slender, the "neck," or portion intervening between the point of insertion of the second pair of appendages and that of the third, about half the length of the rest (exclusive of the abdomen.) The intersegmental lines are very distinct. The lateral processes are not in contact with one another, but not very wide apart, those of the third pair of appendages being more widely separated from the fourth than any of the following pairs are from one another. The proboscis is very large, as long as the neck and first segment, long oval, with the ends somewhat pointed. The abdomen is narrow cylindrical, notched at the extremity, equal in length to the last two segments. The first pair of appendages are very small, scarcely one-third of the length of the proboscis; the first joint is narrow, slightly incurved, rather broader distally than proximally; the second is ovate, about one-fourth of the length of the first. The second pair of appendages are about four and a-half times the length of the first, and are longer than the proboscis; the first joint is short and thick; the rest slender, the second very much the longest, thicker at the distal than at the proximal end; the third about a quarter of the length of the second, the fourth two-thirds of the length of the second, the fifth very short; the sixth nearly half of the length of the fourth; the seventh equal in length to the sixth; the eighth a little shorter, and the ninth shorter still; the ninth joint is ornamented with a few short hairs. The basal joint of the third pair of appendages is small; the second twice as large as the first, curved; the third rather smaller than the second; the fourth twice as long as the third; the fifth rather shorter than the fourth and more slender towards the proximal end; the sixth nearly two-thirds of the length of the fifth; the seventh about equal to the sixth; the eighth rather smaller, the ninth and the tenth nearly equal in length; the last four segments are ornamented with pinnate hairs; the last terminates in a curved claw. The fourth, fifth, sixth and seventh pairs of appendages have each short basal joints, each of which has two short lateral processes near its distal end ; the second joint is a little longer than the first, the third equal to the first ; the fourth is longer than the three first together ; the fifth is somewhat longer than the fourth, the sixth about the same length as the fourth, but more slender, the seventh about half the length of the sixth ; the eighth, the joint between which and the seventh is scarcely discernable, is equal in length to the seventh ; the claw is longer than the eighth segment, tapering distally, and resembles an additional segment.

This species occurs in Port Jackson.

Genus. COLOSSENDEIS. Jarzynsky.

Colossendeis tenuissima. n. sp.

[Plate LVI., figs. 5-8.]

The body of this remarkable species is of extremely slender form exceeding in that respect any of the described species of Pantopoda. The first joint is comparatively short, and its lateral processes approach close to the bases of the preceding appendages. The second segment is extremely long, the length being about six times the breadth, and the lateral process for its pair of appendages which are placed close to the posterior end of the segment, being separated by a very wide interval from those of the preceding pair. The third segment is about equal in length to the second ; the fourth is about half the length of the third. The lateral processes are all very short, and somewhat constricted where they join the segment. The abdomen has been lost. The proboscis is very remarkable ; with its peduncle it is nearly as long as the body, of a pyriform shape armed towards its middle with a prominent tooth and supported on a very long and slender peduncle. The second pair of appendages are very long and slender passing far beyond the extremity of the proboscis ; the first joint is indistinct ; the second is short and stout ; the third is slender and of great length, longer than the peduncle of the proboscis ; the fourth joint is very short ; the fifth is about half the length of the third and equally slender ;

the sixth is scarcely a fifth of the length of the fifth; the seventh is a little longer than the sixth and slightly narrower; the eighth is rather longer and narrower than the seventh; the ninth is equal in length to the seventh, but narrower; the tenth is scarcely two-thirds of the length of the ninth. The third pair of appendages is a little longer than the second; its three first joints are short and stout, while the fourth is very long, equalling in length the third joint of the second pair of appendages, and very slender, expanding a little towards the distal end; the fifth joint is short; the sixth as long as the fourth, very slender throughout the greater part of its extent, but a little expanded towards the distal end; the seventh, eighth and ninth joints are nearly equal, short, slightly curved, bordered with a close line of hairs; the tenth is rather smaller, ornamented internally with a dense fringe of hairs and armed with a terminal claw, forming a cheliform termination to the appendage. The appendages of the fourth, fifth, sixth and seventh pairs are very long and slender, much longer than the body; the three basal joints are short and stout, the fourth very long and very slender in the greater part of its extent, though somewhat thickened distally. The fifth joint is about equal in length to the fourth, slender and a little thickened distally; the sixth joint is a little shorter than the fifth and of nearly uniform diameter throughout; the seventh is scarcely half the length of the sixth; the eighth is about equal to the seventh; the claw is between half and two-thirds of the length of the eighth joint, nearly straight, acute.

The length of the body inclusive of the proboscis is three-eighths of an inch; of the legs seven-eighths.

I have only one specimen of this well-marked species, found in Port Denison.

Genus. PALLENE.

PALLENE PACHYCHEIRA, n. sp.

[Plate LVII., figs. 6-9.]

The body of this species is rather short and thick, the intersegmental lines very distinct, the lateral processes closely approximated to one another. The proboscis with the neck is a little shorter than the body proper; the length and breadth of the segments of the body are nearly equal. The proboscis is as broad as the body behind, conical, coming gradually to a point in front. The abdomen is short, shield-shaped, slightly notched in the middle behind. The first pair of appendages are very large; more than twice as long as the proboscis, the first joint is thick, a little narrower at the proximal than at the distal end, as long as the proboscis; the penultimate joint is very large, somewhat longer than broad, laterally compressed; its digital process is stout, and presents a rounded lobe towards the middle of its inner border; the last joint (dactylus) is of a similar form to the digital process of the preceding and has a similar rounded lobe on its inner border. The third pair of appendages have the four basal joints stout, the third and fourth longer than the first and second; the fifth is as long as the third and fourth together, narrower, curved, and provided with a conical process standing out at right angles at its distal end; the sixth joint is about a fifth of the length of the fifth; the following four joints are each ornamented with a small number—half-a-dozen or fewer—of compound setæ; the seventh and eighth are longer than the ninth and tenth; the last is succeeded by a long pointed claw. In the following pairs of appendages the basal joint is equa in length to the lateral process; the second joint is about twice the length of the first, constricted at the proximal end; the third joint is about the size of the first; the fourth, fifth and sixth joints are nearly equal, the fifth being the smallest; each of them presents two constrictions; the seventh joint is very small, ornamented with a few strong setæ: the eighth joint is rather strongly curved, its palm provided at the base with five or six stout spines, and distally a few small irregular spines; all the joints are ornamented with minute tubercles. The total length of the body and proboscis is an eighth of an inch; of one of the posterior appendages three eighths. This species, which I have found in Port Jackson is rather nearly related to *P. lævis* of Hoeck, but differs from it strongly in the small number of spines on the third pair of appendages, and the presence of the process on the fifth joint, the constrictions on the fourth, fifth and sixth joints of the posterior appendages, etc.

Genus. PHOXICHILIDIUM. Milne-Edwards.

PHOXICHILIDIUM TUBIFERUM. N. sp.

[Plate LVII., figs. 1-5.]

The body is rather elongate, the intersegmental lines indistinct. The first segment constricted produced over the origin of the proboscis. The proboscis is scarcely equal to half of the length of the body, exclusive of the abdomen, notched at the extremity, narrower than the following segments, rather broader at the base than at the apex. The segments of the body have large lateral processes widely separated from one another, and somewhat constricted at the base; those for the seventh pair of appendages rather shorter than those for 4, 5 and 6; the last segment is narrower than the preceding two. The Abdomen is narrower than the last segment of the thorax, rather shorter than the proboscis, cylindrical, a little narrower posteriorly; the posterior extremity notched. The first pair of appendages are very long, extending well beyond the extremity of the proboscis, there are two joints, the first long, cylindrical, rather broader distally than proximally, with about a dozen simple hairs; the second joint scarcely a third of the length of the first, the dactyli slender and acute, crossing at their apices. The third appendage is six jointed, nearly as long as the body and abdomen, slender. The first joint is thicker than the rest but very short; the second is twice as long as the first and rather narrower; the third is more than twice as long as the second and very slender; the fourth is very short, scarcely a fourth of the length of the third, but about the same breadth, slightly curved; the fifth is also slightly curved and is somewhat smaller than the fourth; the sixth is extremely small, scarcely half the length of the fifth. The fourth, fifth, sixth and seventh appendages are very similar to one another. The first joint is short and stout; the second is longer, constricted at the base; the third is very small, not half the length of the second; the fourth is nearly as long as the first three together; the fifth is rather shorter than the fourth and narrower; the sixth is about equal in length to the fifth, but more slender; the seventh is very small; the eighth is scarcely half the length of the sixth; the claw is nearly two-thirds of the length of the eighth joint. There is a whorl of hairs round the distal end of each limb-process and a few scattered hairs on the proximal joints; there is a small process at the distal ends of the fourth, fifth, and sixth joints each bearing one long hair with sometimes a small one at its base; the seventh joint has a small spine and three or four minute hairs on its ventral border; the eighth joint has a well-defined "sole," with a row of twelve (or eleven) curved acute spines; on the projection bounding the palm are three other spines, one large, the others small; between the row of curved spines and the base of the claw is a row of very minute hairs; the second claw is only represented by a rudiment.

The cement glands are placed in the fourth joint of the limbs, and their common duct opens at the end of a very long hair-like process more than a third of the length of the joint itself.

This species was obtained with the dredge in Port Jackson.

Genus. PHOXICHILUS. Latreille.

PHOXICHILUS CHARYBDÆUS. (?) Dohrn.

I am unable to separate a species of *Phoxichilus* obtained at Port Molle from the species above-named, which has hitherto only been obtained in the Mediterranean, except that in my only specimen the third appendages have only three joints instead of seven as in Dohrn's species. This may be owing to the immaturity of the specimen, and I have, therefore, refrained from adding another specific name.

EXPLANATION OF THE PLATES.

PLATE LIV.

Fig. 1.—*Nymphon æquidigitatum*: extremity of one of the first pair of appendages.

Fig. 2.—The same: extremity of second pair of appendages.

Fig. 3.—The same: third pair of appendages.

Fig. 4.—The same: terminal joints of one of the pair of appendages.

Fig. 5.—The same: extremity of the abdomen.
Fig. 6.—Terminal joints of one of the first pair of appendages of *Nymphon validum*.
Fig. 7.—Third pair of appendages of the same.
Fig. 8.—One of the compound setæ of the third pair of appendages of the same.
Fig. 9.—Terminal joints of the fifth pair of appendages of the same.

Plate LV.

Fig. 1.—First pair of appendages of *Nymphopsis armatus*.
Fig. 2.—Second pair of appendages of the same.
Fig. 3.—Extremity of the fifth pair of appendages of the same.
Fig. 4.—Compound spine of one of the posterior appendages of the same.
Fig. 5.—Proboscis and appendage of the first pair of *Ammothea assimilis*.
Fig. 6.—Extremity of one of the appendages of the first pair of the same.
Fig. 7.—Extremity of one of the appendages of the second pair of the same.
Fig. 8.—Terminal joints of one of the posterior appendages of the same.
Fig. 9.—Four basal joints of one of the posterior appendages of the same.

Plate LVI.

Fig. 1.—Proboscis and anterior portion of the body of *Ammothea longicollis*.
Fig. 2.—Abdomen of the same.
Fig. 3.—Extremity of the second pair of appendages of the same.
Fig. 4.—Extremity of one of the posterior appendages of the same.
Fig. 5.—Body, proboscis and anterior appendages of *Colossendeis tenuissima*.
Fig. 6.—Extremity of the second pair of appendages of the same.
Fig. 7.—Extremity of one of the appendages of the third pair of the same.
Fig. 8.—Extremity of one of the posterior appendages of the same.

Plate LVII.

Fig. 1.—Proboscis and anterior appendages of *Phoxichilidium tubiferum*.
Fig. 2.—Base of posterior appendages and abdomen of the same.
Fig. 3.—Extremity of one of the appendages of the third pair of the same.
Fig. 4.—Terminal joints of one of the posterior appendages of the same.
Fig. 5.—Cement gland of the same.
Fig. 6.—Appendage of the first pair of *Pallene pachycheira*.
Fig. 7.—Extremity of one of the appendages of the third pair of the same.
Fig. 8.—Compound setæ of the same appendage.
Fig. 9.—Extremity of one of the posterior appendages of the same.

NOTES ON A FEW AUSTRALIAN EDRIOPHTHALMATA.

By Charles Chilton, M.A.

[Plates XLVI. and XLVII.]

This short paper contains some notes on a few species of Australian Edriophthalmata, collected early in January of this year. Two species are from Coogee Bay, the others were taken from seaweed, &c., growing on the rocks exposed at low tide near the point known as Lady Macquarie's Chair, in Sydney harbour. I also append references to some remarks already published on a few Australian species that I have also taken in New Zealand.

Allorchestes crassicornis. Haswell.

[Plate XLVI., fig. 1.]

Cat. Aust. Crust., p. 223 ; Proc. Linn. Soc., N. S. Wales, IV., p. 252, Pl. VII., fig. 5.

One male and several female specimens were taken on stones in rock-pools at Coogee Bay, in company with *Philougria marina.* The male agrees fairly well with Mr. Haswell's description, but the inferior antennæ are not " very stout ;" the superior antennæ slightly exceed in length the peduncle of the lower, thus agreeing with Mr. Haswell's figure ; in the description he says " superior antennæ exceeding in length the first and second segments of the peduncle of the inferior pair," which must be a mistake since the first three segments of the peduncle of the inferior antennæ are very short in almost all the Amphipoda.

The female of this species does not appear to have been yet described ; it differs from the male chiefly in the form of the second pair of gnathopoda. The first pair of gnathopoda resemble those of the male; the meros is produced inferiorly into a small rounded prominence, which presents a peculiar striated appearance apparently due to rows of very short setæ; the carpus is sub-triangular, much longer than the propodos, the inferior margin is striated like the prominence on the meros, and bears an oblique row of stout setæ; propodos oblong, slightly wider at distal end; postero-distal angle rounded and striated; numerous small setæ scattered about on the inferior margin, and a few also at the base of the dactylos; palm not defined. (See fig. 1, b.) Posterior gnathopoda only slightly larger than the anterior; meros similar to that of preceding gnathopod, but with striated prominence larger, carpus sub-triangular, slightly longer than propodos, bulging out inferiorly and having the integument of this portion striated, a small tuft of three or four setæ near distal end; propodos long ovate narrower at base, infero-distal angle rounded and produced beyond the extremity of the very short dactylos; inferior portion striated and marked off from the rest by a row of very small setæ; a few setæ at base of dactylos.

I propose to give this variety the name of *Coogeensis.*

Allorchestes rupicola. Haswell.

Cat. Aust. Crust., p. 222; Proc. Linn. Soc., N. S. Wales, IV., p. 250, Pl. VIII., fig. 1.

Several specimens from rock-pools about high-water mark, Sydney Harbour, agreeing closely with Mr. Haswell's description.

Glycerina affinis. N. sp.

[Plate XLVII., fig. 1, a, b.]

I have two specimens from Sydney Harbour, of what seems to be a new species of *Glycerina.*

This species closely resembles *G. tenuicornis,* Haswell, in general shape, but differs in the gnathopoda.

In the smaller of my two specimens the first gnathopod has the same general form as that found in *Lysianassa,* but is much slenderer, though scarcely "filiform" The propodos is longer than the carpus and narrows considerably towards the distal end; it bears along nearly the whole of its inferior edge a single row of very short setæ, a few longer ones are scattered over the propodos, carpus and meros, the greater number being found on the carpus. Posterior gnathopoda very long and slender, propodos not so long as carpus, sub-quadrate, nearly three times as long as broad, palm not defined. Both the carpus and propodos bear on their inferior margins, besides a few long setæ of the ordinary kind, a number of densely packed fine straight hairs, similar to those found on the second gnathopoda of some species of *Lysianassa*.

ATYLUS MEGALOPHTHALMUS. Haswell.

Cat. Aust. Crust., p. 244; Proc. Linn. Soc., N. S. Wales, IV., p. 102, Pl. VI., fig. 4.

Numerous specimens from Sydney Harbour. The cephalon is produced between the upper antennæ into a short rostrum about three-fourths as long as the first joint of the peduncle; depth towards the distal end, where it is greatest, about one-third the length, extremity rounded. The telson, which has not yet been described, is oblong, broadest proximally where it is almost as broad as long; postero-lateral angles rounded; cleft for about half its length. It is somewhat curved so that if seen from above without being compressed it may appear narrower than it really is.

ATYLUS LIPPUS. Haswell.

Cat. Aust. Crust., p. 243; Proc. Linn. Soc., N. S. Wales, IV., p. 328, Pl. XX., fig. 1.

Three specimens from Sydney Harbour, taken in company with the preceding species. The antennæ agree closely with the description given in the catalogue, but the eyes appear quite regular, and the telson is rather oblong than triangular, differing from that of the preceding species only in being somewhat narrower.

MŒRA FESTIVA. N. sp.

[See plate XLVI., fig. 2, a. b. c.]

I obtained in Sydney Harbour several specimens of a species of *Mœra* which seems to be new.

The following is a description of my specimens :—

Male.—Superior antennæ about as long as the cephalon and pereion, second segment of the peduncle as long as the first but narrower, third half as long as the second, flagellum considerably longer than the peduncle, secondary appendage of four articuli. Lower antennæ longer than peduncle of upper, flagellum longer than last joint of peduncle.

Anterior gnathopoda small, meros thickly covered on inferior edge with very furry setæ, carpus considerably longer than propodos, inferior edge bordered with many long setæ arranged in short transverse rows, many of the shorter setæ serrated, small tufts of setæ along the centre of the joint and at antero-distal corner a row of stout serrated setæ, the integument near the base of these being thickly covered with short furry setæ similar to those on meros; propodos nearly quadrangular, about twice as long as broad, narrower at base than at distal end, long setæ at base of the dactylos and a few in small scattered tufts over the joint; palm almost transverse, bordered towards the end by 4-5 short serrated setæ like those at end of carpus.

Second gnathopoda large, right and left equal in size, meros produced infero-distally into a short pointed process; carpus subtriangular, short; propodos about four times as long as carpus, quadrangular, greatest breadth about half the length, upper and lower borders nearly straight; palm slightly oblique, defined by a short acute tooth and having a blunt prominence in the centre, bordered with a few stout setæ, whole propodos thickly covered with transverse rows of long fine hairs, chiefly at upper and lower margins but with some also in the centre; carpus having two similar rows on anterior margin and 4-5 densely packed transverse rows of short stouter serrated setæ on posterior margin, two rows of long setæ in centre at base of propodos. Dactylos very short and blunt, truncate at end.

Female.—Differs from the above in having the second gnathopoda much smaller, right and left being equal in size as in the male; carpus three-fourths as long as propodos, subtriangular, thickly covered with transverse rows of setæ on anterior and posterior margins and on centre; propodos ovate, palm oblique, not defined, transverse rows of setæ on both margins; dactylos long, acutely pointed. The first pair of gnathopoda is precisely the same as that of the male.

In all my specimens the terminal pleopoda have been broken off, hence they were probably of large size. In their absence it is impossible to say whether this species is a *Mœra* or a *Melita.*

MŒRA SUB-CARINATA.

MEGAMŒRA SUB-CARINATA. Haswell.

Cat. Aust. Crust., p. 260 ; Proc. Linn. Soc., N. S. Wales, IV., p. 335, Pl. XXI., fig. 4.

MŒRA PETRIEI. G. M. Thompson.

Trans. N. Z. Inst., XIV., p. 236.

Among algæ in Sydney Harbour I took at low water several specimens which on examination proved to be without doubt the same as *Mœra petriei* Thomson, a species fairly common in Lyttelton Harbour, and after a careful comparison of the two descriptions, I have no doubt that this species is the same as *Megamœra sub-carinata*, Haswell. I am by no means sure of the generic impoitance of the differences separating *Megamœra* from *Mœra*, and therefore prefer to place the species under *Mœra* as Mr. Thompson has done.

The only point in which the two descriptions really differ is with regard to the length of the superior antennæ That of *Mœra petriei* is "as long as the body" while that of *Megamœra sub-carinata* is "nearly as long as the cephalon and pereion ;" the length of the superior antenna however, varies in this species as in many others of the Amphipoda.

I have both male and female specimens from Sydney, the females agreeing with the description given by myself in Transactions N. Z. Institute, XV., p. 82. Curiously enough the males agree with those described by Mr. Thomson and differ from my Lyttelton specimens in having the "whole lower surface (of the propodos of the posterior gnathopoda) very densely fringed with two rows of long simple hairs." These hairs which are of the same size throughout their whole length and thus differ from the ordinary setæ found in this genus are quite absent in the Lyttelton specimens. An interesting question thus arises, but must for the present remain unanswered—what is the function of these hairs and why should specimens from Sydney and Stewart Island have them while those from Lyttelton have not ?

AMPHITHOE SETOSA. Haswell.

Cat. Aust. Crust., p. 268; Proc. Linn. Soc., N. S. Wales, IV., p. 270.

A few specimens from Sydney Harbour. One, probably a male specimen, agrees very closely with the description given; the others, presumably females, differ in having the second gnathopoda only as large as the first pair, which they closely resemble except that the carpus is shorter, and they do not bear the long slender hairs found in the male. Both male and female specimens have a very short secondary appendage on the upper antenna.

MICRODEUTEROPUS (1) MORTONI. Haswell.

Cat. Aust. Crust., p. 264; Proc. Linn. Soc., N. S. Wales, IV., p. 339, Pl. XXII., fig. 2.

I have a few specimens of this species from Sydney Harbour. In his description of the anterior gnathopoda Mr. Haswell makes no mention of the long hairs on the various joints. They are, I think, of sufficient importance to be given in the specific description, and so far as my experience goes the general arrangement of them is remarkably constant both in *Microdeuteropus* and many other genera. In this species in the anterior gnathopoda the basos has its anterior margin bordered with a fringe of long hairs, there is a tuft at the antero-distal corner of the ischios, the meros which is slightly hollowed anteriorly for the reception of the carpus has both sides, except towards the end, fringed with long hairs arranged more or less regularly in tufts, the carpus has then on the anterior margin, the propodos on both margins and the dactylos three or four tufts of them on its concave border. The hairs on the basos, ischios, meros and carpus are very delicate and sparsely plumose towards the distal ends only, those on the propodos and dactylos appear to be simple.

MICRODEUTEROPUS TENUIPES. Haswell.

Cat. Aust. Crust., p. 264; Proc. Linn. Soc., N. S. Wales, IV., p. 339, Pl. XXII., fig. 1.

(1). The Rev. T. R. R. Stebbing tells me by letter that "there seems to be a disposition to write *Microdeuteropus* instead of *Microdeutopus* on philological grounds, regarding the latter as merely a casual mis-spelling.'

Along with the preceding species I took a few specimens which I refer without hesitation to *M. tenuipes.* One of my specimens was a mature female, and from its close resemblance to *M. Mortoni* in everything but the anterior gnathopoda, I very much suspect that they are only male and female of the same species. We have a similar case among New Zealand Amphipoda where *M. maculatus,* Thomson, which is certainly a female form, has for male either the form with large anterior gnathopoda which I have described (Transactions New Zealand Institute, Vol. XIV., p. 173), or *Aora typica.* (See Thomson's Trans. N.Z. Inst., Vol. XIII., p. 218.) All three forms are found in Lyttelton Harbour, and though *M. maculatus* ♂, Chilton, and *Aora typica* very closely resemble one another in other respects they differ constantly in the form of the anterior gnathopoda and in the arrangement of the long hairs thereon. Under these circumstances it is a little puzzling to know whether we are dealing with two species of which the males are distinct, but the females almost or quite alike, or with one species having two forms of the males. Until further evidence is forthcoming I prefer to consider the species as distinct. I have a similar instance with *Paranaenia.* For two of the three species, viz., *P. typica* (1), and *P. dentifera* I know only one form of the female, and for the third species *P. longimanus* I have a female form which very closely resembles the female described for *P. typica,* but appears to differ from it in a few small points (2). I have also another instance of the same kind in two undescribed species of *Lysianassa* from Lyttelton Harbour in which the females are almost but not quite identical, but the males considerably different.

If *Microdeuteropus tenuipes* is really the female of *M. Mortoni,* it will be another example of the same thing for it is almost if not quite identical with *M. maculatus* ♀ Thomson, while *M. Mortoni* closely resembles both *M. maculatus* ♂ Chilton and *Aora typica* in everything except the first gnathopoda.

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(1). Possibly *P. typica,* Chilton, is the same as *Moera approximans,* Haswell, a species which I had originally overlooked, but neither the figure nor description is sufficiently detailed to warrant me in actually combining the two species without further evidence.

(2). See "Transactions N.Z. Institute, Vol. XVI., p. 258."

From what has been already said it will be seen that the genera *Aora* and *Microdeuteropus* will have to be combined, I leave this however to be done by some one who may hereafter attempt a re-arrangement of the Amphipoda on a larger scale.

PROTELLA AUSTRALIS. Haswell.

Cat. Aust. Crust., p. 311 ; Proc. Linn. Soc., N. S. Wales, IV., p. 276, Pl. XII., fig. 4.

A single specimen from Sydney Harbour. According to Haswell the form of the posterior gnathopoda varies ; in my specimen the palm has only one tooth, viz., the defining one at the proximal end. The antennæ are scarcely so long relatively to the length of the body as given in the description, the upper one has the flagellum nearly as long as the peduncle and the lower one is slightly longer than the peduncle of upper ; the specimen, however, appears to be a young one and the relative lengths of the antennæ and of the different joints appears to vary considerably at the different stages of growth in these animals.

PHILOUGRIA MARINA. S. Chilton.

I have already described this species, which was taken at Coogee Bay, in a paper communicated to the Linnean Society, N. S. W., on June 25th, 1884.

PARATANAIS IGNOTUS. N. sp.

[Plate XLVII., fig. 2 ; XLVI., fig. 3.]

Cephalon narrowing anteriorly, slightly pointed between the bases of the uppper antennæ which are closely approximated. Antennæ short, inner pair stout, the basal segment about three times as long as the second, third smaller and more slender than the second, succeeded at the end by a minute joint which bears a small tuft of long setæ. Outer antennæ nearly as long as the inner, but more slender, first three joints of the peduncle short ; the second bearing at distal end two stout spines one above and one below, the third bearing a stout spine on upper surface at distal end, last joint smaller than the penultimate, which is as long as the two preceding taken together, and having at the end a small tuft of long setæ. First gnathopoda stout, propodos curved, dactylos with inner margin smooth, fixed finger with a slightly convex inner margin furnished with a few strong hairs and two or three rounded projections. Second thoracic leg long and slender, ischios very short, dactylos very slender, slightly longer than the propodos. Third and fourth thoracic legs similar, stouter than the second, basos long and stout, ischios very short, meros and carpus equal in length and stouter but shorter than the propodos, the last three joints bearing stout spines at their distal ends, inner margin of dactylos smooth. Fifth, sixth and seventh thoracic legs similar to one another and differing slightly from the third and fourth, basos very stout, greatest width half its length, meros and carpus subequal shorter and stouter than the propodos, all three bearing at distal ends stout slightly curved spines, those on propodos at base of dactylos are serrated and are more numerous in the seventh thoracic leg than in preceding, dactylos curved, slender, inner margin *smooth?* Extremity of abdomen truncate but having in centre a small triangular, apparently membranaceous projection which bears two short setæ. Caudal appendages short, inner branch with 5-7 joints, outer very short, one-jointed.

This species appears to resemble *Paratanias tenuis*, G. M Thomson somewhat closely, but I have only one very small specimen of this latter species and I do not feel inclined to base any very positive assertion on the resemblance of the descriptions alone. It is very closely related to *P. tenuicornis*, Haswell, but differs in the presence of the spines on the under surface of the peduncle of the lower antennæ and other minor points

The following five species I have also taken in New Zealand :—

Probolium (1) miersii.

Montagua miersii. Haswell.

Cat. Aust. Crust., p. 226.

Specimens doubtfully referred to this species have been taken at Timaru and at Lyttelton. See Transactions New Zealand Institute, Vol. XV., p. 72.

(1). The Rev. T. R. R. Stebbing informs me that the genus *Montagua* has given place to *Probolium*, Costa. See also Bate's and Westwood's British Sessile-eyed Crustacea. (Appendix), Vol. II., p. 527.

HARMONIA CRASSIPES. Haswell.

Cat. Aust. Crust., p. 251.

Found at Timaru and Lyttelton. Female described. See Trans. N.Z. Institute, Vol. XV., p. 82.

MŒRA SPINOSA. Haswell.

Cat. Aust. Crust., p. 257.

Taken at Auckland. Female described. See Trans. N.Z. Inst., Vol. XV., p. 81.

PARANÆNIA DENTIFERA.

MŒRA DENTIFERA. Haswell.

Cat. Aust. Crust., p. 256.

Taken at Lyttelton and placed in new genus. See Trans. N.Z. Inst., Vol. XVI., p 360.

PODOCERUS LONGIMANUS.

WYVILLEA LONGIMANUS. Haswell.

Cat. Aust. Crust., p. 261.

Taken at Lyttelton and identified with *Podocerus cylindricus*. Kirk (not Say.), and replaced in *Podocerus*. See Trans. N.Z., Inst., Vol. XVI., p. 253.

DESCRIPTION OF PLATE XLVI.

Fig. 1.—*Allorchestes crassicornis*. Var. Coogeensis ♀.
b. First gnathopod, x45; a second gnathopod, x45 of female.
Fig. 2.—*Mœra festiva*. N. sp.
a. First gnathopod of male, x83.
b. Second gnathopod of male, x22½.
c. Second gnathopod of female, x45
Fig. 3.—*Paratanais ignotus*. N. sp.
a. Antennæ, side view, x104.
b. Second thoracicley, x58.

DESCRIPTION OF PLATE XLVII.

Fig. 1.—*Glycerina affinis* sp. nov. (details)
a. Anterior gnathopod, x 58
b. Posterior gnathopod, x 58.
Fig. 2.—*Paratanais tenuicornis*. Haswell. (? or *P. ignotus*, sp. nov) (details)
a. Third thoracic leg, x 90
b. Sixth thoracic leg, x 90
c. Terminal pleopodo (uropoda), x 90.

DESCRIPTIONS OF AUSTRALIAN MICRO-LEPIDOPTERA.

By E. Meyrick, B.A.

XII. Œcophoridæ—*(continued)*.

53. Brachynemata, Meyr.

Head, smooth, sidetufts loosely spreading. Antennæ in ♂ somewhat serrate, shortly ciliated ($\frac{1}{2}$), basal joint with strong pecten. Palpi moderate, second joint not exceeding base of antennæ, densely scaled, rather loosely beneath, terminal joint rather shorter than second, slender, recurved. Thorax smooth. Forewings elongate, hindmargin oblique. Hindwings rather narrower than forewings, elongate-ovate, cilia $\frac{3}{4}$. Abdomen moderate. Posterior tibiæ clothed with long fine hairs above. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Only differs from *Cæsyra* by the shortness of the antennal ciliations, and might perhaps be eventually united with it; the single species nearly resembles the group of *Cæs. ecliptica.*

349. *Brach. cingulata*, n. sp.

Minor, alis ant. dilutius flavis, fascia postica incurvata subtus dilatata fusca; post. dilute griseis.

♂. 13-15 mm. Head and palpi light ochreous yellow. Antennæ fuscous. Thorax purple-fuscous. Abdomen grey, anal tuft ochreous-yellowish. Legs whitish-ochreous, anterior pair fuscous. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin straight, oblique; light ochreous-yellow; costal edge dark fuscous at base; a narrow inwards-curved fuscous fascia from $\frac{2}{3}$ of costa to inner margin before anal angle, dilated beneath: cilia pale brownish-ochreous, on costa and an anal spot pale ochreous-yellow. Hindwings light grey; cilia pale greyish-ochreous.

Duaringa, Queensland; Murrurundi, New South Wales; Mount Lofty, South Australia; five specimens in November.

54. Microbela, Meyr.

Head smooth, sidetufts moderate, spreading. Antennæ of ♂ somewhat serrate, shortly ciliated ($\frac{1}{2}$), basal joint with strong pecten. Palpi short, apex only reaching base of antennæ, second joint slender, loosely scaled beneath, terminal joint about half second, slender, oblique. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings narrower than forewings, ovate-lanceolate, apex somewhat pointed, cilia 1. Abdomen moderate. Posterior tibiæ clothed with very long fine hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle. Hindwings normal.

Intermediate between *Cæsyra* and *Ocystola*; distinguished from the former by the very short palpi, of which the apex does not exceed base of antennæ, from the latter by the short antennal ciliations. The three species are nearly allied together, and approach nearest to the group of *Cæs. amylodes*.

1a. Cilia of forewing yellow .. ..352. *monodyas*.
1b. " " " grey.
2a. Forewings with a dark grey triangular
anal spot.....................................350. *epicona*.
2b. Forewings without anal spot ....351. *allocoma*.

350. *Micr. epicona*, n. sp.

Minor, alis ant. ochreo-flavis, triangulo anguli analis strigaque apicis marginali saturate griseis, nigro-mixtis; post. griseis.

♂ ♀. 13-19 mm. Head and palpi yellow, base of second joint dark fuscous Antennæ grey. Thorax dark fuscous, terminal half of patagia and a posterior spot on each side of back yellow. Abdomen and legs dark grey. Forewings elongate, costa slightly arched, apex round-pointed, hindmargin very obliquely rounded; ochreous-yellow or deep yellow; costal edge dark grey at base; an erect triangular dark grey spot, mixed with black, on inner margin just before anal angle, reaching half across wing; a dark grey streak, mixed with black, from apex along hindmargin to middle, attenuated downwards: cilia dark grey. Hindwings and cilia grey.

Petersburg and Ardrossan, South Australia; common in October and November.

351. *Micr. allocoma*, n. sp.

Minor, alis ant. ochreo-flavis, interdum linea marginis postici incerta nigra, ciliis griseis; post. griseis.

♂ ♀. 15-18 mm. Head and thorax yellow, collar dark grey. Palpi yellow-whitish, second joint suffused with dark grey. Antennæ, abdomen, and legs dark grey. Forewings elongate, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; ochreous-yellow; costal edge dark grey near base; a grey line, anteriorly edged with scattered black scales, along hindmargin from apex to anal angle: cilia grey. Hindwings and cilia grey.

var. a. Hindmarginal line and black scales obsolete.

Murrurundi, Bathurst, and Blackheath (3400 feet), New South Wales; Melbourne, Victoria; common in October and November.

The form described as typical is that found alone at Blackheath; in the other localities the variety is the only form occurring. Except for this localisation the variety would not have required special notice, as the difference is very slight, and traces of the black hindmarginal scales are sometimes perceptible.

352. *Micr. monodyas*, n. sp.

Minor, alis ant. dilutius ochreo-flavis, etiam ciliis ; post. dilutius griseis.

♂ ♀. 13-15 mm. Head and thorax light ochreous-yellow, collar obscurely grey. Palpi whitish-yellow, second joint grey. Antennæ whitish-grey. Abdomen and legs grey, anal tuft and posterior legs whitish-ochreous. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin extremely obliquely rounded ; light ochreous-yellow ; costal edge dark fuscous towards base : cilia light ochreous-yellow. Hindwings and cilia light grey.

Toowoomba, Queensland ; rather common in September.

55. Heterozyga, Meyr.

Head smooth, sidetufts rather small, spreading. Antennæ in ♂ somewhat serrate, moderately ciliated (1), basal joint with strong pecten. Palpi moderate, second joint not exceeding base of antennæ, densely scaled, somewhat loosely beneath, terminal joint rather shorter than second, slender, recurved. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings somewhat narrower than forewings, elongate-ovate, apex round-pointed, cilia 1. Abdomen moderate. Posterior tibiæ clothed with long dense hairs. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell, 3 and 4 closely approximated or short-stalked. Hindwings normal.

Differs from all other *Œcophoridæ* in the close basal approximation or short stalking of veins 3 and 4 of the forewings ; in other characters the genus closely approaches *Cœsyra*, of which it is probably an offshoot, being apparently related especially to the last group of that genus. I have examined the neuration of several ♂'s of the single species, and in all veins 3 and 4 originated on a short stalk or at least from the same point ; and of one ♀, in which these veins were closely approximated at base but not from the same point.

353. *Het. coppatias*, n. sp.

Minor, alis ant. griseis, partim cano-suffusis, punctis disci anticis duobus nigris, fascia postica angusta nigro-bipunctata lineaque subterminali saturatioribus; post. dilutius griseis.

♂ ♀. 13-14 mm. Head, palpi, and thorax white mixed with dark grey; second joint of palpi with a dark grey subapical band. Antennæ white, annulated with dark grey. Abdomen grey. Legs dark grey, apex of joints whitish, posterior tibiæ pale greyish-ochreous. Forewings elongate, narrow, costa gently arched, apex tolerably acute, hindmargin extremely obliquely rounded; grey, suffused with white, and irrorated with dark grey; a black dot in disc before middle, and a second much larger one slightly beyond it on fold; two black dots transversely placed and sometimes confluent in disc beyond middle, placed on a narrow dark grey fascia from $\frac{2}{3}$ of costa to anal angle; a cloudy dark grey line from costa near apex to anal angle; a row of very ill-defined dark grey spots on hindmargin: cilia white, irrorated with grey. Hindwings light grey; cilia whitish-grey.

The posterior markings are sometimes very indistinct, but the two anterior dots are always very conspicuous.

Murrurundi and Bathurst, New South Wales; Adelaide, South Australia; tolerably common in October and November.

56. Oxythecta, Meyr.

Head loosely haired, sidetufts rather large, rough, spreading. Antennæ in ♂ strongly ciliated ($2\frac{1}{2}$-3), basal joint rather stout, with strong pecten. Palpi moderate, second joint not exceeding base of antennæ, densely scaled, dilated beyond middle, somewhat rough beneath, terminal joint rather shorter than second, rather stout, recurved. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings slightly narrower than forewings, elongate-ovate, apex round-pointed, cilia $\frac{4}{5}$ to 1. Abdomen moderate. Posterior tibiæ clothed with extremely long fine dense hairs. Forewings with vein 7 to hindmargin, 2 almost from angle of cell, upper basal fork of 1 obsolete except at origin Hindwings normal.

Characterised by the obsolescence of the upper basal fork of vein 1 of the forewings; apparently most related to *Ocystola*, and perhaps a development of it. In the analytical tabulation *Oxythecta* is erroneously included under 7b; it should be transferred to 7a, and will be separated from 12b (*Peltophora*) by the neural character above-mentioned. The six known species form a closely-allied group; all vary considerably in size, whence I suspect that the larvæ may be wood-feeders.

1a. Ante-median fascia entire ....354. *alternella.*
1b. ,, ,, ,, not reaching inner margin.
2a. With a short streak from base along inner margin ....359. *acceptella.*
2b. Without dorsal streak.
3a. Basal fascia entire... ....357. *zonoteles.*
3b. ,, ,, reduced to a costal spot.
4a. Centre of thorax wholly grey...... ....355. *nephelonota.*
4b. ,, ,, ,, white
5a. Ante-median fascia interrupted beneath costa...356. *hieroglyphica.*
5b. Ante-median fascia not interrupted ....358. *lygrosema.*

354. *Ox. alternella*, Walk.

(*Œcophora alternella*, Walk., Brit. Mus. Cat. 682.)

Media, alis ant. niveis, macula costæ basali nigra, fascia antica obliqua integra inferius furcata maculaque postica magna cum costa quater connexa saturate fuscis; post. albido-griseis.

♂ ♀. 16-23 mm. Head and palpi white, lower $\frac{2}{3}$ of second joint dark fuscous. Antennæ whitish. Thorax white, anterior half blackish. Abdomen pale yellow-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, hindmargin nearly straight, very oblique; snow-white, with dark fuscous markings; a subquadrate blackish spot on base of costa; a narrow fascia from $\frac{2}{5}$ of costa to $\frac{1}{3}$ of inner margin, triangularly dilated on lower third; an irregular streak from middle of this fascia to $\frac{2}{3}$ of inner margin; a small round spot in disc beyond middle, connected with costa by a perpendicular bar, and nearly confluent with a large irregular blotch immediately following, which touches anal angle, and sends from its upper angle a three-branched streak to costa before apex; a curved interrupted line immediately before hindmargin: cilia white, with a cloudy central light grey shade, on costa dark fuscous. Hindwings whitish-grey, ochreous-tinged; cilia pale yellowish-ochreous

Easily recognised by the blackish anterior half of thorax, entire anterior fascia, and more complex posterior markings.

Sydney, Blackheath (3500 feet), and Mittagong (2000 feet), New South Wales; Melbourne, Victoria; Hobart, Tasmania; from August to March, generally distributed but never very common.

355. *Ox. nephelonota*, n. sp.

Media, alis ant. canis, dimidio dorsali griseo, macula costæ basali, fascia antica obliqua dorsum non attingente, altera postica directa maculisque costæ duabus posticis saturate fuscis; post. griseis; thorace medio griseo.

♀. 15-22 mm. Head white, face and crown greyish-tinged. Palpi white, lower $\frac{2}{3}$ of second joint dark grey. Antennæ grey-whitish. Thorax grey, patagia and a posterior spot white mixed with grey. Abdomen whitish-ochreous. Legs dark fuscous, apex of joints white, posterior pair whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, hind-margin almost straight, extremely oblique; white, somewhat sprinkled with greyish-fuscous, and dorsal half wholly light greyish-fuscous, separation irregular; markings dark fuscous; a small rounded spot at base of costa, reaching half across wing; a rather narrow inwardly oblique fascia from costa before middle, not reaching inner margin, sometimes very slenderly interrupted below costa; sometimes a dot in disc above middle; a moderate fascia from costa beyond middle towards anal angle, beneath dilated and lost in the dorsal suffusion; two quadrate spots on costa between this and apex; a row of very ill-defined confluent spots before hindmargin: cilia white, with a cloudy central pale grey shade. Hindwings grey; cilia whitish-ochreous-grey.

Closely allied to the two following, from which it is distinguished by the grey thorax, grey dorsal suffusion of the forewings, and darker hindwings; it differs further from *O. zonoteles* by the basal costal spot not being produced to inner margin, and from *O. hieroglyphica* by the anterior fascia being only slightly or not interrupted beneath costa.

Launceston and Deloraine, Tasmania; from November to January, three specimens.

356. *Ox. hieroglyphica*, n. sp.

Minor, alis ant. canis, macula costæ basali, fascia antica obliqua sub costa interrupta, dorsum non attingente, macula dorsi postica parva, fascia postica directa sub costa interrupta, maculisque costæ duabus posticis saturatius fuscis; post. albido-griseis.

♂ ♀. 12-18 mm. Head and palpi white, apex of terminal joint, and second joint except apex dark fuscous. Antennæ whitish. Thorax white, with a dark fuscous spot on shoulder. Abdomen whitish-ochreous, in ♀ more yellowish. Legs dark fuscous, apex of joints whitish, posterior pair whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex tolerably acute, hind-margin straight, extremely oblique; white, with scattered fuscous scales, sometimes partially suffused with pale greyish; markings ochreous-fuscous or dark fuscous; a rounded spot on base of costa, reaching half across wing; a small oblong spot on costa before middle, and three similar spots between this and apex; an oblique fascia-like spot in disc before middle, not reaching costal spot or inner margin; a small spot on inner margin before anal angle; a narrow fascia from beneath postmedian costal spot to anal angle; a row of small confluent spots close before hind-margin; cilia ochreous-whitish, with a cloudy central pale greyish shade. Hind-wings whitish-grey, ochreous-tinged; cilia pale whitish-ochreous.

Separated from *O. nephelonota* by the white thorax and pale hind-wings, from *O. zonoteles* by the basal costal spot not produced to inner margin, from both by the conspicuous subcostal interruption of the anterior fascia.

Toowoomba (2000 feet), Queensland; Murrurundi, Newcastle, Sydney, and Bathurst (2000 feet), New South Wales; Port Lincoln, South Australia; common from August to November and in March, usually amongst *Acacia*.

357. *Ox. zonoteles*, n. sp.

Minor, alis ant. canis, fascia basali integra, altera antica obliqua dorsum non attingente, macula dorsi postica transversa, fascia postica directa sub costa interrupta maculisque costæ duabus posticis saturate fuscis; post. albido-griseis.

♂ 12-18 mm. Head and palpi white, apex of terminal joint, and second joint except apex dark fuscous. Antennæ whitish. Thorax white, anterior margin irregularly dark fuscous. Abdomen whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, narrow, costa moderately arched, apex tolerably acute, hind-margin straight, extremely oblique; white, with a few scattered dark fuscous scales; markings dark fuscous; a rather narrow entire basal fascia; a narrow inwardly oblique fascia from costa before middle, not reaching inner margin; a transverse spot on inner margin before anal angle, nearly reaching middle; three quadrate spots on costa between middle and apex; from beneath first of these a narrow fascia to anal angle; a row of small confluent spots immediately before hind-margin: cilia ochreous-whitish, with a cloudy central pale greyish shade. Hind-wings whitish-grey, ochreous-tinged; cilia pale whitish-ochreous.

Differs from all the other species by the entire basal fascia.

Sydney and Blackheath (3500 feet), New South Wales, in October and March; five specimens.

358. *Ox. lygrosema*, n. sp.

Minor, alis ant. niveis, macula costæ basali, fascia antica obliqua dorsum non attingente, macula dorsi postica, fascia e costa anteapicali in disco recte angulata in angulum analem percurrente saturatius ochreo-fuscis; post. dilute griseis.

♂. 14-15 mm. Head white, face fuscous. Palpi white, apex of terminal joint, and second joint except apex dark fuscous. Antennæ whitish-grey. Thorax white, anterior margin broadly blackish. Abdomen whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, narrow, costa moderately arched, apex tolerably acute, hind-margin extremely obliquely rounded; white, with scattered ochreous-fuscous scales; markings rather dark ochreous-fuscous; a small cuneiform spot along base of costa; a narrow inwardly oblique fascia from before middle of costa, not reaching inner magin; a dot on costa beyond middle; a small triangular spot on inner margin before anal angle; a rather strong streak from costa before apex to disc beyond middle, thence rectangularly bent and continued to anal angle; some indistinct dots before hind-margin: cilia whitish, with a cloudy central pale greyish shade, on costa dark fuscous. Hindwings pale grey, ochreous-tinged; cilia whitish ochreous.

Closely resembling the following, but immediately distinguished by the broadly black anterior margin of thorax, and absence of basal streak on inner margin.

Toowoomba (2000 feet), Queensland, in September; Blackheath (3500 feet), New South Wales, in November; two specimens.

359. *Ox. acceptella*, Walk.

(*Oecophora acceptella*, Walk., Brit. Mus. Cat. 694; *Oecophora connexella*, ib. 695; ? *Cryptolechia abstersella*, ib. 762.)

Minor, alis ant. niveis, strigula dorsi basali, fascia antica obliqua dorsum non attingente, macula dorsi postica transversa, fascia e costa anteapicali in disco recte angulata in angulum analem percurrente læte ochreis ferrugineisve; post. dilute griseis.

♂ ♀. 13-20 mm. Head white, face beneath and collar ochreous. Palpi white, second joint yellow-ochreous or ochreous-brown except apex. Antennæ ochreous or fuscous. Thorax white. Abdomen light yellow-ochreous. Legs brownish-ochreous, posterior pair yellow-ochreous. Forewings elongate, narrow, costa gently arched, apex tolerably acute, hindmargin somewhat sinuate, extremely oblique; snow-white, with ochreous-orange or ferruginous markings; a short streak from base of costa along inner margin to $\frac{1}{4}$; a narrow fascia, very oblique inwardly, from middle of costa, not reaching inner margin; a short irregular inwardly oblique streak from inner margin before anal angle, not reaching middle; two small dots on costa between middle and apex; a moderate streak from costa before apex to disc beyond middle, thence rectangularly bent and continued to anal angle; a row of small confluent spots before hindmargin: cilia white or ochreous-white, above apex fuscous. Hindwings pale grey, ochreous-tinged; cilia light yellow-ochreous.

Differs from all by the short basal dorsal streak and brighter markings.

Brisbane and Toowoomba (2000 feet), Queensland; Newcastle, Sydney, Bathurst (2000 feet), and Mittagong (2000 feet), New South Wales; Melbourne, Victoria; common from September to April, and in July, apparently attached to *Acacia*.

I have quoted *Cryptolechia abstersella*, Walk., among the synonyms of this species, but it would have been impossible to employ the name for this or any species; Walker appears in this instance to have attained a maximum of confusion. It will be apparent to anyone who will compare Walker's Latin diagnosis with his English description that they must have been drawn from totally different insects, without a particle of resemblance to each other; and an examination of the Museum types will further show that neither the diagnosis nor the description can be intended to refer to them. The Latin diagnosis is certainly unindentifiable with any species known to me, and probably insufficient and erroneous, and may be disregarded; the English description undoubtedly refers to the species described above, for which reason I have quoted it as a synonym; the types belong to a species to be described hereinafter as *Piloprepes aristocratica.*

57. Crepidosceles, Meyr.

Head smooth, sidetufts moderate, loosely appressed. Antennæ in ♂ somewhat serrate, with long ciliations (3), basal joint with strong pecten. Palpi moderate, second joint not exceeding base of antennæ, with appressed scales, smooth beneath, towards apex loosely scaled, terminal joint shorter than second, slender, recurved. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings rather narrow than forewings, ovate-lanceolate, apex almost acute, cilia $\frac{4}{5}$. Abdomen moderate. Anterior tibiæ and tarsi strongly dilated with dense scales; posterior tibiæ clothed with long fine hairs above. Forewings with vein 7 to hindmargin, 2 from somewhat before angle of cell. Hindwings normal.

Closely allied to *Ocystola*, from which it differs principally by the strongly dilated anterior tibiæ and tarsi. Although nearly approaching *Lepidotarsa* in structure, I do not consider that there is any direct affinity with that genus; the best character for separation appears to lie in the terminal joint of the palpi, which in *Crepidosceles* is moderately slender and not much shorter than the second joint, whilst in *Lepidotarsa* it is very fine and hardly more than half the second; this distinction should be inserted in place of that given in the analytical table, which is inaccurate.

1a. With a dark fuscous costal streak..........361. *exanthema.*
1b. Without costal streak............ ....360. *iostephana.*

360. *Crep. iostephana*, n.sp.

Minor, alis ant. flavis, strigula dorsi basali e costa oriente saturate purpureo-fusca, fasciis tribus posticis angustis purpureis prima costam non attingente, tertia marginali; post griseis.

♂. 14 mm. Head pale ochreous-yellow, crown dark fuscous. Palpi ochreous-whitish, apex of second joint dark fuscous.

Antennæ ochreous-whitish. Thorax yellow, with a small posterior purple-fuscous spot. Abdomen grey. Legs whitish-ochreous, anterior pair suffused with dark fuscous. Forewings elongate, costa moderately arched, apex tolerably acute, hindmargin straight, very oblique; bright yellow; a thick dark purple-fuscous streak from base of costa along inner margin to $\frac{1}{3}$; an erect pale crimson-purple streak from inner margin before anal angle, dilated and suffused with dark fuscous beneath, reaching $\frac{2}{3}$ across wing; an outwards-curved narrow pale crimson-purple fascia from $\frac{3}{4}$ of costa to anal angle, and a similar fascia, irrorated with deep purple, along apical part of costa and hindmargin to anal angle: cilia yellow, on anal angle broadly light purple irrorated with dark fuscous. Hindwings grey; cilia light grey.

Brisbane, Queensland; one specimen from *Eucalyptus* in September.

361. *Crep. exanthema*, n. sp.

Media, alis ant. flavis, striga costæ, strigula dorsi basali, fasciaque marginis postici latiore saturate purpureo-fuscis; post subfulvis.

♂. 19 mm. Head light yellow. Palpi whitish-yellow, second joint suffused with dark fuscous except towards base. Antennæ pale fuscous. Thorax light yellow, apex of patagia and a posterior spot dark purple-fuscous. Abdomen fuscous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin faintly sinuate, rather strongly oblique; rather light ochreous-yellow; markings dark fuscous, slightly purple-tinged; a narrow streak along costa from base to $\frac{2}{3}$; a thick streak along basal third of inner margin; a moderate hind-marginal band, inner edge rather convex, extending from near before anal angle: cilia greyish-fuscous, becoming purplish-tinged towards base. Hindwings ochreous-fuscous; cilia lighter fuscous.

Quorn, South Australia; one specimen in October.

58. Ocystola, n. g

Head smooth, side-tufts moderate, loose. Antennæ in ♂ with long ciliations ($2\frac{1}{2}$-8) basal joint with strong pecten. Palpi rather short, second joint not reaching or rarely slightly exceeding base of antennæ, with appressed scales, somewhat loose beneath towards apex, terminal joint shorter or much shorter than second, moderately slender, oblique or curved. Thorax smooth. Forewings elongate, hindmargin very oblique. Hindwings narrower than forewings, from elongate-ovate to narrow-lanceolate, cilia 1 to 3. Abdomen moderate. Posterior tibiæ clothed with moderate or very long hairs above. Forewings with vein 7 to hind margin, 2 from before angle of cell. Hindwings with veins 3 and 4 sometimes more or less remote at origin, sometimes from a point, rarely stalked.

Although showing considerable variation in some characters of structure, this genus is undoubtedly natural, and easily recognised by the short palpi and long antennal ciliations, the former character separating it from *Peltophora*, and the latter from *Coesyra*, of which it appears to be a development. The hindwings are sometimes hyaline, and vary much in form, but the differences are of specific value only. The variation in the origin of veins 3 and 4 of the hindwings is in general here unreliable, though occasionally of specific value; usually individuals and sexes of the same species differ in this respect, the ♀ tending to have these veins more remote than in the ♂. The relative length of the joints of the palpi also differ with the species.

This genus was accidentally omitted from the analytical tabulation; it should be placed under the same head with *Peltophora*, and distinguished from it by the second joint of the palpi (usually) not reaching base of antennæ, in conjunction with the usually lanceolate hindwings.

Larvae 16-legged, of various habits, feeding in portable cases or between joined leaves; those known are all attached to species of *Eucalyptus*.

The genus is not known outside Australia.

1a. Ground colour of forewings white
2a. Veins lined with ochreous....................398. *neurota.*
2b. Veins not lined.
3a. Without markings except a dorsal suffusion.
4a. Thorax grey ....387. *monostropha.*
4b. Thorax white... ....388. *homoleuca.*
3b. With defined darker markings.
4a. With a streak along inner margin.
5a. With a streak along hind margin.
6a. With an entire median fascia .... .392. *paulinella.*
6b. Without median fascia ....391. *crystallina.*
5b. Without hind-marginal streak ... .389. *chionea.*
4b. Without dorsal streak.
5a. Without transverse fascia....................390. *glacialis.*
5b. With one or more fasciæ.
6a. Fascia linear ....393. *suppressella*
6b. Fascia moderately broad.
7a. With two entire fasciæ.......................395. *niphodesma.*
7b. With only one entire fascia.
8a. Thorax dark fuscous..... .... 396. *trilicella.*
8b. Thorax white.
9a. Hindwings light grey ....394. *diclethra.*
9b. Hindwings ochreous-whitish.................397. *thalamepola.*
1b. Ground colour of forewings not white.
2a. Costa white or paler than ground colour.
3a. With dark discal dots.
4a. Hindwings pale yellow-ochreous ....372. *callista.*
4b. Hindwings greyish.
5a. Head whitish....... ... .374. *enoplia.*
5b. Head brownish-ochreous ....378. *milichia.*
3b. Without discal dots ....387. *lithophanes.*
2b. Costa not paler.
3a. Hindwings hyaline or semihyaline towards base.
4a. Forewings yellow.
5a. With a broad posterior purplish fascia.
6a. Fascia terminal ....365. *thiasotis.*

6b. Fascia not terminal ....364. *gnomica.*
5b. Without broad fascia .... 367. *oxytora.*
4b. Forewings ochreous.
5a. With an erect dark spot on anal angle ...366. *hemisema.*
5b. Without anal spot................. ....377. *psamathina.*
3b. Hindwings evenly scaled.
4a. Hindwings dark fuscous.
5a. Anterior half of costa dark fuscous.
6a. Posterior edge of yellow area straight ......381. *placoxantha.*
6b. ,, ,, ,, ,, concave.
7a. Median fascia on inner margin at $\frac{3}{5}$ ....362. *hemicalypta.*
7b. ,, ,, ,, ,, ,, at $\frac{3}{4}$.. ......363. *thymodes.*
5b. Anterior half of costa not dark fuscous.
6a. With entire dark median fascia.
7a. Posterior area wholly fuscous ....382. *mesoxantha.*
7b. ,, ,, partly yellow.. ....380. *euanthes*
6b. Without entire median fascia ....383. *pyramis.*
4b. Hindwings not dark fuscous.
5a. Hindwings more or less ochreous or whitish.
6a. Cilia of forewings yellow.
7a. Hindmarginal edge dark purplish.
8a. Thorax grey........ ....373. *tyranna.*
8b. ,, ochreous-whitish ....371. *anthera.*
7b. Hindmargin not purplish ... .368. *malacella.*
6b. Cilia of forewings not yellow.................375. *coniata.*
5b. Hindwings grey.
6a. Forewings with dark discal dots.
7a. Forewings light yellowish....... ....379. *protosticha.*
7b. ,, not light yellowish.
8a. Cilia of forewings yellow.
9a. Forewings mixed with yellow ....369. *isarithma.*
9b. ,, not mixed with yellow...........370. *acroxantha.*
8b. Cilia of forewings not yellow ....376. *ayelaea.*
7a. Inner margin of forewings suffused with fuscous ....385. *illuta.*
7b. Inner margin of forewings not suffused with fuscous ....384. *acrobaphes.*

362. *Ocyst. hemicalypta*, n.sp.

Minor, alis ant. flavis, striga costæ e dorsi basi oriente fasciaque marginis postici latissima saturate purpureo-fuscis; post. saturate fuscis.

♂. 15 mm. Head and palpi ochreous-yellow, anterior edge of terminal joint dark fuscous, terminal joint half as long as second. Antennæ, thorax, abdomen, and legs dark fuscous; antennal ciliations $2\frac{1}{2}$: thorax purple-tinged; posterior legs whitish-ochreous, base of tarsal joints dark fuscous. Forewings elongate, costa moderately arched, apex acute, hindmargin sinuate, very oblique; yellow; a dark purple fuscous streak from base of inner margin along costa to beyond middle, posteriorly finely attenuated; a very broad dull purplish hindmarginal band, irrorated with fuscous, bounded anteriorly by a narrow inwards-curved dark fuscous fascia from $\frac{3}{5}$ of costa to $\frac{3}{5}$ of inner margin: cilia rather dark fuscous. Hindwings ovate-lanceolate, tolerably acute, veins 3 and 4 somewhat remote; dark fuscous; cilia dark fuscous.

Melbourne, Victoria; one specimen received from Mr. G. H. Raynor.

363. *Ocyst. thymodes*, n.sp.

Minor, alis ant. flavis, striga costæ angusta e dorsi basi oriente fasciaque postica incurvata saturate fuscis, area postica purpureo-mixta griseo-marginata; post. saturate fuscis.

♂. 15 mm. Head and palpi ochreous-yellow, anterior edge of terminal joint dark fuscous, terminal joint half second. Antennæ, thorax, abdomen, and legs dark fuscous; antennal ciliations $2\frac{1}{2}$; thorax purple-tinged; posterior legs pale ochreous-yellowish, base of tarsal joints dark fuscous. Forewings elongate, costa moderately arched, apex acute, hindmargin sinuate, very oblique; yellow; a very slender dark fuscous streak from base of inner margin along costa to beyond middle, finely attenuated; a moderate rather dark fuscous inwards-curved fascia from $\frac{2}{3}$ of costa to $\frac{3}{4}$ of inner margin, beyond which the apical space is irrorated with purple-reddish, and suffused on margins with rather dark fuscous: cilia rather dark fuscous, tips paler and more ochreous. Hindwings ovate-lanceolate, round-pointed, veins 3 and 4 somewhat remote; dark fuscous; cilia dark fuscous.

Closely allied to the preceding, but with the costal streak more slender, the fascia nearer hindmargin, and the posterior space not wholly dark.

Quorn, South Australia; one specimen in October.

364. *Ocyst. gnomica*, n. sp.

Parva, alis ant. dilute flavis, linea costæ saturate fusca, fascia postica latiore strigulaque marginis postici dilute purpureis fusco-marginatis; post. griseis, basim versus vitreis.

♂. 10 mm. Head and palpi pale whitish-yellow, terminal joint half second. Antennæ whitish, ciliations 3. Thorax grey, patagia pale whitish-yellow. Abdomen light grey. Legs whitish-yellowish, anterior pair fuscous. Forewings elongate, narrow, costa posteriorly moderately arched, apex acute, hindmargin sinuate, extremely oblique; pale ochreous-yellow: a linear dark fuscous streak along anterior half of costa, posteriorly attenuated; a broad pale reddish-purple fascia from $\frac{2}{3}$ of costa to inner margin before anal angle, margin broadly irrorated with dark fuscous; a pale purple streak, irrorated with dark fuscous, from apex along upper half of hindmargin: cilia light ochreous. Hindwings narrow-lanceolate, acute, veins 3 and 4 somewhat remote; grey, towards base hyaline; cilia light grey.

Sydney, New South Wales; one specimen in December.

365. *Ocyst. thiasotis*, n. sp.

Minor, alis ant. flavis, fascia marginis postici lata purpurea saturate griseo-marginata; post. griseis, ♂ basim versus vitreis.

♂ ♀. 10-14 mm. Head yellow, back of crown dark fuscous. Palpi yellow, lower half of second joint dark fuscous, terminal joint $\frac{4}{5}$ of second. Antennæ dark fuscous, ciliations 5. Thorax yellow, Abdomen grey, segmental margins whitish-ochreous. Legs deep greyish-purple, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded ; bright yellow ; base of costa slenderly dark fuscous ; a broad purple hindmarginal band, suffused with dark grey on margins, anterior edge convex, extending from $\frac{3}{4}$ of costa to $\frac{3}{4}$ of inner margin : cilia ochreous-yellow, with a dark purple-grey spot above apex, beneath middle of hindmargin wholly light purplish-grey, becoming purple at base. Hindwings broadly lanceolate, tolerably acute, veins 3 and 4 from a point or slightly remote ; grey, basal half in ♂ semi-hyaline ; cilia light grey.

Sydney, New South Wales ; seven specimens taken on a fence beneath *Eucalyptus* trees, from August to November.

366. *Ocyst. hemisema*, n. sp.

Minor, alis ant. dilute ochreis, strigula costae basali, macula anguli analis transversa, striga marginis postici, saepius etiam puncto plicæ saturate fuscis ; post. ♂ vitreis, ♀ saturatius griseis.

♂ ♀. 11-16 mm. Head, palpi, and thorax pale yellowish-ochreous, second joint of palpi dark fuscous, terminal joint $\frac{4}{5}$ of second. Antennæ light grey, ciliations 3. Abdomen light grey. Legs dark grey, apex of joints and posterior pair whitish-ochreous. Forewings elongate, narrow, costa hardly arched, apex tolerably acute, hindmargin slightly sinuate, very oblique; light yellow-ochreous, with dark fuscous markings; a narrow streak along basal third of costa ; a round dot on submedian fold below middle of disc, sometimes absent ; an erect spot on anal angle, reaching half across wing, constricted beneath its apex ; a thick streak from apex along hindmargin to below middle, attenuated beneath : cilia whitish-ochreous, with a dark fuscous spot above apex, beneath middle more or less grey, becoming purplish at base. Hindwings broadly lanceolate, acute, veins 3 and 4 short-stalked ; in ♂ wholly hyaline, with dark grey veins ; in ♀ rather dark grey, towards base hyaline ; cilia light grey.

The wholly hyaline hindwings of the ♂, and the stalking of veins 3 and 4 in both sexes are special characteristics of this species, which is nearly allied to the following.

Sydney, New South Wales; Mount Lofty, South Australia; five specimens in October.

367. *Ocyst. oxytora*, n. sp.

Parva, alis ant. flavis, strigula costæ basali, puncto disci postico, strigaque marginis postici saturatius fuscis; post. dilute griseis, basim versus vitreis.

♂♀. 11-13 mm. Head and thorax ochreous-yellow. Palpi with second joint whitish, towards apex externally dark grey, terminal joint yellowish, $\frac{2}{3}$ of second. Antennæ grey, basal joint whitish, ciliations 3. Abdomen whitish-ochreous. Legs dark grey, apex of joints and posterior pair whitish-ochreous. Forewings elongate, narrow, costa hardly arched, apex tolerably acute, hind-margin somewhat sinuate, extremely oblique; ochreous-yellow, with cloudy rather dark fuscous markings; a line along basal third of costa; a round dot in disc at $\frac{2}{3}$; a streak along hind-margin from apex to anal angle: cilia ochreous-yellow, becoming greyish-tinged towards anal angle. Hindwings broadly lanceolate, acute, veins 3 and 4 from a point, grey, towards base semihyaline, in ♂ rather more widely; cilia whitish-grey, slightly yellowish-tinged.

Brisbane, Queensland; Sydney and Bulli, New South Wales; in September, October, February, and March, rather common.

368. *Ocyst. malacella*, n. sp.

Minor, alis ant. flavis, puncto disci postico, interdum cum marginibus connexo, strigulaque marginis postici ochreis, saepius partim obsoletis; post. ochreo-albidis.

♂♀. 12-14 mm. Head, palpi, and thorax light yellow, terminal joint of palpi $\frac{2}{3}$ of second. Antennæ grey-whitish, ciliations 5. Abdomen pale whitish-ochreous. Legs whitish-ochreous, anterior pair dark fuscous. Forewings elongate, rather narrow, costa moderately arched, apex round-pointed, hindmargin extremely obliquely rounded; bright yellow; a dot in disc beyond middle, sometimes connected by obscure bars with costa and anal angle, and a suffused streak along hindmargin light brownish-ochreous, but these markings are eften more or less obsolete; cilia yellow. Hindwings ovate lanceolate, round-pointed, veins 3 and 4 from a point or slightly remote; ochreous-whitish; cilia pale whitish-ochreous.

Sydney, New South Wales; Fernshaw, Victoria; Launceston and Hobart, Tasmania; common from September to November, and in January.

369. *Ocyst. isarithma*, n. sp.

Minor, alis ant. ochreis, partim luteo-mixtis, punctis disci tribus majusculis, macula anguli analis, strigaque marginis postici saturatius fuscis; post. griseis.

♀. 14-15 mm. Head, palpi, and thorax light brownish-ochreous, somewhat mixed with fuscous and yellowish; terminal joints of palpi $\frac{3}{4}$ of second Antennæ ochreous-whitish Abdomen and legs whitish-ochreous, anterior pair dark fuscous. Forewings elongate, tolerably narrow, costa moderately arched, apex round-pointed, hindmargin somewhat sinuate, extremely oblique; brownish-ochreous, somewhat mixed with yellow in disc and towards inner margin; a small roundish dark fuscous spot in disc at $\frac{1}{3}$, a second obliquely beyond it on fold, and a third in disc beyond middle; a fuscous erect spot on anal angle; a cloudy fuscous streak along hindmargin from apex nearly to anal angle: cilia ochreous-yellowish. Hindwings ovate-lanceolate, round-pointed, veins 3 and 4 from a point or somewhat remote; grey; cilia whitish-grey.

Mount Wellington (2500 feet), Tasmania; two specimens in January and February.

370. *Ocyst. acroxantha*, n.sp.

Minor, alis ant. rufescentibus, punctis disci tribus strigaque marginis postici purpureo-tincta obscure saturatioribus, ciliis flavis; post. griseis.

♂ ♀. 13-15 mm. Head, palpi, and thorax light reddish-fuscous; terminal joint of palpi $\frac{4}{5}$ of second. Antennæ grey-whitish, ciliations 1. Abdomen pale grey. Legs dark grey, posterior pair grey-whitish. Forewings elongate, costa gently arched, apex round-pointed, hindmargin nearly straight, rather strongly oblique; rather light reddish-fuscous; an indistinct darker fuscous dot in disc at $\frac{1}{3}$, a second obliquely beyond it on fold, and a third in disc beyond middle; hindmargin suffused with darker and purplish-tinged: cilia ochreous-yellow, on costa and anal angle purplish-grey. Hindwings elongate-ovate, round-pointed, veins 3 and 4 from a point or slightly remote; grey, lighter towards base; cilia pale grey.

Broader-winged than *O. isarithma*, and with the hindmargin of forewings much less oblique; the ground colour not mixed with yellowish, and no anal spot.

Blackheath (3500 feet), New South Wales; Warragul, Victoria; Deloraine and Hobart, Tasmania; in November, December, March and April; six specimens.

371. *Ocyst. anthera*, n.sp.

Minor, alis ant. ochreis, postice flavo-suffusis ac purpureo-mixtis, punctis disci tribus strigaque marginis postici saturate purpureo-fuscis, ciliis flavis; post. albido-ochreis.

♀. 15-16 mm. Head, antennæ, and thorax ochreous-whitish. Palpi whitish, second joint externally suffused with dark purplish-grey, terminal joint $\frac{3}{4}$ of second. Abdomen pale whitish-ochreous. Legs light crimson-purple, banded with dark grey, posterior pair pale whitish-ochreous. Forewings elongate, costa gently arched, apex round-pointed, hindmargin sinuate, very oblique; light yellow-ochreous, posteriorly suffused with deep yellow and somewhat mixed with reddish-purple; a purplish-fuscous dot at $\frac{1}{3}$, a second obliquely beyond it on fold, and a third in disc beyond middle; a narrow greyish-purple suffusion along hindmargin from apex to near anal angle: cilia ochreous-yellow, on anal angle light grey, becoming reddish-purple at base. Hindwings elongate-ovate, round-pointed, veins 3 and 4 from a point or slightly remote; whitish-ochreous, apex and hindmargin narrowly suffused with grey; cilia whitish-ochreous.

Closely allied to *O. acroxantha*, but lighter and brighter-coloured, and separable by the ochreous-whitish head and thorax, and whitish-ochreous hindwings.

Sydney, New South Wales; two specimens in September and October.

372. *Ocyst. callista*, n. sp.

Minor, alis ant. rufescentibus, macula dorsi media pallidiore, costa nivea, punctis disci tribus areaque apicali saturate purpureo-fuscis, ciliis flavis; post. dilute ochreis.

♂. 16 mm. Head and thorax purple-fuscous, with scattered grey-whitish hair-scales. Palpi white, terminal joint and apical half of second externally purple, terminal joint $\frac{1}{3}$ of second. Antennæ dark fuscous, ciliations $2\frac{1}{2}$. Abdomen pale yellow-ochreous. Legs white, anterior pair internally dark fuscous suffused with reddish purple, hairs of posteror tibiæ light yellow-ochreous. Forewings elongate, rather narrow, costa sinuate, apex round-pointed, hindmargin sinuate, very oblique; dark purple-fuscous, lighter towards inner margin anteriorly, and densely strewn in disc from near base to $\frac{3}{4}$ with pale greyish-ochreous hair-scales; a snow-white streak along costa almost from base to near apex; a round pale flesh-coloured spot on inner margin beyond middle, surmounted by a dark fuscous dot; a second dark fuscous dot in disc above and rather beyond this; a fuscous ring in disc beyond middle, connected with costal streak and inner margin by fuscous lines: cilia bright yellow, on costa bright crimson, on anal angle grey, becoming purplish at base. Hindwings broad-lanceolate, tolerably acute, veins 3 and 4 from a point; pale yellow-ochreous, semihyaline, veins and margins densely scaled; cilia light ochreous-yellow, from middle of hindmargin to anal angle greyish.

A conspicuously distinct and elegant species.

Larva feeds in a portable case on *Eucalyptus hemiphloia*, eating holes in the leaves; case formed of a single stout cylindrical twig, hollowed down the centre and open at both ends; found in November. This kind of case (shared at least by the following species and probably others) is not known to me as employed in any other genus of *Lepidoptera*.

Sydney, New South Wales; one specimen bred in December.

373. *Ocyst. tyranna*, n. sp.

Media, alis ant. griseis, albido-conspersis, serie obliqua antica macularum trium parvarum lutearum, punctis disci duobus lineaque postica obscuris saturatioribus, ciliis flavis; post. dilutius ochreo-flavis.

♀. 23 mm. Head and thorax light grey. Palpi grey-whitish, reddish-tinged, anteriorly greyer, terminal joint very short, $\frac{1}{6}$ of second. Antennæ grey-whitish. Abdomen light yellow-ochreous. Legs light grey, crimson-tinged, posterior pair light yellow-ochreous. Forewings elongate, moderate, costa rather strongly arched, apex round-pointed, hindmargin sinuate, rather oblique; clear grey, densely irrorated with whitish hair-scales except towards base and on margins; three small round pale whitish-ochreous spots arranged in an inwardly oblique row from beneath $\frac{1}{4}$ of costa to above inner margin near base; two indistinct grey dots in disc before and after middle; a faint roundish pale whitish-ochreous spot above middle of inner margin; an indistinct irregular grey line from $\frac{3}{4}$ of costa to anal angle; a dark grey hindmarginal line: cilia ochreous-yellow, becoming light reddish-purple towards base, on anal angle broadly grey. Hindwings elongate-ovate, round-pointed, veins 3 and 4 slightly remote; light ochreous-yellow, extreme apex grey; cilia pale ochreous-yellow, on an apical spot and between middle of hindmargin and anal angle light grey.

Certainly allied to the preceding but very different: the terminal joint of palpi is relatively much shorter than in any other species of the genus.

Larva feeds in a portable case on the leaves of *Eucalyptus sp.*; case formed of a stout cylindrical hollowed twig, open at both ends; found in October.

Quorn, South Australia; one specimen bred in December.

374. *Ocyst. enoplia*, n. sp.

Minor, alis ant. dilutius fuscis, costa anguste nivea, punctis disci duobus saturatioribus; post. albido-griseis.

♀. 15-17 mm. Head whitish, back of crown greyish. Palpi grey, apex of second joint white, terminal joint $\frac{2}{3}$ of second. Antennæ grey-whitish. Thorax light grey-fuscous. Abdomen grey-whitish. Legs dark fuscous, mixed with white, posterior pair grey-whitish. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin very obliquely rounded; light fuscous; a narrow white streak along costa from near base to near apex; a dark fuscous dot on fold beneath middle, and a second in disc at $\frac{2}{3}$: cilia light fuscous. Hindwings elongate-ovate, round pointed, veins 3 and 4 from a point; whitish-grey; cilia whitish-grey.

Port Lincoln, South Australia; six specimens early in November.

375. *Ocyst. coniata*, n. sp.

Parva, alis ant. albido-ochreis, saturate fusco-conspersis, punctis disci tribus, plerisque etiam marginis circum apicem nigris; post albidis.

♂ ♀. 12-13 mm. Head, palpi, and thorax whitish-ochreous, mixed with dark fuscous; terminal joint of palpi $\frac{3}{5}$ of second. Antennæ whitish-ochreous, annulated with dark fuscous, ciliations 5. Abdomen ochreous-whitish. Legs dark fuscous, apex of joints and posterior pair ochreous-whitish. Forewings elongate, narrow, costa gently arched, apex acute, hindmargin somewhat sinuate, extremely oblique; whitish-ochreous, irregularly irrorated with dark fuscous; a round black dot in disc at $\frac{1}{3}$, a second obliquely beyond it on fold, and a third in disc at $\frac{2}{3}$; some ill-defined blackish spots on apical part of costa and hindmargin: cilia pale whitish-ochreous, somewhat mixed with dark fuscous at base round apex. Hindwings lanceolate, acute, veins 3 and 4 from a point; grey-whitish; cilia grey-whitish.

Deloraine and Mount Wellington (1000 feet), Tasmania ; three specimens in November and December.

376. *Ocyst. agelæa*, n. sp.

Parva, alis ant. ochreis, fusco-suffusis, punctis disci tribus majusculis saturate fuscis ; post. saturatius griseis.

♂ ♀. 10-12. mm. Head, palpi, and thorax brownish-ochreous ; terminal joint of palpi $\frac{2}{3}$ of second. Antennæ fuscous, ciliations 5. Abdomen grey. Legs grey, posterior pair grey-whitish. Forewings elongate, narrow, costa gently arched, apex acute, hindmargin sinuate, extremely oblique ; brownish-ochreous, irregularly suffused with fuscous ; a small round dark fuscous spot in disc before middle, a second slightly beyond it on fold, and a third in disc at $\frac{2}{3}$: cilia fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point ; rather dark grey ; cilia grey.

Distinguished from the two following by the much longer antennal ciliations (relatively twice as long), partial fuscous suffusion, and darker grey hindwings.

Deloraine, Tasmania ; two specimens in November.

377. *Ocyst. psamathina*, n. sp.

Minor, alis ant. ochreis, puncto plicæ interdum obsoleto, altero disci postico nigris ; post. dilute griseis.

♂. 13-14 mm. Head, palpi, and thorax yellow-ochreous, second joint of palpi externally fuscous, terminal joint $\frac{2}{3}$ of second. Antennæ greyish-ochreous, ciliations $2\frac{1}{2}$. Abdomen grey, anal tuft whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, very narrow, costa slightly arched, apex round-pointed, hindmargin extremely obliquely rounded ; yellow-ochreous ; a black dot on fold slightly before middle, sometimes obsolete, and a second in disc at $\frac{2}{3}$: cilia yellow-ochreous. Hindwings broad-lanceolate, tolerably acute, veins 2 and 3 from a point ; light grey, towards base semihyaline ; cilia light greyish-ochreous.

Sydney, New South Wales ; two specimens in September and April

378. *Ocyst. milichia*, n. sp.

Minor, alis ant. fusco-ochreis, costa ochreo-albida, punctis disci tribus nigris; post. dilute griseis.

♂. 16 mm. Head, palpi, and thorax brownish-ochreous; terminal joint of palpi $\frac{3}{4}$ of second. Antennæ light ochreous, ciliations $2\frac{1}{2}$. Abdomen grey, anal tuft whitish-ochreous. Legs dark fuscous, posterior pair whitish-ochreous. Forewings elongate, narrow, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; brownish-ochreous; a slender yellow-whitish streak along costa from base to $\frac{2}{3}$; a black dot in disc at $\frac{1}{3}$, a second very obliquely beyond it on fold, and a third in disc at $\frac{2}{3}$: cilia light brownish-ochreous. Hindwings broad-lanceolate, tolerably acute, veins 3 and 4 from a point; light grey; cilia pale greyish-ochreous.

Closely allied to the preceding, but with the forewings somewhat broader and the costa rather more arched, a pale costal streak, and additional anterior discal dot.

Blackheath (3500 feet), New South Wales; one specimen in October.

379. *Ocyst. protosticha*, n. sp.

Parva, alis ant. dilute ochreo-flavis, punctis disci tribus saturate fuscis, tertio cum angulo anali per strigam fuscam fere connexo; post. griseis.

♂ ♀. 12-13 mm. Head and palpi light ochreous-yellowish, second joint sometimes more or less fuscous externally, terminal joint $\frac{2}{3}$ of second. Antennæ greyish-ochreous, ciliations $2\frac{1}{2}$. Thorax light ochreous-yellowish, anterior margin rather broadly fuscous. Abdomen whitish-grey. Legs dark fuscous, posterior pair pale ochreous-yellowish. Forewings elongate, rather narrow, costa moderately arched, apex tolerably acute, hindmargin slightly rounded, very oblique; light ochreous-yellow; a dark fuscous dot in disc before middle, a second directly beneath it on fold, and a third (sometimes double) in disc beyond middle; a cloudy fuscous streak from third dot to anal angle, sometimes obsolete; some fuscous scales along hindmargin : cilia pale ochreous-yellow, base sometimes mixed with fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point ; grey ; cilia pale grey.

Duaringa and Toowoomba (2000 feet), Queensland ; one specimen taken in September, and six received from Mr. G. Barnard.

380. *Ocyst. euanthes*, n. sp.

Minor, alis ant. flavis, strigula dorsi basali e costa oriente, fascia media latiore, alteraque marginis postici saturate fuscis ; post. saturate fuscis.

♀. 17 mm. Head yellow. Palpi dark fuscous, internally yellow-whitish, terminal joint nearly as long as second. Antennæ, thorax, abdomen, and legs dark fuscous ; posterior legs yellowish beneath. Forewings elongate, rather narrow, costa moderately arched, apex acute, hindmargin slightly sinuate, extremely oblique ; yellow ; markings dark fuscous, slightly purplish-tinged ; a short streak from base of costa along inner margin to $\frac{1}{4}$; a moderately broad fascia from middle of costa to inner margin before anal angle, dilated beneath ; an irregular fascia along hindmargin from apex to anal angle, touching central fascia : cilia dark fuscous. Hindwings ovate-lanceolate, acute, veins 3 and 4 from a point ; dark fuscous ; cilia dark fuscous.

Adelaide and Wirrabara Forest, South Australia ; two specimens.

381 .*Ocyst. placoxantha*, n. sp.

Parva, alis ant. saturate fuscis, macula dorsi antica magna subquadrata alteraque disci postica parva tranversa dilute ochreo-flavis ; post. saturate fuscis.

♂. 13 mm. Head, palpi, antennæ, thorax, abdomen, and legs dark fuscous ; second joint of palpi internally yellow-whitish, terminal joint $\frac{2}{3}$ of second ; antennal ciliations 5 ; posterior legs greyish-ochreous. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin sinuate, extremely oblique ; dark fuscous ; a large light ochreous-yellowish trapezoidal blotch extending on inner margin from near base to beyond middle, upper side near and parallel to costa, anterior and posterior sides erect; a transverse light ochreous-yellowish spot in disc above anal angle: cilia dark fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point; dark fuscous; cilia dark fuscous.

Bathurst (2300 feet), New South Wales, one specimen in November.

382. *Ocyst. mesoxantha*, n. sp.

Parva, alis ant. flavis, basi fasciaque marginis postici latissima saturatius fuscis; post. saturatius fuscis.

♀. 10-11 mm. Head shining purple-grey, face whitish. Palpi whitish, terminal joint anteriorly dark fuscous, $\frac{2}{3}$ of second. Antennæ dark grey. Thorax and abdomen dark purple-fuscous. Legs grey, posterior pair grey-whitish. Forewings elongate, rather narrow, costa moderately arched, apex acute, hindmargin slightly sinuate, extremely oblique; yellow; base narrowly dark fuscous; a narrow dark fuscous fascia from beyond middle of costa to $\frac{2}{3}$ of inner margin, beyond which the whole apical area is rather dark purple-fuscous; cilia rather dark fuscous. Hindwings ovate-lanceolate, acute, veins 3 and 4 from a point; rather dark fuscous: cilia rather dark fuscous.

Sydney, New South Wales; two specimens in September.

383. *Ocyst. pyramis*, n. sp.

Media, alis ant. flavis, basi, triangulo erecto dorsi postico, areaque apicali saturate fuscis; post. saturate fuscis.

♂♀. 15-20 mm. Head light yellow. Palpi yellow-whitish, second joint grey except towards apex, terminal joint $\frac{4}{5}$ of second. Antennæ grey, ciliations 3. Thorax dark purple-fuscous. Abdomen and legs dark fuscous, posterior legs yellowish beneath. Forewings elongate, costa moderately arched, apex round-pointed, hindmargin somewhat sinuate, very oblique; bright clear yellow; base rather narrowly dark fuscous; an erect elongate triangular dark fuscous spot on inner margin before anal angle, reaching more than half across wing; a dark purple-fuscous apical suffusion, extending nearly to this spot and sometimes partially confluent with it at the base and apex: cilia dark fuscous. Hindwings ovate-lanceolate, acute, veins 3 and 4 from a point; dark fuscous; cilia dark fuscous.

Larva feeds between joined leaves of *Eucalyptus tereticornis;* pupa in a firm flattened cocoon in same position; found in August.

Sydney and Blackheath (3500 feet), New South Wales; seven specimens from September to November, usually at rest on fences.

384. *Ocyst. acrobaphes*, n. sp.

Minor, alis ant. dilute ochreo-flavis, macula anguli analis parva saturate fusca; post. griseis.

♂. 18 mm. Head light yellow-ochreous. Palpi ochreous-whitish, anterior edge dark grey, terminal joint $\frac{4}{5}$ of second. Antennæ grey, ciliations $3\frac{1}{2}$. Thorax light yellow-ochreous, anterior margin strongly dark fuscous. Abdomen light greyish-ochreous. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex tolerably acute, hindmargin very obliquely rounded; pale ochreous-yellowish; extreme costal edge dark fuscous at base; a small roundish dark fuscous spot on anal angle; some dark fuscous scales at apex: cilia rather dark fuscous, towards middle of hindmargin mixed with pale ochreous-yellowish. Hindwings ovate-lanceolate, round-pointed, veins 3 and 4 from a point; grey; cilia grey.

Sydney, New South Wales; one specimen in January.

385. *Ocyst. illuta*, n. sp.

Minor, alis ant. dilute ochreo-flavis, dorso usque ad apicem latius fusco-suffuso; post. fuscis.

♂ ♀. 14-18 mm. Head light ochreous-yellow, face ochreous-whitish. Palpi dark grey, internally whitish, terminal joint almost as long as second. Antennæ grey, ciliations 3. Thorax light ochreous-yellow, sometimes suffused with greyish, collar and a large quadrate anterior spot dark fuscous. Abdomen grey. Legs dark grey, posterior pair whitish-ochreous. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin extremely obliquely rounded; light ochreous-yellow; base of costa narrowly dark fuscous; inner and hind margins more or less broadly suffused with fuscous, apex more broadly, the suffusion sometimes extending over whole wing: cilia fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point; fuscous; cilia fuscous.

Sydney and Blackheath (3,500 feet), New South Wales; Melbourne, Victoria; from January to March, rather common.

386. *Ocyst. lithophanes*, n. sp.

Media, alis ant. griseis, costa ochreo-albida; post. griseis.

♂ ♀. 18-19 mm. Head grey-whitish, crown more or less grey. Palpi grey, apex of second joint white, terminal joint $\frac{2}{3}$ of second. Antennæ, thorax, abdomen, and legs grey; antennal ciliations 4; posterior legs grey-whitish. Forewings elongate, narrow, costa gently arched, apex round-pointed, hindmargin extremely obliquely rounded; shining grey; costa suffused with ochreous-white, in ♂ forming a definite moderate streak: cilia whitish-grey. Hindwings broad-lanceolate, round-pointed, veins 3 and 4 from a point; grey; cilia light grey.

Deloraine, Tasmania; two specimens in November.

387. *Ocyst. monostropha*, n. sp.

Media, alis ant. albis, dimidio dorsali dilute griseo; post. griseis; thorace griseo.

♂ ♀. 16-20 mm. Head white, crown slightly greyish-tinged. Palpi white, anteriorly grey; terminal joint $\frac{2}{3}$ of second. Antennæ whitish, ciliations 5. Thorax light grey. Abdomen ochreous-whitish. Legs grey, posterior pair whitish. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin slightly sinuate, extremely oblique; shining white, very faintly ochreous-tinged; dorsal half suffused with light ochreous-grey from base to anal angle: cilia ochreous-white, beneath anal angle pale greyish-ochreous. Hindwings broad-lanceolate, acute, veins 3 and 4 more or less remote or even parallel; grey; cilia very pale greyish-ochreous.

Sydney and Blackheath (3500 feet), New South Wales; rather common from September to November.

388. *Ocyst. homoleuca*, n. sp.

Minor, alis ant. candidis, dorso vix griseo-tincto; post. dilute griseis; thorace candido.

♂ ♀. 10-15 mm. Head and thorax white, faintly ochreous-tinged. Palpi white, anterior edge somewhat grey, terminal joint $\frac{2}{3}$ of second. Antennæ whitish, ciliations 5. Abdomen ochreous-whitish. Legs dark grey, posterior pair ochreous-whitish. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin extremely obliquely rounded; shining white; inner margin narrowly and slightly tinged with greyish-ochreous: cilia white, on anal angle somewhat greyish-ochreous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point or very slightly remote; light grey; cilia ochreous-grey-whitish.

Closely allied to *O. monostropha*, but always smaller, with the thorax white, the grey suffusion of forewings hardly perceptible, and veins 3 and 4 of the hindwings hardly or not remote.

Sydney and Bathurst (2300 feet), New South Wales; Wirrabara Forest, South Australia; six specimens in October and November.

389. *Ocyst. chionea*, n. sp.

Minor, alis ant. candidis, striga dorsi saturate fusca; post. griseis.

♂ ♀ 16-17 mm. Head yellowish-white or whitish-ochreous. Palpi white, anterior edge grey; terminal joint $\frac{3}{4}$ of second. Antennæ grey, ciliations $3\frac{1}{2}$. Thorax dark grey, patagia white except at base. Abdomen pale yellow-ochreous. Legs dark grey, posterior pair pale yellow-ochreous. Forewings elongate, narrow, costa gently arched, apex acute, hindmargin sinuate, extremely oblique; shining white, very slightly ochreous-tinged; a moderate dark fuscous streak along inner margin from base to anal angle, attenuated at both extremities: cilia white, faintly ochreous-tinged, on anal angle light fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point; grey; cilia whitish-ochreous.

Wirrabara Forest, South Australia; four specimens in October.

390. *Ocyst. glacialis*, n. sp.

Parva, alis ant. candidis, macula dorsi postica parva, strigaque marginis postici saturate fuscis; post. dilute griseis.

♂ 13 mm. Head and palpi white, terminal joint almost as long as second. Antennæ, thorax, and abdomen whitish-grey; antennal ciliations 3. Legs dark grey, posterior pair whitish. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin faintly sinuate, extremely oblique shining white; a rather small subquadrate dark fuscous spot on inner margin beyond middle; a slender dark fuscous streak along hindmargin from apex to anal angle: cilia whitish, mixed with dark fuscous scales towards base. Hindwings broad-lanceolate, acute, veins 3 and 4 widely remote, parallel; light grey; cilia ochreous-whitish.

Mount Lofty, South Australia; one specimen received from Mr. E. Guest.

391. *Ocyst. crystallina*, n. sp.

Media, alis ant. candidis, striga dorsi bidentata, punctis disci quattuor interdum obsoletis. strigula anguli analis erecta, strigaque marginis postici saturate fuscis; post. griseis.

♀ 16-20 mm. Head yellowish-white or whitish-ochreous. Palpi white, second joint externally grey except apex, terminal joint $\frac{3}{4}$ of second. Antennæ grey. Thorax dark fuscous. Abdomen pale yellowish-ochreous. Legs dark fuscous, posterior pair pale yellowish-ochreous. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin sinuate, very oblique; shining white, faintly ochreous-tinged, with dark fuscous markings; a moderate streak along inner margin from base to anal angle, shortly protuberant upwards before middle and near anal angle, each protuberance often connected with a round dot placed immediately above it, but these dots are sometimes separate or absent; a small round dot in disc before middle, somewhat beyond first protuberance, and another in disc at $\frac{2}{3}$, both sometimes obsolete; a short erect streak from anal angle, sometimes touching second discal dot; a streak along hindmargin from apex to below middle, tending to be interrupted into spots: cilia white, beneath anal angle fuscous. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point; grey; cilia pale yellowish-ochreous, becoming greyer round apex.

Mount Lofty, South Australia; five specimens in October and February.

392. *Ocyst. paulinella*, Newm.

(*Oecophora paulinella*, Newm., Trans. Ent. Soc. Lond., Vol. III., (n.s.), 297, Pl. XVIII.)

Media, alis ant. candidis, striga dorsi, fascia angusta media incurvata, triangulo anguli analis delineato, strigaque marginis postici saturate fuscis; post. dilute griseis.

♂ ♀. 16-21 mm. Head and palpi white, lower $\frac{2}{3}$ of second joint dark fuscous, terminal joint $\frac{2}{3}$ of second. Antennæ whitish, ciliations 3. Thorax blackish, with a narrow transverse anterior white spot. Abdomen light yellow-ochreous. Legs dark fuscous, posterior pair light yellow-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex acute, hindmargin sinuate, very oblique; shining white, with dark fuscous markings: a moderate streak along inner margin from base to anal angle, abruptly narrowed and sometimes interrupted near base; a narrow inwards-curved fascia from beyond middle of costa to before middle of inner margin; a streak from $\frac{3}{4}$ of inner margin and another from anal angle converging to meet in middle of disc, apex produced upwards into a short tooth; a moderate streak along hindmargin from apex to anal angle, attenuated beneath: cilia white, beneath anal angle dark fuscous-grey. Hindwings broad-lanceolate, acute, veins 3 and 4 from a point; light grey, sometimes tinged with whitish-ochreous; cilia pale yellow-ochreous, with a grey apical spot.

Sydney and Blackheath (3500 feet), New South Wales; Melbourne, Victoria; Mount Lofty, South Australia; tolerably common from August to October, and in March.

393. *Ocyst. suppressella*, Walk.

(*Gelechia suppressella*, Walk., Brit. Mus. Cat., p. 650.)

Parva, alis ant. niveis, punctis disci tribus, macula dorsi media parva, lineaque postica recta fuscis; post. griseo-albidis.

♂ ♀. 12-13 mm. Head, palpi, antennæ, thorax, and abdomen white; terminal joint of palpi $\frac{2}{3}$ of second; antennal ciliations 8. Legs fuscous, posterior pair whitish. Forewings elongate, rather narrow, costa gently arched, apex acute, hindmargin slightly sinuate, very oblique; white; a fuscous dot in disc before middle, a second directly beneath it on fold, and a third in disc beyond middle; a small fuscous spot on middle of inner margin, touching second dot; a nearly straight linear dark fuscous fascia from $\frac{3}{4}$ of costa to anal angle; some fuscous scales on hindmargin: cilia whitish, mixed with rather dark fuscous from apex to near anal angle. Hindwings broad-lanceolate, round-pointed, veins 3 and 4 slightly remote; grey-whitish; cilia grey-whitish.

The antennal ciliations in this species reach their maximum.

Rosewood, Queensland; three specimens in September.

394. *Ocyst. diclethra*, n. sp.

Parva, alis ant, niveis, macula disci antica transversa fasciaque postica in marginibus nonnihil producta ac cum angulo anali connexa ochreis, saturate fusco-sparsis; post. dilute griseis.

♂ ♀. 10-13 mm. Head, palpi, antennæ. and thorax white; second joint of palpi externally grey on lower half, terminal joint $\frac{2}{3}$ of second; antennal ciliations $2\frac{1}{2}$. Abdomen light grey. Legs dark grey, posterior pair ochreous-whitish. Forewings elongate, narrow, costa gently arched, apex acute, hindmargin slightly sinuate, extremely oblique; snow-white; markings bright yellow-ochreous, more or less irrorated with dark fuscous; two small round generally confluent spots transversly placed in disc before middle, lower slightly anterior; a rather narrow fascia from $\frac{2}{3}$ of costa to $\frac{3}{4}$ of inner margin, narrowly produced along inner margin to beneath anterior spots, and more broadly along costa to near apex, and connected below middle by a short slender bar with anal angle: cilia ochreous-whitish, suffused with ochreous and sometimes irrorated with dark fuscous between apex and anal angle. Hindwings lanceolate, acute, veins 3 and 4 somewhat remote; light grey; cilia very pale greyish-ochreous.

Sydney, New South Wales; not uncommon from October to December.

395. *Ocyst. niphodesma*, n. sp.

Parva, alis ant. niveis, costæ basi fasciisque duabus rectis fusco-ochreis, saturate fusco-sparsis; post. dilute griseis.

♂. 12 mm. Head and palpi white, second joint externally fuscous except at apex, terminal joint $\frac{2}{3}$ of second. Antennæ fuscous, ciliations 3. Thorax white, anterior margin dark fuscous. Abdomen whitish-ochreous. Legs dark fuscous, post. pair whitish-ochreous. Forewings elongate, rather narrow, costa moderately arched, apex acute, hindmargin sinuate, extremely oblique; snow-white; markings brownish-ochreous, somewhat irrorated and irregularly margined with dark fuscous; a small quadrate fuscous spot on base of costa; a straight moderate fascia from $\frac{2}{5}$ of costa to before middle of inner margin; a fascia from before $\frac{4}{5}$ of costa to anal angle, moderate on costa, rather broadly dilated beneath; some dark fuscous scales at apex: cilia white, basal half somewhat suffused with pale ochreous and irregularly irrorated with dark fuscous. Hindwings lanceolate, acute, veins 3 and 4 remote; light grey; cilia whitish-grey, ochreous-tinged.

Duaringa, Queensland; one specimen received from Mr. G. Barnard.

396. *Ocyst. trilicella*, n. sp.

Minor, alis ant. niveis, fascia media supra abbreviata, altera postica integra incurvata, lineaque marginis postici ochreo-fuscis; post. dilute griseis.

♂ ♀. 14-18 mm. Head and palpi white, lower half of second joint anteriorly suffused with dark grey, terminal joint $\frac{3}{4}$ of second. Antennæ whitish, ciliations 4. Thorax dark fuscous. Abdomen ochreous-whitish. Legs ochreous-whitish, anterior pair dark fuscous, middle pair suffused with fuscous. Forewings elongate, costa moderately arched, apex roundpointed, hindmargin sinuate, very oblique; white, slightly ochreous-tinged, with ochreous-brown markings; an erect triangular spot on middle of inner margin, reaching more than half across wing, apex sometimes produced obliquely forwards; a moderate inwards-curved fascia from $\frac{2}{3}$ of costa to anal angle; an irregular line along hindmargin: cilia ochreous-whitish, basal half ochreous-fuscous. Hindwings broad-lanceolate, tolerably acute, veins 3 and 4 from a point; light grey; cilia pale whitish-ochreous, round apex greyish-tinged at base.

Sydney and Blackheath (3500 feet), New South Wales; four specimens, in September, December, and January.

397. *Ocyst. thalamepola*, n. sp.

Parva, alis ant. albidis, macula disci prope basim, fascia antica supra abbreviata, altera postica integra incurvata nebulosis ochreis; post. ochreo-albidis.

♂ ♀. 10-11 mm. Head, palpi, antennæ, thorax, abdomen, and legs white; terminal joint of palpi $\frac{3}{4}$ of second; antennal ciliations 7; shoulders with a fuscous spot; anterior legs dark fuscous. Forewings elongate, costa moderately arched, apex tolerably acute, hindmargin faintly sinuate, very oblique; ochreous-whitish, with ill-defined yellow-ochreous markings; a roundish spot in disc near base; an erect elongate triangular spot on middle of inner margin, reaching more than half across wing; a moderate somewhat inwards-curved fascia from $\frac{2}{3}$ of costa to anal angle: cilia ochreous-white. Hindwings broad-lanceolate, tolerably acute, veins 3 and 4 from a point or slightly remote; ochreous-whitish; cilia ochreous-whitish.

Sydney and Blackheath (3500 feet), New South Wales; three specimens in December and February.

398. *Ocyst. neurota*, n. sp.

Minor, alis ant. niveis, venis omnibus ochreis; post. ochreo-albidis.

♂ ♀. 14-16 mm. Head, palpi, antennæ, thorax, abdomen, and legs ochreous-white; second joint of palpi externally fuscous except apex, terminal joint $\frac{3}{4}$ of second; antennal ciliations 3; anterior legs fuscous. Forewings elongate, narrow, costa moderately arched, apex acute, hindmargin slightly rounded, extremely oblique; white; all veins obscurely lined with pale ochreous: cilia ochreous-white. Hindwings broad-lanceolate, tolerably acute, veins 3 and 4 from a point; ochreous-whitish; cilia ochreous-whitish.

Duaringa and Brisbane, Queensland; one specimen taken in September, and a second received from Mr. G. Barnard.

A MONOGRAPH OF THE AUSTRALIAN SPONGES.

(Continued.)

By R. von Lendenfeld, Ph.D.

Part III.

[Plates LIX. to LXVII.]

PRELIMINARY DESCRIPTION AND CLASSIFICATION OF THE AUSTRALIAN CALCISPONGIÆ.

CLASSIS SPONGIÆ.

CŒLENTERATA, WITH A GASTROVASCULAR SYSTEM WHICH OPENS ON THE SURFACE WITH MANY SMALL AND MOSTLY ONE OR A FEW LARGE APERTURES. NOURISHING MATERIAL FLOWS IN THROUGH THE SMALL PORES, THE LARGE PORES OR OSCULAE ARE CLOACÆ. FRILLED CILIATED CELLS ARE GENERALLY AMASSED IN CERTAIN PORTIONS OF THE CANAL SYSTEM. ALL THE EPITHELIA CONSIST OF SINGLE LAYERS OF CELLS, THE MESODERM IS HIGHLY DEVELOPED.

I.—ORDO CALCISPONGIÆ.

SPONGIÆ POSSESSING A SKELETON COMPOSED OF CARBONATE OF LIME WITH A LITTLE ORGANIC SUBSTANCE, GASTRULA FORMED BY INVAGINATION.

I.—SUBORDO HOMOCŒLA. Von Lendenfeld.

Calcispongiæ the Entoderm of which consists throughout of frilled flagellate cells. No histological difference between the Entodermal clothing of the central gastral cavity and that of its branches.

This Subordo is nearly identical with the Homocoela of Poléjaeff (1) but comprises some species, which according to Poléjaeff would be considered Heterocoela.

FAMILY. ASCONIDÆ. Claus (2).

Sac-shaped Homocoela often forming colonies without a thick Mesoderm which the Canals perforate. The Asconidæ are identical with Haeckels (3) Ascones. Haeckel's genera are adopted preliminarily.

1. GENUS. ASCETTA. Haeckel (4).

With predominant triradiate spicules some of which may possess an incipient fourth ray, without acerate spicules.

1. SPECIES. ASCETTA DICTYOIDES. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. DICTYOIDES. E. Haeckel (5).

Triradiate spicules regular, rays conic or semi spindle-shaped, pointed. Spicules forming several layers. Rays 8 to 16 times as long as thick with simple gastral cavity.

Locality : Australia. (Haeckel.)

2. SPECIES. ASCETTA POTERIUM. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. POTERIUM. E. Haeckel (6).

CLATHRINA POTERIUM. Ridley (7).

LEUCOSOLENIA POTERIUM. Poléjaeff (8).

Triradiate spicules regular with straight, conic or semi-spindle-shaped rays in several layers. The dermal spicules clumsy with

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(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 35,

The new species described here have been partly obtained by the author himself, and were partly furnished by the Colonial Museums. I am particularly indebted to Mr. E P. Ramsay for some highly interesting specimens from the Australian Museum in Sydney.

(2) *C. Claus.* Grundzüge der Zoologie. Vierte Auflage. Band I., Seite 221.

(3.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 11.

(4.) *E. Haeckel.* L.c. Band II., Seite 14.

(5.) *E. Haeckel.* L.c. Band II., Seite 17-23 ; Band III., Taf, V., fig. 1.

(6.) *E. Haeckel.* L.c. Band II., Seite 17 ; Band III., Taf. II., figs. 8-9, Taf. V., fig. 1f—1i.

(7.) *Stuart O. Ridley.* Proceedings of the Zoological Society of London, 1881, p. 133.

(8.) *N. Poléjaeff.* L.c., p. 35 ; Taf. III., figs. 1-2.

rays which are 6 to 8 times as long as thick. The Gastral ones more slender with rays which are 16 to 20 times as long as thick. Triradiate spicules of the wall of the Pseudostoma with equal angles and paired rays.

Dormal rays, 0·18—0·3 x 0·01—0·035.

Gastral rays, 0·12—0·18 x 0·006—0·01.

Always Auloplegma-form.

Locality: East Coast of Australia (Twofold Bay, Challenger), and other places on the Australian Coast. Haeckel.

3. SPECIES. ASCETTA LOCULOSA. Von Lendenfeld.

ASCETTA PRIMORDIALIS var. LOCULOSA. E. Haeckel (1.)

Triradiate spicules regular, rays conic or semi-spindleshaped, pointed.

Spicules in several layers. All of the same size, the rays 8 to 16 times as long as thick. From the Gastral wall Lamellæ extend inward which divide the Gastral cavity into numerous compartments. Haeckel (2.) states that these folds are covered by several layers of entodermal Epithelium.

Poléjaeff (3.) doubts the correctness of this statement, and also I can state that I have never met with such a structure in any calcarious sponge.

Locality: Australia. Haeckel.

4. SPECIES. ASCETTA CHALLENGERI. Von Lendenfeld.

LEUCOSOLENIA CHALLENGERI. N. Poléjaeff. (4.)

The triradiate spicules form two layers; a Gastral one of regular spicules and a dermal one of irregular sagittal differenciated triradiate spicules.

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 17, 23.
(2.) *E. Haeckel.* L.c., Band I., Seite 144. Band II., Seite 17, 23.
(3.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., page 6.
(4.) *N. Poléjaeff:* L.c., p. 38; Taf. I., fig. 1; Taf. III., fig. 4,

The only specimen is a Soleniscus with 0·3—0·8 broad persons. The Pseudopores have a diameter of 0·28. The clumsy colony which is 30 mm. in length is sessile on a 2 mm. long peduncle. The Oscula are slightly larger than the pores in the reticulation.

Regular spicules with cylindrical, rounded rays, which are 0·18 long and 0·01 thick. The irregular dermal spicules are of the same size as the above, but with paired angles and generally in such a way irregular, that their rays are not situated in one plane. The paired rays which inclose the unpaired angles are slightly curved, convex towards each other.

Besides these there are a few regular spicules with rays 0·8 mm. long.

Colour : Yellowish.

Locality : North Coast of Australia, Cape York (Challenger.)

5. SPECIES. ASCETTA PROCUMBENS. Nov. spec.

The sponge consists of numerous slightly curved cylindrical tubes, extending in one plane, in one or more layers. The sponge has the appearance of a perforated plate, and attains a diameter of 25 and a thickness of 2·5 mm.

The spicules are regular. The rays are 0·1 mm. long and at the base 0·015 thick. The rays are pretty stout, conic and slightly rounded at the ends. Our species is distinguished from the allied species by the rays of its spicules being neither cylindrical as in Ascetta coriacea nor pointed as in the numerous varieties of Ascetta primordialis. Besides that, the spicules are shorter than in the latter and thicker than in the former.

Locality : East coast of Australia (Port Jackson.) South coast of Australia (Port Phillip), von Lendenfeld.

6. SPECIES. ASCETTA MACLEAYI. Nov. spec.

Triradiate spicules forming low triangular pyramids with equal angles. One ray always longitudinally situated, longer than the other two and pointing towards the aboral pole. Longitudinal ray 0·05 (Pseudo-osculum)—0·1 (body and peduncle) x 0·003—

0·007. Lateral rays 0·04—0·05 x 0·003—0·004 mm. Rays conic, rounded at the end, rarely with a slight stricture just below. Auloplegmaform with Pseudo-osculum ; a reticulate colony like guancha blanca (1). The canals (Ascon-individuals) with small inhalent pores on the outer side and larger exhalent pores towards the Pseudo-gaster.

(Transition form between Asconidæ and Nardopsidæ.)

Colonies 3-10 mm. high, peduncle as long, or longer than the reticulated part of the body.

Locality : East coast of Australia (Port Jackson), Laminarian zone. Von Lendenfeld.

2. GENUS. ASCALTIS. Haeckel (2.)

Asconidœ with tri- and quadriradiate spicules. Without acerate spicules.

7. SPECIES. ASCALTIS LAMARCKII. Haeckel (3.)
LEUCOSOLENIA LAMARCKII. N. Poléjaeff (4.)

Tri- and quadriradiates regular. Some of the triradiates three times as large as the other triradiates and the quadriradiates. Quadriradiates and small triradiates with rays 0·08—0·12 x 0·004—0·006. The large triradiates with rays 0·2—0·3 x 0·015—0·02 mm. Auloplegma form. Spherical 5-20 mm. in diameter.

Locality : East Coast of Australia, (Port Jackson, Challenger.) 30-35 fathoms.

3. GENUS. ASCANDRA. Haeckel (5.)

Asconidæ with triradiate, quadriradiate and acerate spicules.

(1.) *N. M. Maclay :* Jenaische Zeitschrit für Naturwissenschaft, Band IV., 2 Heft, 1868, Seite 221.

(2.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 51.

(3.) *E. Haeckel.* L.c. Band II., Seite 60 ; Taf. IX., fig. 5 ; Taf. X., fig. 4 a-d.

(4.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger, Tart. XXIV., p. 36.

(5.) *E. Haeckel.* L.c. Band II., Seite 80.

8. SPECIES. ASCANDRA DENSA. Haeckel (1).

Tri- and rare quadriradiate spicules regular, of equal size. Rays straight cylindrical and pointed. Apical ray half as thick, straight. Acerate spicules straight truncate on both ends, inflated on the external end, 3-4 times as long, and 5-6 times as thick as the ray of the triradiates. Triradiates 0·1—0·12 x 0·006—0·001 mm. Acerates 0·5—0·6 x 0·03—0·04 mm., with or without Pseudo-oscula.

Locality : South Coast of Australia, Haeckel.

2. FAMILY. HOMODERMIDÆ. Von Lendenfeld (2.)

Homocœla with radial tubes.

Transition form between Asconidæ and Syconidæ.

4. GENUS. HOMODERMA. Von Lendenfeld (3.)

Homodermidæ which form colonies of several spindle-shaped persons; the Gastral cavities of which are connected with each other by a hollow Spongorhiza.

9. SPECIES. HOMODERMA SYCANDRA. Von Lendenfeld (4.)

Quadriradiate, triradiate and acerate spicules. The radial tubes in regular strobiloid circles around the cylindrical Gastral cavity which is clothed up to the margin of the Osculum with frilled flagellate cells. Gastral quadriradiates, centripetal radial ray 0·02—0·04 x 0·0024 conic, pointed and straight ; lateral tangental ray slightly curved, convex outside 0·05 x 0.0038 ; longitudinal, aboral tangental ray 0·04 x 0·0038. Parenchymal triradiates; internal triradiates with unequal rays, radial centrifugal ray 0·048 x 0·0032 conic, sometimes protruding into the Gastral cavity. Tangental basal rays curved 0·0074—0·011 x 0·0048, convex towards the outer side often equatorially situated.

(1.) *E. Haeckel.* L.c. Band II., Seite 85, Taf. XIV., figs. 2a-2c; Taf. XVII., fig. 9-12.

(2.) *Von Lendenfeld.* Proceedings of the Linnean Society of N.S.W., Vol. IX., p. 338.

(3.) *Von Lendenfeld.* L.c.

(4.) *Von Lendenfeld.* L.c.

Medial triradiates regular, rays conic 0·048 x 0·003. Dermal rays similar in size and shape to the former on the summits of the radial tubes some triradiates are situated, the outer rays of which protrude beyond the surface. Dermal acerates protruding and leaning towards the Osculum under an angle of 45° 0·71 x 0·0071 mm., cylindrical, pointed, the centrifugal end abruptly pointed to a sharp point. Situated in groups of 10 to 12 on the summits of the radial tubes. Oscular acerates a longitudinal cylinder forming a kind of Oesophagus with a frill of horizontal acerates. The former slightly curved, convex on the inner side 0.57 x 0·0016, the latter 0·21 x 0·003 slightly concave to the front.

Persons attaining a height of 14 mm., and a breadth of 5 mm.

Homoderma Sycandra is connected with the Asconidæ by forms such as Ascaltis canariensis (1), and Ascaltis Gegenbauri (2.)

Locality: East Coast of Australia, Port Jackson, South Coast of Australia, Port Phillip, Von Lendenfeld.

3. FAMILY. LEUCOPSIDÆ. Von Lendenfeld.

Homocoela with a highly developed Mesoderm in which the mouthless ascon persons are imbedded. With a large Pseudogaster and Pseudostom.

Transition-form between Asconidæ and Leuconidæ.

5. GENUS. LEUCOPSIS. Von Lendenfeld.

Leucopsidæ without any canal system. The inhalent Pores of the Ascon tube reticulation small and in direct communication with outer water. The exhalent Pores large and opening direct into the Pseudogaster.

10. SPECIES. LEUCOPSIS PEDUNCULATA, nov. sp.

A pedunculate small Sponge with one or several Oscula. The peduncle is hollow and clothed with ectodermal pavement cells internally. On the summit of it a spherical Sponge is situated

(1.) *E. Haeckel.* L.c. Seite 52., Taf. IX., figs. 1-3; Taf. X., figs. 1a-1c.
(2.) *E. Haeckel.* L.c. Seite 62, Taf IX , figs. 6-8; Taf. X., figs. 5a-5d.

which possesses triradiate spicules only, scattered throughout the Mesoderm which is exceptionally rich in cells. Tangental multipolar tissue cells and glandcells are met with. The spicules have one longer ray mostly pointing towards the aboral pole. The longitudinal ray measures 0·074—0·11 x 0·0074; and the paired rays 0·056—0·0074 x 0·004—0·006 mm. The three angles are equal. Height 3 to 7 mm, breadth 3 to 4 mm. Peduncle half as long as the body.

Locality: East Coast of Australia, Port Jackson, Laminaria zone, Von Lendenfeld.

II.—SUBORDO HETEROCOELA.

Von Lendenfeld.

Calcispongiæ with differentiated Entoderm. Ciliated chambers clothed with frilled flagellate cells are always present. The gastral cavity is clothed with entodermal pavement cells.

I adopt Poléjaeff's (1) name with a different definition but nearly identical meaning.

1. FAMILY. SYCONIDÆ. Claus (2).

Heterocoela with cylindrical ciliated chambers which traverse the body-wall, are situated radially, and open direct into the gastral cavity. Sensitive cells around the inhalent pores. Identical with Haeckel's (3) Sycones.

Connected with Asconidæ by Homoderma and with Leuconidæ by Vosmaeria

1. SUB-FAMILY. SYCONINÆ. Von Lendenfeld.

Syconidæ with unbranched distally separate ciliated tubes, and without complicated canal system. (Subgenera with the end syllable "aga" of Haeckel (4.)

(1.) *N. Poléjaeff.* L.c P. 39.
(2.) *C. Claus.* Grundzuge der Zoologie. Vierte Auflage. Band I, Seite 221.
(3.) *E. Haeckel.* L.c. Band II., Seite 232.
(4.) *E. Haeckel.* L.c. Band II.

I devide this Subfamily, which comprises a great number of the Sycones of Haeckel, according to Haeckel's principle preliminarily into the seven genera, which according to Haeckel (1) comprise *all* Syconidæ.

6. GENUS. SYCETTA. Von Lendenfeld.

Syconidæ, with predominant triradiate spicules, which sometimes show an incipient fourth ray, without acerate spicules. Identical with Haeckel's (2), sub-genus Sycettaga.

11. SPECIES. SYCETTA PRIMITIVA. Haeckel (3).

Radial tubes conic or bell-shaped, free; between them wide free intercanals. On both ends of each tubus an ostium, the gastral ostium three times as large as the dermal one, dermal surface and gastral surface smooth. Triradiate spicules of the skeleton all of the same regular shape, with equal angles and rays, rays straight, slender conic, 10 to 15 times as long as thick, with sharp point. All triradiate spicules are situated in regular order, with parallel rays, the basal ray is directed aborally downward in the gastral-surface, and centrifugally outward in the tubar-surface.

Colour: White (in spirits.)

Locality: South coast of Australia (Bass's Straits, Wendt; St. Vincent Gulf, Schomburgk.)

7. GENUS. SYCANDRA. Von Lendenfeld.

Syconinæ with acerate, triradiate and quadriradiate spicules. Comprising Haeckel's (4.) Subgenera Sycocarpus, Sycocercus, Sycocubus, Sycotrebus.

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(1) *E. Haecket.* L.c.

(2.) *E. Haeckel.* L.c. Band II., Seite 236.

(3.) *E. Haeckel.* L.c. Band II., Seite 237, Taf. XLI.

(4.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 294-295.

12. SPECIES. SYCANDRA CORONATA. Haeckel (1).

Spongia coronata. Ellis and Solander (2.)
Spongia coronata. A. F. Schweiger (3.)
Scyphor coronata. F. Gray (4.)
Spongia coronata. R. E. Grant (5.)
Spongia coronata. R. E. Grant (6.)
Grantia coronata. Hassal (7.)
Sycum coronatum. E. Haeckel (8.)
Sycomella tubulsoa. E. Haeckel (9.)
Grantia ciliata. T. S. Bowerbank (10.)
Grantia ciliata. T S. Bowerbank (11.)

Radial tubes cylindrical, with slender distal cones, quite free or adnate at the base, between these quite free intercanal spaces. Dermal surface villose, Gastral surface bristly, Acerate spicules forming a bundle at the distal end of the radial tubes; they are several times longer and 2 to 3 times as thick as the triradiate and quadriradiate spicules. Tubar triradiate spicules subregular or sagittal, with straight basal rays, curved lateral rays and large lateral angles. Gastral quadriradiate spicules without order,

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(1.) *E. Haeckel.* L.c. Band II., Seite 304; Taf. LI., figs. 2a.-2t. Taf. LX., figs. 1-6.

(2.) *Ellis and Solander.* The Natural History of many curious and uncommon Zoophytes, 1786, p. 190; Taf. LVIII., figs. 8-9.

(3.) *A. F. Schweiger.* Beobachtungen auf naturhistorischen Reisen über Corallen etc., 1819, page 80. Taf. V., fig. XXXXVII.

(4.) *F. Gray.* British Plants. Vol. 1., p. 357.

(5.) *R. E. Grant* Remarks on the structure of some calcareous sponges. In the new Philosophical Journal of Edinburgh Vol. I., 1826, p. 166.

(6.) *R. E. Grant.* Observations and Experiments on the Structure and Functions of the Sponges. In the new Philosophical Journal of Edinburgh. Vol. II., p. 122. Pl. II., figs. 17-18.

(7.) *Hassal.* Annals and Magazine of Natural History. Vol. VI., p. 174.

(8.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift fur Medicin und Naturwissenschaft 1870. Band V. Heft 2, p. 239.

(9.) *E. Haeckel.* Prodromus l.c., p. 239.

(10.) *T. S. Bowerbank.* On the Organisation of Grantia ciliata. Transactions of the Microscopical Society. New series. Vol. VII., 1859, p. 79-84, pl. LXXV., figs. 1-5.

(11.) *T. S. Bowerbank.* A Monograph of the British Spongidæ, 1864. Vol. I., pl. XXVI., figs. 345, 346a; *T. S. Bowerbank,* l.c. Vol. II., p. 19.

mostly subregular, more rarely sagittal or regular. Their facial rays mostly straight, about as long or a little longer than the slightly curved apical-ray.

Colour : White, silvery-grey or yellowish.

Locality : Mediterranean (Lesina, Nice, Gibraltar, Haeckel) ; Atlantic Ocean, Coast of Portugal, Barbozza du Boyage ; Bretagne, Mièvre ; Normandie, Lazaze-Duthiers, Grube ; South Coast of England, Montagu ; Torquay, Griffiths, Weymouth, Max Schultze; Pacific Ocean, California, Brown ; Honolulu, Sandwich Islands, Haltermann ; East Coast of Australia, Wendt.

13. SPECIES. SYCANDRA INCONSPICUA. Nov. spec.

Cylindrical erect persons remaining solitary with a small frill of longitudinal Acerates around the terminal, circular Osculum. Height 10 to 15 mm., breadth 4 to 7 mm. Dermal cones small, flat dome-shaped. Inhalent canals very narrow, hardly visible, with triangular section.

Spicules. Gastral quadriradiate spicules with three tangental rays below the surface and one longer radial one, penetrating the Gastral wall. Radial ray pointing inward 0·14—0·2 x 0·0048 mm., pointed abruptly, slightly bent towards the Osculum. Three tangental rays equal and nearly straight 0·074 x 0·004 pointed abruptly. Parenchymal triradiates regular with conic slightly rounded rarely bent rays, measuring 0·12 x 0·007—0·008. Dermal acerate spicules 0·8 x 1·2 mm., x 0·016 mm., curved regularly towards the Osculum ; densely scattered over the surface, pointed abruptly on the outer end, conic proximally.

Locality : East Coast of New Zealand, Lyttelton. Von Lendenfeld.

14. SPECIES. SYCANDRA RAPHANUS. Haeckel (1.)

Sycon raphanus. O. Schmidt (2.)

Sycon raphanus. O. Schmidt (3.)

(1). *E. Haeckel* Die Kalkschwämme. Eine Monographie. Band II., Seite 312, Taf. LIII., figs. 4a-4t ; Taf. LX., fig. 7.

(2.) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Leipzig, 1864, p. 14, Taf. I., fig. 2.

(3.) *O. Schmidt.* III. Supplement-Heft der Spongien des Adriatischen Meeres, p. 32.

Grantia raphanus. T. E. Gray (1.)
Sycum raphanus. E. Haeckel (2.)
Sycon ciliatum. O. Schmidt (3.)
Sycon ciliatum. N. Lieberkuehn (4.)
Spongia inflata. S. delle Chiage (5.)
Sycum inflatum. E. Haeckel (6.)
Sycarium vesica. E. Haeckel (7.)
Syconella proboscidea. E. Haeckel (8.)
Sycum tergestinum. E. Haeckel (9.)
Sycodendrum procumbens. E. Haeckel (10.)
Sycandra raphanus. F. E. Schulze (11.)
Sycandra raphanus. H. T. Carter (12.)

Radial tubes cylindrical-prismatic, mostly hexagonal, coalesce with their edges throughout the whole length to the low distal conus. Between those triangular prismatic inter-canals. Dermal surface corymbate-shaggy. Gastral surface with slender and small spines. Acerate spicules only at the distal conus of each tube forming a thinner or thicker bundle, cylindrical, straight or curved, at both ends tapering continuously to a fine point much longer, and 2 to 4 times as thick as the triradiate and quadriradiate spicules. Tubar triradiate spicules sagittal, with unequal

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(1.) *T. E. Gray.* Notes on the arrangements of Sponges, with the description of some new Genera. Proceedings of the Zoological Society of London, 1867, p. 554.

(2.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870. Band V., Heft 2, p. 239.

(3.) *O. Schmidt.* Adriatische Spongien, l.c., p. 14, Taf. I., figs. 1-1d.

(4.) *N. Lieberkuehn.* Neue Beiträge zur Anatomie der Spongien. Archiv für Anatomie und Physiologie, 1859, p. 373, Taf. IX., fig. 3.

(5.) *S. delle Chiaje.* Memoire sulla storia e notomia degli animali senza vertebrate nopoli, Vol. III., p. 114.

(6.) *E. Haeckel* Prodromus, l.c., p. 239.

(7.) *E. Haeckel.* Prodromus, l.c., p. 238.

(8.) *E. Haeckel.* Prodromus, l.c., p. 239.

(9.) *E Haeckel.* Prodromus, l c., p. 239.

(10.) *E. Haeckel.* Prodromus, l.c., p. 245.

(11.) *F. E. Schulze.* Ueber den Bau and die Entwickelung von Sycandra raphanus, Haeckel. Zeitschrift fur wissenschaftliche Zoologie. Band XXV., Suppl., Seite 247, Taf. XVIII., XIX., XX., XXI.

(12.) *H. T. Carter.* On Grantia ciliata, var. spinispiculum, Crtr. Annals and Magazine of Natural History. Fifth Series. Vol. XIII., 1884, p. 153.

obtuse angles, the straight basal ray just as long or a little longer than the curved lateral rays. Gastral triradiate and quadriradiate spicules mostly regular or sub-regular with straight or slightly curved radii, nearly as long and thick as the tubar triradiate spicules. The slightly curved apical ray a little shorter than the 3 facial rays.

Colour: White, grey, or yellowish, seldom brown.

Locality: Mediterranean (Nice, Naples, Messina, Triest, Lesina, Haeckel; Triest, Zara, Sebenico, Lesina, Cette, O. Schmidt; Triest, Lieberkuehn); Red Sea, Siemens; Indian Ocean, Ceylon, Wright; Australia, St. Vincent's Gulf, Schomburgk; Bass's Straits, Wendt; Philippines, Bohol, Semper; Japan, Jeddo, Gildemeister.

15. SPECIES. SYCANDRA ARBOREA. Haeckel (1.) SYCON ARBOREA. Poléjaeff (2.)

Branched colonies composed of more or less cylindrical Sycon-Persons. No peduncles and small frills. Colonies composed of from 5 to 30 persons. Each measuring from 8-20 mm. in length and from 4 to 8 mm. in diameter. Inhalent pores very regularly disposed and surrounded by rings of sensitive cells and a sphincter. They lead into spherical subdermal extensions of the intercanals, which are wide and have a quadratic transverse section.

Spicules: Gastral quadriradiate spicules. The radial centripetal ray pointing towards the Osculum and also curved in that direction, pointed, conic 0·04—0·06 exceptionally 0·08 x 0·008 (Haeckel), 0·08 x 0·008 my measurements. The two aboral rays paired and straight, the other longitudinal and curved, concave towards the gastral cavity. All of equal size, 0·037—0·04 x 0·006. Parenchymal Triradiates sagittal. Lateral rays 0·06—0·1 x 0·005—0·006. The unpaired ray in the proximal part of the ciliated tubes shorter than the others 0·05 x 0·004; in the distal part longer, 0·12 x 0·007 mm. Dermal acerates short and stout,

(1.) *E. Haeckel.* L.c., Seite 331; Taf. LIII., figs. 1a-1t; Taf. LVIII. fig. 7.
(2.) *N. Poléjaeff.* L.c. Part XXIV., p 40.

curved and irregularly amassed on the summits of the ciliated tubes. In each group 6-10 long, acerates 0·96—1 x 0·05, and very numerous; shorter ones 0·02—0·04 mm. long of the same thickness. All these are inflated at the distal ends. The terminal knobs form a hard pavement. They have a diameter of 0·08—0·1 mm.

Locality: East coast of Australia; Sydney, Frauenfeld; Port Jackson, von Lendenfeld; South Coast of Australia; Bass's Straits, Wendt; Moncoeur Island, Challenger; Port Phillip, von Lendenfeld.

16. SPECIES. SYCANDRA ALCYONCELLUM. Haeckel (1.)

Alcyoncellum gelatinosum. de Blainville (2.)
Alcyoncellum gelatinosum. T. E. Gray (3.)
Sycidium gelatinosum. E. Haeckel (4.)
Grantia gelatinosa. T. S. Bowerbank (5.)
Grantia virgultosa. T. S. Bowerbank (6.)

Radial tubes prismatic, mostly octagonal, coalesce with their edges throughout the whole length to the low distal conus, between them narrow quadrangular prismatic inter-canals are situated. Dermal surface smooth, plain, regularly pannelled. Gastral surface covered thickly with bristles and spines. Acerate spicules forming only at the distal conus of each tubus, a dense and short reversed conic bundle, the base of which is a hexangular dermal pannel. Acerate spicules partly club-shaped, partly nail-shaped. The inner ends are thin

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., p. 333. Band III; Taf. LIII., figs. 2o-2d; Taf. LVIII.

(2.) *M H. de Blainville.* Manual d'Actinologie ou de Zoophytologie, Paris 1834, p. 529, pl. XCII., fig. 5.

(3.) *T. E. Gray.* Notes on the Arrangements of Sponges with the Description of some New Genera. Proceedings of the Zoological Society, 1867, p. 557.

(4.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft. Band V., Heft 2, p. 245.

(5.) *T. S. Bowerbank.* On the Generic name Alcyoncellum. Annals and Magazine of Natural History, 1869. Vol. III., p. 84.

(6.) *T. S. Bowerbank.* Manuscript.

and pointed, the outer ends thick and rounded. Tubar triradiate spicules with right angles, the proximal and distal spicules more or less differentiated. Gastral quadriradiates mostly regular or subregular, with straight and thin facial rays. Their apical ray very strong, cylindrical or spindle-shaped, straight or slightly curved, thicker and longer (twice as large) as the rays of the proximal triradiate spicules.

Colour : Dry, and in spirit, white or yellowish.

Locality : Indian Ocean, Quoy et Gaimard ; Java, Mulder ; West Coast of Australia, Harvey ; Fremantle, G. Clifton ; Mouth of the Murray River, Ray.

17. SPECIES. SYCANDRA RAMSAYI. Nov. spec.

Sac-shaped or spherical Sycandræ which never form colonies, obtaining a height of 50, and a diameter of 40 mm. The body wall is very thick, so that even the largest specimens have a comparatively small Gastral cavity which is more or less tubular, sac-shaped. In consequence of the thickness of the body wall, the ciliated tubes attain an exceptional length ; they are longest in the middle of the Sponge. Their length decreases towards the oral and aboral end. The Sponge attains in consequence of the long protruding dermal acerates, a very hairy appearance. The circular Osculum 5 to 10 mm., in diameter, is surrounded by a frill of very long (4 mm.) longitudinal Acerates. The protruding nearly conic distal end of the ciliated tubes are crowned by clusters of very long and slender acerates.

Spicules : Gastral radiate spicules very slender, irregular. Centripetal radial ray conic or cylindrical nearly straight, 0·22 x 0·005 ; transverse tangental rays straight, 0·2 x 0·0048 longitudinal tangental ray 0·1 x 0·003—0·004 pointing towards the aboral pole. The centripetal radial rays protrude into the Gastral cavity.

Parenchymal Spicules : Triradiates and quadriradiates with numerous transition forms. The largest quadriradiates perfectly regular, all rays straight slender and slightly conic. 0·17 x 0·0048. The rays of the largest triradiates which are likewise regular, of the same dimensions. Towards the outer surface, the spicules become sigittal, the unpaired rays always being longer and pointing outwards.

Measurement of the dermal quadriradiates and triradiates :

Centrifugal ray 0·15—0·18 x 0·006 ; tangental rays 0·07—0·12 x 0·006. Dermal protruding acerates straight, slightly leaning towards the Osculum, cylindrical in the centre end conic at both ends ; the proximal end more abruptly pointed than the distal end. 1·8—2·5 x 0·021 mm.

Locality : East Coast of Australia, Port Jackson, "Bottle and Glass," on black mud, 10 fathoms. Ramsay.

This Sponge, one of the most beautiful in Port Jackson, was provisionally set down by Miklouho-Maclay (manuscript), as Baeria Ramsayi. The Genus Baeria may with further investigation be re-established, when we are in a position to replace Haeckel's artificial classification by a more natural one. The specific name has been adopted.

II. SUB-FAMILY. UTEINÆ. Von Lendenfeld.

Syconidæ the ciliated tubes of which coalesce throughout, so that there are no projecting distal cones, but a smooth and continuous outer surface. The tubes are simple unbranched ; no complicated canal system.

8. GENUS. GRANTESSA. Von Lendenfeld.

Uteinæ with sparsely scattered bunches of long dermal protruding Acerates, which are not determined in their number or position by the ciliated tubes. Sensitive cells in clusters on the inner side of the strictures which surround the inhalent pores.

18. SPECIES. GRATESSA SACCA. Nov. spec.

Large sackshaped Uteinæ, which do not form colonies and are characterized by the largeness of their gastral cavity and the thinness of the body-wall. The sponge attains a length of 80 mm., and has the shape of a straight or slightly curved cylinder, with a circular transverse section, and a diameter of 20 to 25 mm. The body wall is only 2 to 2·5 mm. thick. Intercanals triangular regular and conspicuous connected with the outer water by small pores which pervade the dermal layer. No subdermal cavities.

Spicules: Gastric quadriradiates rare. One differentiated ray protruding into the gastral cavity, straight, short and stout, conic and pointed 0·055—0·006 x 0·005. Tangental rays regular in one plane, vertical to the centripetal ray 0·07 x 0·005.

Triradiate spicules of the Parenchyma, sigittally differentiated. Centrifugal unpaired ray straight, conic, rounded at the end 0·2—0·3 x 0·006—0·007 mm; the paired rays slightly bent irregularly or curved with the convex side looking inwards 0·11 x 0·005. Regular Triradiates with straight, cylindrical, abruptly pointed rays are met with towards the outer surface. Their rays measure 0·1—0·14 x 0·007. Dermal Triradiates similar in shape to the sagittal ones in the Parenchyma are very numerous. Their unpaired ray is situated radially and points inwards. The paired rays stand nearly vertical on the sagittal one and are very variable in size, always however very slender; they form a dense and hard dermal felt. The dermal acerate spicules are cylindrical and pointed at both ends, more abruptly at the distal end. They are very slender and in specimens nearly always broken off in consequence of their extreme tenderness. They measure 2—3 x 0·014 mm. These spicules are amassed in clusters of 10 to 15 and they protrude $\frac{5}{6}$ths of their length beyond the surface, on which they stand vertical. The clusters are regularly disposed and situated at intervals of about 2 mm., from one another. In these "villi" also small linear Acerates are met with.

Locality: East Coast of Australia, Port Jackson on rocky bottom 5 to 10 fathoms. Ramsay, Von Lendenfeld.

9. GENUS. UTE. O. Schmidt (1).

Uteinæ, with a cortex consisting mainly of several layers of large acerate spicules disposed tangentally.

(1.) *O. Schmidt.* Die Spongien des Adriatischen Meeres. Leipzig, 1862. Seite 16.

19. SPECIES. UTE ARGENTEA. Poléjaeff (1.)

The Sponge has the shape of an elongated tube, 40 mm. long and 3 mm. thick. (The only specimen.) Bodywall 0·5 mm. thick. Half of its thickness is taken up by the strong cortex. Outer surface smooth.

Skeleton of the gastric surface: This consists of an outer layer of quadriradiate, of an inner layer of quadriradiate or triradiate, and of minute acerate spicules, scattered amongst those just mentioned without any regular order.

Outer quadriradiate Spicules: Basal and lateral rays straight, sharply or rather bluntly pointed, all of the same diameter, 0·01 mm., and usually of the same length (0·25 mm. on an average); basal ray forming with each of lateral rays an angle of 115° ; apical ray curved tapering from the base to a sharp point, reaching 0·15 mm. in length with a diameter of 0·01.

Inner quadriradiate Spicules: Basal ray straight, tapering from base to sharp point, usually rather thinner than lateral rays, forming with each of them an angle of about 100°, length inconstant, varying from 0·18 mm. to 0·5 mm. ; lateral rays curved inwards, tapering from the base to sharp points, reaching 0·3 mm. in length, 0·0125 mm. in diameter; most of them are truly quadriradiate, their apical ray being occasionally longer, 0·2 mm., than that of the outer quadriradiate spicules; its length is, however, variable, and there are amongst the inner quadriradiate spicules others with a merely incipient apical ray, and even quite deprived of it.

Minute acerate Spicules: Straight or slightly curved, spindle-shaped, tapering from the centre to a sharp point at either extremity, usually 0·1 mm. long 0·002 mm. in diameter.

Skeleton of the radial tubes: The tubar skeleton consists of subgastric triradiate spicules, reaching with their centrifugally

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 43, pl. I., fig. 3; pl. IV., fig. 3; pl. V., fig. 1a-1p.

directed basal ray to the zone of the cortical acerate spicules. Tuber Acerate lying parallel to the basal ray just mentioned, and tubar quadriradiate spicules scattered here and there at the bottom of the radial tubes.

Subgastric triradiate Spicules: All rays of the same thickness, 0·013 mm ; basal ray straight, tapering from the base to a sharp point, its average length 0·3 mm. ; lateral rays slightly curved inwards, forming with basal ray an angle varying from 100° to 110°, rarely exceeding 0·15 mm. in length.

Tubar quadriradiate Spicules: All rays in different planes, lateral rays forming one curve, basal and apical rays another; basal ray bluntly pointed, cylindrical 0·0025 mm. thick, rarely longer than 0·003 mm. ; lateral rays straight or slightly curved, tapering from the base to sharp points, each forming with basal ray an angle of about 110°, reaching 0·05 mm. in length, with a diameter of 0·002 ; apical ray slightly curved, sharp pointed, of the same diameter as lateral rays, but usually three times shorter.

Tubar acerate Spicules: Straight or slightly curved, tapering from the centre to sharp points, rarely longer than 0·3 mm., with a diameter of 0·005.

Skeleton of the Cortex: The skeleton of the Cortex consists of large spindle-shaped acerate, of minute acerate, and of sagittal triradiate spicules, with the basal ray directed towards the closed end of the Sponge.

Large acerate spicules straight or slightly curved, tapering from the centre to a sharp point at either end ; length varying from 1 to 3 mm., diameter from 0·05 to 0·12 mm.

Minute acerate Spicules: Like those of the gastric surface spindle-shaped, straight, or slightly curved, tapering from the centre to sharp points, rarely exeeding 0·15 mm. in length and 0·0028 mm. in diameter.

Sagittal triradiate Spicules: Basal ray smooth, either of cylindrical form or tapering from the base to a sharp point, reaching 0·75 mm. in length, with a diameter of 0·005 ; lateral rays sharp pointed, forming with basal ray an angle of 112°, either straight or more frequently slightly curved, usually inwards, twice as thick as basal ray; length inconstant, varying from 0·025 mm. to 0·12 mm.

Locality: Station 163, April 7, 1874; latitude 36° 56′ S., longitude 150° 30′ E., depth 120 fathoms; off Twofold Bay, Australia. (Challenger.)

10. GENUS. SYCORTUSA. Von Lendenfeld.

Uteinæ with minute acerate spicules in the cortex. Identical with Haeckel's (1) Subgenus Sycortusa.

20. SPECIES. SYCORTUSA LÆVIGATA. Von Lendenfeld.
SYCORTIS LÆVIGATA. Haeckel (2.)

Cylindrical radial-tubes irregularly prismatic, coalesce with their sides. No distal cones. Dermal surface and gastral surface smooth. Acerate spicules very small in dense masses felted in the dermal surface and forming a kind of cement, which covers the whole Sponge. Here we find regularly disposed sagittal triradiate spicules with straight rays, the basal ray which points to the aboral pole, of which is three times as long as the lateral rays. Tubar triradiate spicules sagittal, with straight rays; the mesial angle much larger than the paired ones. The basal ray two to three times as large as the lateral ones. Most of the gastral triradiate spicules irregular, with strongly curved unequal rays and very varying angles without any order closely packed in the gastral surface. All triradiate spicules of the skeleton of the same thickness, six times as thick as the minute acerate spicules of the dermal surface.

Colour: In spirit, white.

Locality: South Coast of Australia (St. Vincent's Gulf, Schomburgh.)

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 278.
(2.) *E. Haeckel.* L.c. Seite 285. Taf. 49,

11. GENUS. AMPHORISCUS. Von Lendenfeld.

The radial rays of the dermal quadriradiate spicules and the centrifugal rays of the Gastral spicules are joined, or the former penetrate the whole thickness of the body wall.

This genus is nearly identical with Poléjaeff's Amphoriscus, Haeckel (1), but very different from Haeckel's (2) Genus Amphoriscus.

21. SPECIES. AMPHORISCUS CYLINDRUS. Von Lendenfeld.
SYCILLA CYLINDRUS. Haeckel (3.)

Radial tubes prismatic, dermal surface flat, smooth. Gastral surface shortly spined. Gastral quadriradiates sagittal; rays cylindrical, straight and short trunkate, 0·008—0·012 mm. thick. Basal ray 0·24, both lateral ones 0·16, the free apical ray which is slightly curved towards the Osculum only 0·06—0·09 mm.

Parenchymal quadriradiate spicules sagittal; radial rays 0 016 mm. thick. Basal 0·3, both lateral 0·2, and the straight centrifugal apical ray 0-5—0·6 mm.

Dermal quadriradiate spicules, all four rays are cylindrical at basal half, 0·024 mm. thick, in the apical half slender, conic. Basal ray straight, 0·5 mm. long, nearly twice as large as the lateral rays, which are only 0·3 mm. The centripetal apical ray, 0·8 mm.. reaches to the subgastral layer.

Locality: Adriatic, E. Haeckel; East Coast of Australia, Port Jackson, von Lendenfeld.

22. SPECIES. AMPHORISCUS POCULUM. Poléjaeff (4.)

The single specimen representing this species in the Challenger collection is of tubular elongated form, 36 mm. long 4 mm. broad in its middle and superior part; towards the closed end the tube

(1.) *E. Haeckel.* L.c. Seite 46.
(2.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift fur Medicin und Naturwissenschaft, 1870. Band V., Heft 2., Seite 238.
(3.) *E. Haeckel.* L.c. Seite 254. Taf XLIII., fig. 5-7. Band III.
(4.) *Poléjaeff.* Report on the Calcarea. The Zoologie of the Voyage of H.M.S. Challenger, Part XXIV., p. 46, pl. IV., fig. 4; Pl. V., figs. 2a-2f.

becomes rather narrower. The individual is bare-mouthed; the outer and inner surfaces are slightly roughened by the cortical and gastric triradiate spicules respectively; the average thickness of the wall does not exceed 0·6 mm.

Skeleton: The skeleton consists of gastric triradiate, subgastric triradiate, subdermal triradiate, dermal triradiate and acerate spicules.

Gastric triradiate spicules sagittal, all rays in the same plane and of the same diameter 0·015 mm.; basal ray straight, tapering from the base to a sharp point, length inconstant, usually one and a half times as long as the lateral rays, often much shorter, lateral rays curved outwards, cylindrical, either sharply or rather bluntly pointed, each forming with basal ray an angle of about 110°, on an average 0·25 mm. long. *Subgastric triradiate spicules,* sagittal, all rays of the same diameter 0·02 mm.; basal ray straight, tapering from the base to a sharp point, usual length 0·38 to 0·45 mm., lateral rays sharp pointed, curved, often angularly bent in their middle or basal part rarely exceeding 0·275 mm. in length, forming with each other an angle varying from 170° to 140°, and with the basal ray an angle varying from 106° to 120°.

Subdermal triradiate spicules irregular; all rays usually of the same thickness, 0·015 mm., but of different lengths, lying in the same plane; basal ray straight, tapering from the base to a sharp point, rarely exceeding 0·1 mm. in length, occasionally rather thinner than lateral rays, forming with each of these an angle of about 120°; lateral rays curved forwards, sharp pointed of different lengths, the longer directed centripetally, reaching 0.35 mm. often, however, considerably shorter, scarcely longer than the shorter ray, the length of which varies from 0·12 to 0·15 mm.

Dermal triradiate spicules sagittal; all rays of the same diameter, 0·02 mm., usually sharp pointed; basal ray straight, length inconsistent, not exceeding 0·425 mm.; lateral rays curved, each forming with basal ray an angle of about 120°; average length 0·25 mm. *Acerate spicules* usually spindle-shaped, often lanceolate, sharp pointed ; the lanceolate straight the spindle-shaped either straight or slightly curved ; attaining a length of 1 mm. and a diameter of 0·05 mm. ; a few much shorter and stouter, the proportion between the length and the thickness being 6:1 Sparsely scattered in the parenchyma, their free end projecting from the outer surface being usually broken off ; piercing the wall perpendicularly to the longitudinal axis of the Sponge.

Colour : Pale yellowish.

Locality : Station 163A, June 5, 1874 ; off Port Jackson, East Coast of Australia ; depths, 30 to 35 fathoms ; rock. (Challenger.)

23. SPECIES. AMPHORISCUS CYATHISCUS. Haeckel (1.)

SYCILLA CYATHISCUS. E. Haeckel (2,)

Radial tubes prismatic, coalesce entirely with their sides, no distal cone. Dermal surface plain, smooth, Gastral surface with short spines. The skeleton consists of quadriradiate spicules. The *quadriradiate* spicules of the skeleton possess throughout sagitally differentiated facial rays and form four layers :— 1. A dermal layer of parallel quadriradiate spicules, the straight basal ray and the knee-shaped lateral rays are situated in the dermal surface, whilst the centripetal apical ray penetrates the distal half of the gastral wall. 2. A subdermal layer, which is perfectly similar to the dermal one, and which lies just underneath it. 3. A subgastral layer of parallel quadriradiate spicules, the facial rays of which are situated underneath the gastral layer, whilst the centrifugal apical ray which is two to three times as long as the former, penetrates the greater part of the gastral wall. 4. A gastral layer of parallel quadriradiate spicules, the fascial rays of which lie in the gastral surface. The apical ray is much shorter and protrudes into the gastral cavity. The dermal

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(1.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme Jenaische Zeitschrift für Medicin und Natur Wissenschaft, 1870. Band V., Heft. 2, p, 238.

(2.) *E. Haeckel.* Die Kalkschwämme, Eine Monographie. Band II., p. 250, Taf. XLIII., figs. 8-11, Band III.

quadriradiate spicules as thick as the gastral ones, and three to five times as thick as the gastral quadriradiate spicules.

Colour : White in spirits and in the dry state.

Locality: Coast of South Australia (Sonder.)

III. SUB-FAMILY. GRANTINÆ. Von Lendenfeld.

Syconidæ with ramified ciliated tubes, with a complicated inhalent canal system.

12. GENUS. GRANTIA. Von Lendenfeld

The skeleton consists of acerate, triradiate and quadriradiate spicules. which are all of the same size exclusively. Groups of sensitive cells around the inhalent pores. This Genus is nearly identical with Poléjaeff's " Grantia Fleming " (1), but very different from Flemings (2) original Genus Grantia. Transition-forms between Syconidæ, Sylleibidæ and Leucopsidæ (3).

24. SPECIES. GRANTIA LOBATA. Von Lendenfeld.
SYCANDRA COMPRESSA var. LOBATA. E. Haeckel (4).

The specimens of Grantia compressa, Fleming, in Australian waters are all cylindrical, solitary persons and must be referred to Haeckel's variety " lobata." I therefore consider myself justified in raising this variety to the rank of a species.

The Sponge attains a height of 25 mm. and a diameter of 6 mm. The body wall is 1·5 mm. thick. The ramifications of the ciliated tubes only slight.

Spicules : Gastral quadriradiate spicules irregularly scattered, generally disposed in such a manner that the sagittal ray stands

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger, Part XXIV., p. 41.

(2) *J. Fleming.* History of British Animals, 1824, p. 524.

(3.) *F. E. Schulze* describes that also in Sycandra the ciliated tubes are slightly ramified, and may even form a reticulation at the base of the Sponge; sharp distinction between the families can of course not be expected.

(4.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Part II., Seite 362.

radial. Tangental rays 0·1—0·15 x 0·305 mm., cylindrical slightly bent, pointed. Centripetal ray 0·04—0·08 x 0·007 mm. shorter and thicker than the tangental ones. Triradiates of the Parenchyma sagittal, basal ray 0·2 x 0·007, lateral rays slightly curved 0·09—0·12 x 0·007 mm. There are 2-3 layers of these spicules in the body-wall. The cortex contains triradiates and acerates. The former are mostly regular, disposed tangentally the three rays nearly in one plane cylindrical, pointed 0.09—0·12 x 0·007 mm. The Acerates are bent on the outer end rectangularly so as to attain the shape of hooks. The longer portion is immersed in the sponge with its proximal two thirds and stands vertical on it and measures 0·2 x 0·014 mm., the bent outer part 0·05 x 0·014 mm., centripetal end conic, both pointed. The outer part of these Acerates points towards the Osculum.

Locality : East Coast of Australia, Port Jackson, V. Lendenfeld ; Europe, E. Haeckel.

13. GENUS. HETEROPEGMA. Poléjaeff (1).

Grantinæ with a highly developed cortex containing triradiates and quadriradiates, totally different from those of the Parenchyma, ciliated tubes much branched.

25. SPECIES. HETEROPEGMA NODUS GORDII. Poléjaeff (2.)

This species forms colonies of a rather Asconoid appearance. The tubes, sometimes standing vertically, sometimes lying horizontally, ramify and interlace, thus constituting a kind of knot in which neither beginning nor end can be discerned. The individuality of the tubes is expressed only by Oscula, these latter being naked. The size of the Oscula is inconstant, varying from 0·25 mm. to 1 mm. in diameter. Both the surfaces are rough. The average thickness of the wall is 1 mm., the diameter of the inner cavity 1 to 2 mm. The radial tubes are of irregular outline, and show a great tendendy to ramify.

(1.) N. *Poléjaeff.* L.c., 25-45.
(2.) N. *Poléjaeff.* L.c., p. 45, pl. I., fig. 7 ; pl. IV., fig. 1a-1d.

Skeleton: The tubar quadriradiate spicules are regular, their rays either tapering from the base to a sharp point, or of cylindrical form with truncated ends; in both cases the proportion between the length and the thickness of the rays at their base remaining the same 0·01, their length being 0·06 mm., their diameter 0·002 mm. These regular spicules of the radial tubes are connected by all possible intermediate stages with sagittal and irregular quadriradiate spicules supporting the inner surface. Constant as to the thickness of their rays, only near to the Osculum exceeding 0·002 mm., the gastric quadriradiate spicules vary extremely with regard to the comparative length of the rays, as well as with regard to their form and their angles. The apical rays, which in the tubar quadriradiates do not exceed the length of the facial rays, and are often still shorter, grow much longer in the gastric quadriradiate spicules, and near the Oscular part of the tube attain 0·18 mm. in length, and 0·005 mm. in diameter, the corresponding facial rays rarely exceeding the length of 0·06 mm., the lateral rays remaining of the same diameter, 0·005., the basal ray growing rather thinner.

Skeleton of the cortex. The triradiate and quadriradiate spicules of the cortex are regular, their rays sharp-pointed, more or less stout, the proportion between their length and thickness varying from 6·1 to 12·1. With respect to their dimensions, the quadriradiate are connected with the triradiate spicules by intermediate stages; the length of the rays of the quadriradiate reaching 1 mm., that of the rays of the triradiate not exceeding 0·6 mm. These spicules lie apart from the centripetally directed apical ray of the quadriradiate spicules, parallel to the outer surface, but the direction of the basal rays is variable.

Skeleton of the Osculum. The skeleton of the border of the Oscular circle consists exclusively of rectangular sagittal triradiate spicules, marked by their horn-shaped lateral rays, lying parallel to the line of the border. Their size is extremely inconstant, the length of the rays from 0·05 to 0·25 mm., and the proportion between the length and the thickness from 10·1 to 20·1. The comparative length of the basal ray is also variable; in most cases, however, this ray is shorter and rather thinner than the lateral.

Colour: Yellowish-grey.

Locality: Station 36, April 23, 1873, off Bermuda's, depth 32 fathoms; Mud Station 186, September 8, 1874; Lat. 10° 30′ S. Lon. 142° 18′ E.; Cape York, Australia; depth, 8 fathoms, Coral Sand, Challenger.

14. GENUS. ANAMIXILLA. Poléjaeff (1.)

The spicules in the Parenchyma irregularly disposed, more or less tangental as in the Leuconidæ. Ciliated tubes slightly branched.

26. SPECIES. ANAMIXILLA TORRESII. Poléjaeff (2.)

The single specimen of Anamixilla torresii of the Challenger collection, presents a colony of tubular individuals; some individuals are bare-mouthed, some mouthless. The thickness of different individuals varies from 1 to 9 mm., the width of the walls is more constant, reaching 1 mm. on the average. The inner surface is slightly roughened by the protruding rays of the gastric quadriradiates, the outer surface is in a still higher degree roughened by the cortical triradiate spicules.

Skeleton: *Gastric quadriradiate spicules.* All rays of the same diameter, 0·02 mm.; basal ray straight, either sharply or bluntly pointed, of conical form, length varying from 0·16 to 0·4 mm., occasionally rather thicker than lateral rays, forming with each of these an angle of about 115°, lateral rays curved outwards, often highly undulating, tapering fiom the base to a sharp point, usual length 0·35 to 0·4 mm.; apical ray curved, sharply pointed, its length not exceeding 0·06.

Gastral triradiate spicules: Rays smooth, tapering from the base to sharp points, reaching 0·4 mm. in length, with a diameter of 0·015 mm.; basal ray straight, lateral rays slightly curved

(1.) *N. Poléjaeff.* L.c., p. 50.
(2.) *N. Poléjaeff.* L.c., p. 50, pl. IV., fig. 2a-2c.

inwards, each forming with basal ray an angle of about 110°; some of them are provided with embryonic apical rays, reaching occasionally 0·2 to 0·3 mm. in length.

Subgastric triradiate spicules: Sagittal; lateral rays either lying in the same plane or forming with one another an angle varying from 180° to 140°; all rays of the same diameter, varying from 0·02 to 0·05 mm.; basal ray straight tapering from the base to a sharp point reaching 0·8 mm. in length; lateral rays curved, often undulating usually half as long as basal ray, often of the same length, occasionally even longer, not exceeding however 0·8 mm. *Triradiate spicules of the Parenchyma* either quite regular, or showing a slight tendency to sagittal differentiation; rays sharply pointed maximum size about 1 mm., diameter varying from 0·1 to 0·025 mm.

Dermal triradiate spicules: Regular, more slender than the triradiate ones just described; rays either tapering from the base to a sharp point or of cylindrical form; average size of the rays 0·3 mm. in length by 0·02 mm. in diameter.

Color: Pale yellowish.

Locality: Torres Straits, Australia, September 7, 1874; depth 3 to 11 fathoms. Challenger.

5. FAMILY. SYLLEIBIDÆ. Von Lendenfeld.

Heterocoela with a complicated exhalent canal system, connecting the sack-shaped, cylindrical ciliated chambers with the gastral cavity. The Sylleibidæ are transition-forms between Syconidæ and Leuconidæ. They can be considered as Syconidæ with an exhalent canal net, or as Leuconidæ with cylindrical sack-shaped ciliated chambers. I establish this family for Leucetta vera and the Genus Lucilla of Poléjaeff and devide it into two Subfamilies, which represent different modes of development of the Canal system and which I name after the two greatest authorities on Calcispongiæ among the younger zoologists, Vosmaer and Poléjaeff.

I. SUB-FAMILY. VOSMAERINÆ. Von Lendenfeld.

The ciliated chamber-tubes are all situated at the same distance from the main axis of the sponge-person and all stand radially like the simple ciliated tubes of the Syconidæ. The layer of ciliated chambers is cylindrical. A thick layer of reticulate exhalent Canals intervenes between the ciliated chambers and the gastral cavity. The inhalent canals also form a reticulation.

15. GENUS. VOSMÆRIA. Von Lendenfeld.

Vosmærinæ with triradiate, quadriradiate, and acerate spicules. Sensitive cells in small irregularly scattered clusters on the surface. I cannot agree with Poléjaeff in combining forms like his Leucetta vera and Haeckeliana with different ciliated chambers and a different canal system to one Genus, and I have no doubt that Poléjaeff will gladly accept an alteration on this point, according to the structure of the canal system, the importance of which he has very correctly asserted.

27. SPECIES. VOSMÆRIA GRACILIS. Nov. spec.

The Sponge has the outer appearance of an ordinary Syconid, is ovate or cylindrical, does not form colonies and attains a length of 25 mm. and a diameter of 12 mm. The circular, terminal small Osculum is surrounded by a frill. The gastral cavity is cylindrical, the body wall attains in the central and lower part of the Sponge a thickness of 2·5-4 mm. The ciliated chambers are of the uniform length of 1·1 mm., only towards the Osculum they are shorter. The Sponge appears hairy. The reticulation of the inhalent canals is but slightly developed, that between the ciliated chambers and the gastral cavity on the other hand attains a diameter of 2 mm. In this part of the Sponge the sexual cells are matured. The inhalent canals are narrower than the ciliated chambers. The latter possess a width of 0·14 mm. The exhalent canals are of very varying dimensions and irregular, sometimes as narrow as 0·05 mm. often attaining a diameter of 1 mm. They open into the gastral cavity by means of distant circular pores 1·1-2 mm. in diameter. These pores are pretty regularly disposed towards the Osculum on an average 5 mm. apart. Near the base as near as 2 mm.

Spicules: The skeleton consists of gastric quadriradiates, triradiates of the Parenchyma (two kinds), dermal acerates and long acerates around the Osculum. *The gastric quadriradiates* are very curiously shaped. One ray protrudes into the Gastral cavity. This centripetal ray is slightly bent upwards, conic and slightly rounded at the end, it measures 0·1 x 0·0074 mm. One of the three other rays, which are tangental, is very much longer than the other two, and points away from the Osculum. This ray measures 0·15 x 0·005, it is conic, slightly rounded at the end, and regularly curved, turning the concave side towards the Gastral cavity or canal. The angle between this ray and the centripetal one is about 110°, with the tangental rays about 133°. The paired tangental rays measure 0·05—0·06 x 0·003 mm. These quadriradiates are met with not only in the Gastral wall, but also in the larger exhalent canals. The further away from the stomach, the smaller the longitudinal and centripetal rays become. *Triradiates of the Parenchyma* of the two kinds. Regular ones with mostly straight cylindrical rays with rounded ends, measuring 0·1 x 0·005, and sagittal triradiates, the unpaired ray of which is situated centrifugally and longer than the other two with which it encloses angles of about 125° ; it measures 0·15 x 0·005. The paired rays 0·08 x 0·004. All rays straight, conic and sharp pointed. Dermal acerates in clusters of 15-20, immersed in the Sponge one-tenth of their entire length, pointed at both ends, tapering towards the terminal end throughout the projecting part nearly vertical on the surface, measuring 1 x 0·007 mm. The clusters of these spicules are very close to one another, so that the Sponge appears hairy velvet like. The clusters are not determined in their position by the ciliated tubs below, as in Grantessa. The acerate spicules of the Oscular frill measure 2 x 0·0065 and taper towards the upper end. The distal half is only 0·0006 thick, very flexible and moves backward and forward like a soft thread, with the liquid in which the Sponge is immersed.

Locality: East Coast of Australia, Port Jackson. Von Lendenfeld.

28. SPECIES. VOSMAERIA IMPERFECTA. Von Lendenfeld.
LEUCETTA IMPERFECTA. N. Poléjaeff (1.)

This species is bare-mouthed, of tubular, elongated, cylindrical form, 35 mm. long, and 5 mm. in diameter, the thickness of the wall being 1·25 mm. that of the cortex 0·35. Both the surfaces are rather rough. The characteristic peculiarities of the species consists in the form of its pigmy triradiate, and in the presence of the parenchyma of large quadriradiate spicules, not differing either in size or in form from those of the cortex; these last are not numerous.

Gastric quadriradiate spicules. All more or less regular; facial rays straight, smooth, tapering from the base to approximately sharp points 0·06 mm. long, diameter varying 0·006 mm. 20·008 mm. Apical ray either straight or curved, often irregularly bent, sharply pointed; length constant, reaching 0·08 mm. *Minute quadriradiate and triradiate spicules of the Parenchyma.* Quadriradiates just of the same form and dimensions as those of the gastric surface, not numerous; triradiates still smaller, their rays rarely exceeding 0·025 mm. in length, and 0·002 mm. in diameter; some of these are regular, their straight and smooth rays tapering from the base to sharp points; but such regular triradiate forms are extremely rare; most present only two rays, forming an angle varying from 120° to 16°, the basal ray having become rudimentary, and being represented only by a small process at the crossing of the lateral rays.

Quadriradiate spicules of the Parenchyma and cortex. Both of the same form and the same very inconstant dimensions, the length of their rays varying from 0·3 mm. to 1 mm., and even more. Regular rays smooth, tapering from the base to sharp points, usually ten times as long as thick.

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XIV., p. 67, Pl. VII, figs. 9a-9c.

Dermal triradiate spicules. Like the quadriradiates just described, regular, but more constant with respect to the proportion of the length of their rays to their thickness ; this proportion varies from 10/1 to 16/1. Rays smooth, of conical or cylindrical form, bluntly pointed, average length 0·6 mm.

Locality : Station 163A, 1874 ; off Port Jackson, Australia ; depth, 30 to 35 fathoms, rock. Challenger.

29. SPECIES. VOSMAERIA HAECKELIANA. Von Lendenfeld.
LEUCETTA HAECKELIANA. N. Poléjaeff (1).

The largest specimen reaches 65 mm., in length with a maximum diameter of 10. ; the walls are 2·5 mm., thick, the cortex strongly developed. The outer surface is smooth, the inner slightly rough. Gastric and parenchymal quadriradiate spicules : either regular or sagittal, the lateral rays becoming more or less curved, or even irregular, all rays instead of being straight becoming irregularly bent and of different lengths ; all rays of the same average diameter 0·005 mm., tapering from base to sharp points; facial rays 0·02 mm., to 0·08 mm. The gastric radiate spicules follow the course of the exhalent canals throughout their whole length, and their presence or absence on the surface of the cavities of the parenchyma intimates whether we have to do with an exhalent or inhalent canal.

Dermal quadriradiate spicules : Extraordinarily rare ; regular ; all rays of the same length not exceeding 0·75 mm., by 0·075 mm., smooth tapering from the base to sharp points.

Dermal triradiate spicules : Regular, rays of a rather cylindrical form, 0·55 mm., long, 0·03 mm., in diameter, lying in the cortex in several parallel layers, becoming smaller in the low collar and sagittally differentiated, the angles between basal and lateral rays becoming more acute, 120°-95°, and the lateral rays themselves, like those in the Oscular triradiate spicules of Leucetta vera becoming horn-shaped.

Locality : Station 163A, June 3, 1874, off Port Jackson, Australia ; depth, 30 to 35 fathoms, rock. Challenger.

(1.) *N. Poléjaeff.* L.c., p, 69, Pl. II., fig. 6 ; Pl. VIII., figs. 1-6.

II. SUBFAMILY POLEJNÆ. Von Lendenfeld.

The ciliated chambers (tubes) vertical on the exhalent canals, disposed therefore radially around the canals and not equi-distant from the axis of the Sponge, the chamber layer not a simple cylinder but extensively folded.

16. GENUS. POLEJNA. Von Lendenfeld.

The spicules of the Parenchyma resemble Amphoriscus inasmuch as the centripetal rays of the dermal layer lie parallel with and meet the centrifugal rays of the gastral layer. Poléjaelff (1) has adopted Haeckel's name Leucilla for these Sponges. As the meaning which he gives to it however is totally different from that, which Haeckel associated with the word Leucilla, and as I retain the Genus Leucilla in the true sense of Haeckel I fancy myself justified in establishing this new name, which like the term Polejnæ is derived from the name of the author of the Challenger-Calcarea.

30. SPECIES. POLEJNA UTER. Von Lendenfeld.
LEUCILLA UTER. N. Poléjaeff (2.)

The external form of this Sponge is variable; mostly of tubular elongated form, growing narrower towards both ends, attaining a length of 100 mm. and a maximum diameter of 13 mm. The walls are 2 mm. thick.

Gastric quadriradiate spicules sagittal. All rays of the same diameter, 0·02 mm. on an average, more or less sharply pointed, basal ray straight, length inconstant, varying from 0·25 to 0·35 mm., forming with each of the lateral rays an angle of about 110° ; lateral rays curved outwards, reaching a length of 0·7 mm. ; apical ray curved, half as long as lateral rays. Towards the osculum these quadriradiate spicules grow smaller, lateral rays 0·3 mm. long, with a diameter of 0·0125 mm., the concave lateral rays becoming straight and convex.

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoologie of the Voyage of H.M.S. Challenger. Part XXIV.f p. 51.
(2.) *N. Poléjaeff.* L.c., p. 53, Pl. VI., figs. 2a-2f.

Subgastric triradiate spicules sagittal. All rays sharp pointed and of the same diameter, the proportion between their length and thickness varying from 12·1 to 20·1 ; length inconstant, not exceeding, however, 0·6 mm. in basal, and 0·42 mm. in lateral rays ; some are provided with a rudimentary fourth apical ray.

Quadriradiate spicules of the parenchyma and dermis : All rays of the same diameter, rarely exceeding 0·05 mm. ; facial rays usually of the same length, varying from 0·4 (rarely shorter) to 0 6 mm. ; basal ray straight, tapering from an approximately sharp point, forming with each of the lateral rays an angle of 105° to 110° ; lateral rays either straight or slightly curved inwards, sharp pointed ; apical ray straight, tapering from the base to a sharp point, never projecting from the inner surface, length varying from 0·4 to 1·2 mm.

Dermal acerate spicules straight, fine, linear, sharp pointed, surface smooth, length not exceeding 0·4 mm., with a diameter of 0·0025 mm. ; not numerous, projecting from the outer surface.

Locality: Station 36, April 23, 1873 ; off Bermudas ; depth, 32 fathoms. Station 209, January 22, 1875 ; Lat. 10° 10′ N., Long. 123° 55′ E. Philippine Islands ; depths, 95 to 100 fathoms Challenger. Torres Straits, Von Lendenfeld. Macleay-Museum.

6. FAMILY. LEUCONIDÆ. Von Lendenfeld.

Heterocoelia with ramified inhalent and exhalent canals with spherical ciliated chambers. The outer surface is not differentiated into two different parts. This family comprises the Leucones of Haeckel (1), with spherical chambers with the exception of the Teichonidæ.

17. GENUS. LEUCETTA. Von Lendenfeld.

Leuconidæ with triradiate spicules exclusively. This Genus is nearly identical with Haeckel's (2) Leucetta.

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 113.
(2.) *E. Haeckel.* L.c. Band II., Seite 116.

31. SPECIES. LEUCETTA MICRORHAPHIS. Von Lendenfeld.
LEUCETTA PRIMIGENIA var. MICRORHAPHIS. Haeckel (1.)
LEUCETTA PRIMIGENIA var. MICRORHAPHIS. Ridley (2.)

Both surfaces smooth. Triradiates regular. Rays straight, pointed. Numerous small spicules measuring 0·742 x 0·011, and rarer large ones of a similar shape measuring 0·8 x 0·085, very rare spicules of an intermediate size are also met with. I have many specimens of Haeckel's Leucetta primigenia, they are all slightly ramified; 3-6 cylindrical pieces with uneven surface grown together and meeting at sharp angles. These cylinders taper towards the dermal osculum and attain a length of 25 and a diameter of 8 mm. The gastral cavity is large. The body wall not exceeding 2 mm. in thickness.

The inhalent pores are covered by a thin perforated membrane as in other Sponges (Aplysillidæ) and lead into wide bulbous extensions from the proximal end of which the inhalent canals take their origin. A great number of Canals radiate from each subdermal lacune. The latter have a diameter of 0·12 mm. In the surface the small spicules are situated very regularly and tangentally disposed in such a manner that they form a network with hexagonal meshes. The pores are situated in the meshes, but there is not a pore to each mesh.

The spiculation of all these specimens is the same—as above—corresponding to Haeckels var. microhaphis of Leucetta primigenia. Ridley (l.c.) has obtained the same sponge from Torres Straits. The similarity in the structure of my specimen led me to assume that this variety of Haeckels should be considered as a species.

Locality: Australia ? Haeckel; North Coast of Australia, Torres Straits. Alert; East Coast of Australia, Port Jackson, Von Lendenfeld; South Coast of Australia, Port Phillip V. Lendenfeld.

(1.) *E. Haeckel.* L.c. Band II., Seite 119; Band III., Taf. 21. Figs. 10-17.

(2.) *Stuart O. Ridley.* Report on the Sponges. Report on the Zoological Collections made in the Indian and Pacific Ocean, during the Voyage of H.M.S. Alert, 1881-82. British Museum Catalogue, 1884, p. 482.

32. SPECIES, LEUCETTA DURA. Von Lendenfeld.
LEUCONIA DURA. Poléjaeff (1).

Irregular colonial or solitary Sponges with or without a frill round the Osculum. Gastral cavity small. Besides the regular spicules of large and small size there are irregular and sagittal Triradiates. The latter are amassed around the Oscula.

Locality: Bermudas, North Coast of Australia, Torres Straits Challenger.

33. SPECIES. LEUCETTA PANDORA. Haeckel (2.)

A solitary Sponge, without frill round the osculum. Spherical or ovate often with a short peduncle. They are 12 to 15 mm. long and have a diameter of 8 to 12 mm. The Gastral wall is very thin, measuring only 1-1·5 mm. in thickness. Dermal and Gastral surface smooth. Triradiates very variable in size and shape, in greater part or throughout irregular, with bent unequal rays. Rarely acerate, and quadriradiate spicules are met with, so that E. Haeckel establishes three connective varieties of this species: Leucaltis pandora, Leucortis pandora, Leucandra pandora. The spicules contain, according to Haeckel (3) more organic substance in proportion than those of other Leucetta species. The mean size of the rays is 0·3—0·6 x 0·0005—0·005.

Locality: South Coast of Australia, Bass' Straits, Wendt ; St. Vincent's Gulf, Schomburgh.

34. SPECIES. LEUCETTA CLATHRATA. Carter (4.)

A cake-like Sponge, consisting of a plate-like basal extension, which bears curved cylindrical extensions on the upper surface, the latter appearing on relief. Triradiates of two kinds, small ordinary regular ones in great abundance with rays measuring

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(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 65, pl. II., fig. 3; pl. VII., figs. 7a-7a[III].

(2.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 127., Bd. III., Taf. XXII., figs. 3a-3c.

(3.) *E. Haeckel.* L.c. Band II., Seite 129.

(4.) *H. T. Carter.* Annals and Magazin of Natural History 23; series. Vol. XI., nr. 61, p. 33, pl. I., figs. 13-17.

0·08 x 0·011, and larger pyramidal cnes the rays of which are curved S shaped. The proximal ends are turned towards the axis and the distal ends away from it, so that the whole represents a tripod (l.c., fig. 16.) Their rays measure 0·13 x 0 04. The dome-shaped central part underlies the surface of the Sponge, the rays point centripetally.

Locality : South-west Coast of Australia. Carter.

18. GENUS. LEUCALTIS. Von Lendenfeld.

Leuconidæ, with triradiate and quadriradiate, but without acerate spicules. This genus is nearly identical with Haeckel's (1) genus Leucaltis.

35. SPECIES. LEUCALTIS HELENA. Nov. spec.

Oval, elongate or cylindrical, solitary Sponges attaining a length of 25 and diameter of 15 mm., with circular transverse section. No frill to the Osculum. Gastral and dermal surface smooth. Gastral cavity large ovate. Thickness of the body wall 2 mm. The inhalent pores lead into large cylindrical canals, which are 0·2 mm. wide, and extend longitudinally just below the surface. From these tangental subdermal Lacune-canals, tubes originate which extend, more or less regularly, radially in a centripetal direction towards the Gastral cavity. Below the Gastral surface, which is perforated by distant circular pores, with from 0·5—1·5 mm. diameter, likewise longitudinal lacunose canals extend, which are very irregular and have an average diameter of 0·4 mm. From these, radial tubes, extending centrifugally originate. Between these and the inhalent tubes described above, there is one layer of spherical ciliated chambers which measure 0·1 mm. The canal system is like that of Aplysilla. When the canal system of a greater number of species will be better known it will afford characters for the establishment of classificatory categories.

(1.) *E. Haeckel.* L.c. Band II., Seite 142.

Spicules; A dense felt-like layer of Triradiates and Quadriradiates with one very short ray clothing the Gastral cavity. The rays of these spicules measure on an average 0·1 x 0·01 mm. Rare regular triradiates in the Parenchyma with straight conic rays measuring 0·28 x 0·03 mm. Very numerous sagittal quadriradiates, the sagittal ray mostly pointing towards the interior of the Parenchyma. Sagittal ray straight, conic and pointed 0·42 x 0·056. The three basal rays alike with equal angles between them, straight, conic and pointed 0·35 x 0·042 mm. Dermal quadriradiates sagittal. Differentiated ray centripetal, straight, conic and pointed 0·57 x 0·05—0·06, always exactly radial. Tangental rays curved in the proximal, and straight in the distal part; conic and pointed, all equal and regularly disposed convex towards the outer side 0·28 x 0 033—0·04.

Locality: East Coast of Australia, Port Jackson. Von Lendenfeld.

36. SPECIES. LEUCALTIS PUMILA. Hackel (1.)
LEUCONIA PUMILA. Bowerbank (2.)
LEUCONIA PUMILA. Gray (3.)
DYSSYCONELLA PUMILA. Haeckel (4.)

This Sponge does not appear to form colonies. It is always solitary spindle-shaped, ovate or cylindrical, with or without Osculum, which may be sessile or on the termination of a long proboscis. Sponge 10 to 20 mm. long and 3-7 mm. in diameter. Gastral cavity cylindrical. Body wall of uniform thickness 1 to 2 mm. The regularly disposed Gastral pores have a diameter of 0·3—0·6 mm. The exhalent canals form a lacunose reticulation composed of relative narrow tubes. All the Australian specimens examined by Haeckel, possess a proboscis.

(1.) *E. Haeckel.* L.c. Band II., Seite 148., Band III., Taf. XXVII., figs. 2a-2g.

(2.) *T. S. Bowerbank.* Monograph of the British Spongiadæ. Vol. II., p. 41.

(3.) *F. Gray.* Proceedings of the Zoological Society of London, 1867, p. 556.

(4.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Wissenschaft. Band V., Heft II., Seite 242.

Skeleton: The main skeleton is formed out of larger and smaller, slender triradiate spicules. The large Triradiates are mostly sagittal. The rays of which are slender, conic, mostly straight, or slightly bent, 0·6—0· 9mm., rarely 1—1·2 mm., long and only 0·03—0·05 mm., rarely 0·06—0·08 mm., thick. The smaller triradiate spicules, which are more numerous than the large one, are irregularly scattered, and fill up the space between the former, they are mostly sagittal or irregular. Their rays are sometimes straight, or more or less, often strongly bent, on an average of 0·2—0·3 mm. in length, and 0·01—0·02 mm. in thickness. Triradiate spicules very variable.

The Gastral surface and the inner surface of the larger wall canals is clothed by a dense layer of middle-sized sagittal quadriradiate spicules. These are regular, parallel disposed, the basal ray is bent aboral downwards, or in the canals, outwards, if straight 0·25—0·35 mm. long. Both the lateral rays are slightly curved, and a little shorter, only 0·15—0·3 mm. long. The angles vary greatly, once nearly equal, once strongly differentiated. The unpaired angle increases from 120°, 150°, and to 160°, 180° in the proboscis.

Accordingly the paired angles decrease from 120° to 105° and to 90°. Round the mouth there are only rectangular quadriradiate spicules. The apical ray varies greatly, mostly very short, only 0·05—0·15 mm. long, slightly bent to the oral side. All rays are at the base 0·01—0·02 mm. thick.

Locality· Atlantic Ocean, Norman's Islands; Guernsey, Norman; Coast of Mexico; Mogados, Haeckel; Cape of Good Hope, Wilhelm Bleek; Indian Ocean, Bass Straits, Wendt.

37. SPECIES. LEUCALTIS BATHYBIA Haeckel (1).
GRANTIA ARABICA. Miklouho (2).
LEUCALTIS BATHYBIA var. AUSTRALIS. Ridley (3).

Solitary Sponge, of a cylindrical or ovate rather irregular shape. The specimen of Haeckel measured 8 to 16 mm., in length 4 to 6

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 156, pl. XXVIII., figs. 2a-2e.
(2.) *N. M. Maclay.* Manuscript.
(3.) *Stuart O. Ridley.* Report on the Sponges. Report on the Zoological Collections made in the Indian and Pacific Ocean, during the Voyage of H.M.S. Alert, 1881-1882. British Museum Catalogue, 1884.

mm., in thickness. The cylindrical Gastral cavity is covered with small pores, rather narrow. The body-wall measures 1-1½ mm. in thickness.

Skeleton. Most of the spicules are Quadriradiates of middling size. These are covered by a clothing of Triradiates. The latter form a dense dermal layer. The Quadriradiates are mostly sagittal or irregular. Their rays measure 0·3—0·6 x 0·03— 0·05. The dermal Quadriradiates are situated as in Leucaltis Helena: three rays in the surface tangental; the fourth radial, pointing centripetally. The tangental rays of these spicules are sagittal in themselves, the unpaired angle measuring 150—180°

The Triradiates are irregular, the mean measurement of their rays is 0·15—0·3 x 0·008—0·015. The inner layer is formed by Triradiates and Quadriradiates.

The principal difference between this species and Leucaltis Helena lies in the distribution of the Triradiates, which in the latter do not form sheaths around the parenchymal Quadriradiates. Ridley (l.c.) has established the variety Leucaltis bathybia var. australis for a slightly aberrant form obtained by the Alert. He describes his variety as follows:—A small low marine specimen, with a small lateral unarmed vent and very reduced cloacal cavity. The Quadriradiates are sagittal, those of the outer surface very large. Diameter of rays about 0.04 mm. The facial angle nearly 180°, the apical ray in the same plane as the laterals. The deep Quadriradiates have a somewhat smaller facial angle and more slender rays and the apical ray often projects well forward. Rays almost straight. The Triradiates form a thin layer on the inner wall where their rays measure only about 0·01 mm., in diameter, they have a facial angle of about 160°, in the deep parts they are subregular, sparsely scattered amongst the Quadriradiates and the ray measure about 0·02 sometimes 0·025 in diameter, rays approse straight:

Colour: White.

The main feature of this variety lies in the large size of the profound Triradiates, and in the massive form of the Sponge.

Locality: Red Sea, Perim, Siemens, Djeddah, Miklouho-Maclay; East Coast of Australia, Port Jackson, Alert.

19. GENUS. LEUCORTIS. Von Lendenfeld.

Leuconidæ with acerate and triradiate spicules. This genus is nearly identical with Haeckel's Genus Leucortis.

38. SPECIES. LEUCORTIS LORICATA. Von Lendenfeld.
LEUCONIA LORICATA. N. Poléjaeff (1.)

This species represented by a single specimen, 30 mm. long and 8 mm. broad, possesses a strongly developed cortex 0·5 mm. thick, the width of the whole wall being 2 mm. consisting of several parallel layers of sagittal triradiate spicules; a quite irregular disposition of the Parenchymal spicules, only those which are near the inner surface lying more or less parallel to it; minute spined acerate spicules scattered everywhere in the body, but chiefly coating the inner surface. The structure of the canal system presents no deviations from the general type.

Spined acerate spicules 0·025 mm. x 0·002 mm. Numerous on the inner surface, they are very rare in the Parenchyma and in the coxtex. Triradiate spicules of the Parenchyma, either quite regular or rather sagittal and irregular; rays straight, tapering from the base to sharp points ; surface more or less smooth ; the proportion between the length and thickness 8·1, the length 0·6—1 mm.

Cortical triradiate spicules, sagittal, all rays lying in the same plane, tapering from the base to a more or less rounded end, usually of the same thickness, the proportion between this latter and the length varying from 10·1 to 16·1 ; basal ray straight, sometimes rather thinner than lateral rays forming with each of these latter an angle of 115°, lateral rays either straight or slightly curved forwards, 0·325—0·5 mm. long, usually somewhat shorter than basal ray, often of the same length, sometimes even rather longer. In the wall of the collar these triradiate spicules become smaller, their rays being rarely longer than 0·15 mm., with a diameter of 0·0125 mm., and show a regular disposition.

(1.) *N. Poléjaeff*. Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 63, pl. II., fig. 2; pl. VII., figs. 6a.-6b.

their basal ray being directed towards the closed end of the animal.

Stout acerate spicules, sparsely scattered in the wall perpendicularly to the outer surface, often projecting from it; spindle-shaped, tapering from the centre to a sharp point at each side, either straight or slightly curved; rarely exceeding 0·75 mm. in length and 0·07 mm. in diameter.

Slender acerate spicules of the same shape and disposed similarly to the last mentioned form, rarely longer than 0·3 mm. with a diameter of 0·0025 mm.

Acerate spicules of the collar straight or curved, either sharply or bluntly pointed, 0·5—1 x 0·018 mm.

Locality: East Coast of Australia. Station 163A, June 3, 1874, off Port Jackson; depth 30 to 35 fathoms; rock.

39. SPECIES. LEUCORTIS PULVINAR. E. Haeckel (1.)
SYCOLEPSIS PULVINAR. E. Haeckel (2.)
MLEA DOHRNI. N. Miklouho (3.)
LEUCORTIS PULVINAR VAR. INDICA. E. Haeckel (4).

This species forms, in the adult stage, solitary persons or colonies, with or without mouth-opening. The latter is always simple and naked. The canal-system is always very narrow and especially the Gastral cavity of a very small extension.

In the lipostome forms the latter coalesces entirely, so that the whole Sponge gets the appearance, in a transverse section, for the naked eye of quite massive heap, without any visible cavity. The Parenchyma firm. The solitary form mostly appears as a conic, oval or roundish, rather irregular mass, which has no peduncle. Its diameter is mostly 5 to 10, rarely 15 to 20 mm. A longitudinal section shows that the Gastral cavity is very narrow, rarely exceeding 1 or 1·5 mm. in diameter. The colonial specimen forms very irregular roundish colonies of a bulbous or

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 162., Band III., pl. XXIX.

(2.) *E. Haeckel.* Prodromus eines Systems der Kalkschwämme. Jenaische Zeitschrift für Medicin und Naturwissenschaft, 1870; Band V., Heft II., Seite 251.

(3.) *N. Miklouho-Maclay.* Manuscript.

(4.) *E. Haeckel.* L.c. Band II., Seite 163.

rough shape, which are mostly composed of only 2 to 5, rarely of 6 to 12 persons. These colonies resemble small potatoe-bulbs and have a diameter of 10 to 20 mm. rarely 30 to 40. Sometimes they form flat cushions covered with excrescences. At the top of each knob generally a small Osculum is met with, 0·5 to 1·5 mm. in diameter, which leads into a similar narrow Gastral cavity. Sometimes there is no trace of an Osculum, sometimes several persons in a colony possess only one Osculum, or there is only one single Osculum for all the persons in the colony. Dermal and Gastral surface bare. The main mass of the skeleton consists out of middle sized triradiate spicules, between which there are enormous Ascerates. These are on an average 5 to 10 times as long and thick as the rays of the triradiate spicules. The Dermal and the Gastral surfaces contain sagittal triradiate spicules, the lateral rays of which are as long but only half as thick as the rays of the subregular or irregular triradiate spicules of the outer layer of the Parenchyma. The Australian specimen belongs to Haeckel's Leucortis pulvinar var. indica. The spicules contain a very large proportion of organic matter, therefore they are more flexible, the triradiate spicules of the Parenchyma mostly irregular.

Locality: Indian Ocean, Schneehagen; West Coast of Australia, Harvey; Ceylon; Wright. Red Sea, Frauenfeld, Miklouho.

20. GENUS. LEUCANDRA. Von Lendenfeld.

Leuconidæ with acerate, triradiate and quadriradiate spicules. Nearly identical with Haeckel's (1) genus Leucandra.

40. SPECIES. LEUCANDRA ALCICORNIS. E. Haeckel (2).

The solitary person, which possess an Osculum sometimes, sometimes none, is a slender cylinder measuring from 10 to 20 x 3 to 5 mm. The most common colonial form is a bushy scrub,

(1.) *E. Haeckel.* L.c. Band II., Seite, 170.
(2.) *E. Haeckel.* L.c. Band II., Seite 184; Band III., Taf. XXXII., figs. 4a-4h; Taf. XXXVII., figs. 3 A., 3 B., 4.

with dichotomous branches, every terminal branch with a simple naked Osculum. The branches form sometime anastomoses. The Sponge represents in outer appearance the coral Cladocora cæspitosa, and forms an elongate cushion measuring 40—70 x 30 — 50 x 20—40 mm. The number of persons forming a colony is great (sometimes several hundred). The Australian specimen, which are slightly branched, each branch measures 30 to 50 mm., and more, in length, and 3-6 mm., in thickness. The bare Oscula have only a diameter of ½ to 1 mm. All persons are curved, the concave side towards the interior of the colony.

Skeleton. The main mass is formed by middle-sized triradiate spicules. The rays are at an average 0·2 to 0·4 x 0·012 to 0·02 mm., subregular or sagittal. The rays are slender, mostly slightly, often much curved, rarely quite straight. In the sagittal triradiate spicules both the lateral rays more curved, the basal ray straight and at the end inflated. On the inner surface of the large canals there are many sagittal quadriradiate spicules of the same shape and size. Apical ray is only short, 0·05 mm. Characteristic of this species is the armer-like cortex of the outer surface, which consists of one or more layers of the very large acerates. These are spindle-shaped, either tapering equally towards both ends, or thicker in the outer portion, sometimes inflated. They are slightly curved, seldom quite straight, 1 to 3 x 0·07 to 0·1 mm. All acerate spicules are situated parallel in the dermal surface and extend longitudinally. The interstices of acerate spicules are filled up with sagittal triradiate spicules, of which the basal-ray is parallel to the longitudinal ones of the acerate spicules and pointing downwards. The outer surface sometimes quite smooth and bare, sometimes velvet-like, as everywhere a mass of very fine bristly acerate spicules stand vertically on it. These spicules are 0·1—0·3 x 0·001 mm.

41. SPECIES. LEUCANDRA CONICA. Nov. Spec.

A small solitary, irregular, more or less cylindrical Sponge with an Osculum, which bears a small hardly perceptible fringe of spicules but appears naked. Outer and inner surface are pretty smooth. The Sponge attains a length of 30 and a diameter of 12 mm. The Gastral cavity is cylindrical and rather narrow, measuring only a third of the diameter of the Sponge across. The thick body wall is lacunar; wide canals measuring from 0·2—0·25 mm. in diameter, and with a circular transverse section, traverse it in every direction. Below the outer surface we meet with extension, communicating sub-dermal cavities, from which comparatively narrow canals take their origin, which can be traced in a centripetal direction for some distance. The circular Canals mentioned above belong to the exhalent canal system, and are connected with the Gastral cavity by very wide (0·4 mm.) and irregular tubes, which do not stand vertical in the Gastral wall, but extend upwards towards the Osculum. The pores in the Gastral wall at their terminations are scattered sparsely, and measure on an average 0·5 mm. across. The ciliated chambers have a diameter of 0·06 mm.

Spicules: The skeleton consists mainly of triradiates in the Parenchyma. The Gastral quadriradiates are small and irregularly scattered ; the rays and angles are all different. The rays vary from 0·028—0·08 x 0·004—0·007. The Parenchymal Triradiates are very regular; sometimes the rays are slightly bent; they are conic and blunt and measure 0·35 x 0·01. Acerates of the Parenchyma, more or less radially disposed, pointed at both ends, slightly protruding beyond the surface, spindle-shaped, and measuring 1·5 and 0·035 mm., rather rare. Minute Acerates in a continuous layer in the outer surface all parallel and situated radially, measuring 0·08 x 0·002. These spicules are rounded at the proximal, and pointed sharply at the distal end. Although forming a continuous layer, they nervertheless do not produce a dense and hard outer skin as in those Sponges which possess a "Stäbchen-Mörtel." Acerates forming the frill named the Osculum of the same appearance as the former, measuring 0·3—0 5 x 0·002 often slightly bent. Thickest towards the proximal rounded end, and tapering from there to the distal end, which is mostly broken off in specimens.

Locality: East Coast of Australia, Port Jackson, Laminarian zone. Von Lendenfeld.

42. SPECIES. LEUCANDRA MEANDRINA. Nov. spec.

A solitary cylindrical and tube-shaped Sponge attaining a length of 120 and a diameter of 25 mm. The dermal surface is smooth, without projecting spicule rays, the Gastral surface and also that of the larger exhalent canals appears hairy or velvet-like. The outer surface is very uneven, and has the appearance of a surface with an intricate meänder-like sculpture on it, in high relief. The Gastral cavity is cylindrical and the thickness of the body wall is very different in different parts in consequence of the above-mentioned surface-sculpture. The canal system is rather peculiar: there are no lacunose extensions of the inhalent canals, no subdermal cavities. In the Gastral part of the body wall we meet with very regular longitudinal canals of an oval transverse section. The short axis of the Ellipse is situated radially. The thickness of the body wall is 1·8—2.1 mm., the Gastral cavity is accordingly very large. The longitudinal canals measure on an average 0·7 x 1·2 mm. These exhalent wide collecting canals open separately into the Gastral cavity, without forming anastomoses or lacunes. The remarkable gastric quadriradiate spicules clothe these canals in the same way as the Gastral cavity itself, so that they make rather the impression of branches of a ramified Gastral cavity than of exhalent canals.

Spicules : The skeleton consists of gastric quadriradiate spicules with a very elongated, protruding centripetal ray, Parenchymal triradiates of two kinds and Parenchymal, radially situated and slightly protruding large acerate spicules. The gastric quadriradiates are sagittal and regular. The centripetal ray measures from 0·07 to 0·28 mm. in length, the longer ones are predominating with a very constant basal thickness of 0·005 mm. The tangental rays lie in one plane which is vertical to the centripetal ray. Their rays are equal and also the angles, like the centripetal ray quite straight or slightly and irregularly curved at the distal end. They measure 0·18 x 0·005 mm. All rays are cylindrical and pointed. The Triradiates of the Parenchyma are regular or slightly irregular, never sagittal and stout or slender. The stout ones predominate throughout. The slender ones are more numerous towards the outer surface. The rays of the stout spicules measure 0·28 x 0·021, those of the slender ones have the same length, but are only 0 0)7 mm. thick. Among the Triradiates there are also a few small Quadriradiates with spicules corresponding to those of the slender triradiate spicules. Transition forms between these Quadriradiates and the slender Triradiates are present in great abundance. Transition forms between the slender and the stout triradiate spicules do not exist.

The acerate spicules are spindle-shaped and pointed at both ends. They measure 1·5 mm. x 0·035 mm. These are rare. Around the Osculum there are no differentiated spicules.

Locality : East Coast of Australia, Port Jackson, 10-20 fathoms. Von Lendenfeld.

43. SPECIES. LEUCANDRA CATAPHRACTA. E. Haeckel (1).

This Sponge consists of solitary persons of an elongate cylindrical or flattened shape, they are slightly spindle-shaped, a narrow peduncle and narrow oscular part are generally met with. These cylinders attain a length of 20 to 30 mm., by a diameter of 6 mm. The Gastral cavity is narrow only $\frac{1}{6}$ to $\frac{1}{4}$ of the diameter of the outer cylindrical surface. Osculum present without frill. On the surface of the stomach there open a great number of very fine Gastral pores, which lead into minute perietal-canals. On a longitudinal section through the wall these latter are hardly visible.

Skeleton : The main mass of the skeleton is in this species, quite different from all the others, formed by several layers of longitudinal enormous acerate spicules, which lie parallel to the dermal surface. They are coated and united by a cement, which consists of small, mostly sagittal triradiate spicules. The large acerate spicules are spindle-shaped, either tapering to both ends, or inflated on the oral side, mostly slightly curved, rarely straight, 1 to 3 mm., 0·15 to 0·2 mm. All Acerates lie in a longitu-

(1.) *E. Haeckel.* L.c. Band II. Seite 203., Band III., Taf. XXXII., figs. 6a-6f ; Taf. XXXVII., fig. 2.

dinal direction, parallel to the longitudinal axis of the body, but pointing a little outwards with the oral end. They are situated in several parallel layers closely backed (10 to 15 layers at the thickest place in the body-wall). The small interstice between the Acerates are filled up by small Triradiates, which surround sheath-like the inner Acerates. Most of them are sagittal and are with their basal ray parallel to the longitudinal axis of the body, whilst both the lateral rays diverge to the oral side, and often embrace the acerate spicules by their more or less curvity. The unpaired angle 150° to 170°, both the paired ones 95 to 105°. The straight basal ray measures 0·15 to 0 2 in length. Their basal thickness 0·005 to 0·008 mm. Between the sagittal rays there are also single irregular, rarely regular triradiate spicules. The sagittal quadriradiate spicules which coat the whole inner surface of the Gastral cavity, and the larger canals, and which are arranged regularly, the basal ray towards the aboral side, possess an unpaired angle of 160 to 170°, the two paired angles 100 to 95°. Their basal ray is to 0·35 mm., long, straight, their slightly curved lateral rays 0·2 to 0·3 mm., and like the basal ray only 0·005 mm., thick. But the apical ray is 2 to 6 times thicker, that is 0·01—0·02 or 0·03 mm., in thickness. It is very varying, in the greater part of the Gastral cavity only 0·1—0 15, but towards the Osculum 0 3—0·4 mm., long. The entrance to the Gastral cavity is in this way hindered by a terrible circle of strong apical rays just below the Osculum.

Locality: East Coast of Australia, Port Jackson, Frauenfeld; Port Denison, Von Lendenfeld.

44. SPECIES. LEUCANDRA TYPICA. Von Lendenfeld.
LEUCONIA TYPICA. var. tuba. N. Poléjaeff (1.)

This Sponge attains a length of 40 mm. and an average diameter of 12 mm., the thickness of the body wall is 3 mm. The round flagellated chambers in this species have particularly regular outlines, and are smaller than in any other case, their diameter rarely exceeding 0·04 mm.

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 56, pl. VII., figs, 2a-2c.

Gastric Quadriradiate spicules. Basal ray straight, tapering from the base to a sharp point usually shorter, 0·18 mm., and rather thinner than lateral rays, forming with each of these latter an angle varying from 105° to 110°; lateral rays more or less cylindrical, either straight or slightly curved forwards, rarely exceeding 0·225 mm. in length, with a diameter of 0·015 mm.; apical ray curved, more or less sharply pointed, length not exceeding 0·06 mm. The length of the apical ray, however, is variable, and there are amongst the quadriradiate spicules many triradiate spicules also. *Triradiate spicules of the Parenchyma.* Most quite regular, rays straight, smooth, tapering from the base to sharp points, reaching 0·75 mm. in length and 0·065 mm. in diameter.

Dermal Triradiate spicules. Sagittal, all rays of the same length, rarely exceeding 0·35 mm., and of the same diameter, 0·02 mm., either tapering from the base to sharp points or of a more cylindrical form; basal ray straight, lateral rays curved. forwards, forming each with basal ray an angle of about 115°. *Acerate spicules.* In the walls of the body, sparsely scattered here and there in the Parenchyma, either isolated or in groups, fine linear, straight, occasionally slightly curved, reaching 0·3 mm.; near the Osculum piercing the wall in perpendicular direction, either spindle-shaped or rather cylindrical, but sharp pointed, straight or slightly curved, 0·1 mm. long, 0·304 mm. in diameter.

Locality: Station 36, April 23, 1873; off Bermudas, 32 fathoms, mud. East Coast of Australia, Port Jackson. Von Lendenfeld.

45. SPECIES LEUCANDRA VILLOSA. Nov. spec.

This Sponge appears in the shape of the very large thin-walled and irregular sacs with an extremely wide Osculum. These sacs, of an irregular cylindrical or oval shape, attain a length of 50 and width of 25 mm. and more. They generally appear compressed, with an oval transverse section, the large axis of the ellipse about twice as long as the small one. The Osculum is nearly as wide as the body. Narrower in the oval Sponges it is relatively much wider in the cylindrical specimens. The body wall is only 2-4 mm. thick, so that the Gastral cavity appears very roomy. The Osculum is destitute of a frill. Our Sponge seems always to be solitary. The outer surface is covered by dense hair protruding a good distance and consequently makes the impression of a thick fur. The inner surface is slightly rough. The cana system, in different parts of the Sponge near the Osculum, extremely simple, no lacunes or anastomoses of any kind are formed. The body wall is consequently very thin in this part 2 mm. Further down towards the aboral pole we find the Gastral wall perforated by large, densely scattered round holes measuring 1·5-2·5 mm. in diameter. These exhalent pores lead into longitudinal canals of an oval, transverse section similar to those described in a very different species, Leucandra meandrina by myself. The pores or rather short radial canals connecting the longitudinal tubes with Gastral cavity are conic or trumpet-shaped, wide at the mouth, they open with an aperture not exceeding 0·5 mm. in diameter into the tubes. These longitudinal tubes are clothed with the same skeleton as the stomach.

Spicules : Gastric Quadriradiate spicules. Centripetal, sagittally differentiated ray, straight, slender, and protruding into the tubes and Gastral cavity. This ray is cylindrical and pointed, rarely slightly curved towards the end, measuring 0·2—0·55 mm. x 0·01 mm. Three tangental rays equal, in a plane vertical to the centripetal ray, straight, conic and pointed with equal angles between them. These rays measure 0·28 x 0·01 mm. *Triradiates and Quadriradiates of the Parenchyma.* Regular Triradiates with straight conic and rounded rays, measuring 0·35 x 0·02 mm. are predominant in the body wall. Besides there are triradiates of a similar size as the former with curved rays and more or less irregular angles. I have never met with proper sagittal Triradiates. On these irregular spicules and also on a few regular ones an incipient fourth ray can be observed. These forms lead up to Quadriradiates with conic, curved and terminally rounded rays measuring 0·3 x 0·018 mm. which are however rare. The dermal Acerates are of two kinds; very slender linear spicules and larger but also slender and very long spindle-shaped spicules. The latter are set at nearly right angles to the surface of the Sponge and extremly dense, they cause the hairy appearance of our Sponge. They are sharply pointed at either end and immersed about $\frac{1}{5}$-$\frac{1}{4}$ of their length in the body. They measure 2—3·5 mm. by 3·035 mm. The shorter ones are common, those measuring over 3 mm. in length found only exceptionally. The linear acerates measure 1 mm. x 0·006 mm.

Locality: East Coast of Australia, Port Jackson. Von Lendenfeld.

46. SPECIES. LEUCANDRA VAGINATA. Nov. spec.

Solitary cylindrical Sponges with hairy inner, but nearly smooth outer surface if compared to the nearly related L. aspera. Our Sponge has the shape of an irregular cone or spindle, or may even be ovate. The Osculum is always situated terminally on the narrow end of the cone. Leucandra vaginata attains a height of 30—40 mm. and a diameter 12—20 mm. The body wall is thick, particularly in the short and irregular specimens. The Gastral cavity measuring only $\frac{1}{5}$-$\frac{1}{3}$ of the diameter of the Sponge. The Osculum sometimes is surrounded by a frill. The canal system is rather complicated. The inhalent pores lead into a reticulation of tangental canals below the surface, all of which possess a circular transverse section and a diameter of 0·2 mm. The meshes of this reticulation are wide, so that no lacunes, which might be considered as subdermal cavities are formed. Towards the Gastral wall we meet with irregular circular canals running tangentally, but not regularly longitudinally. I am doubtful as to whether these form a reticulation, I think not. If anastamoses are present they are very rare. From these canals numerous small radial tubes only 0·2 mm. in diameter lead into the Gastral cavity. The terminations of these, the pores in the Gastral wall, are of the same dimensions as the canals to which they belong, and very close to one anoth er.

Spicules.. The skeleton consists of similar elements as that of the foregoing species.

Gastric Quadriradiates. Centripetal, protruding ray 0·1 x 0·008 conic, pointed, mostly straight, sometimes slightly curved near the end. Tangental ray sagittally developed. One ray situated longitudinally and pointing towards the aboral pole shorter than the other two. Angles on the side of it equal, about 100° This ray measures 0·08 x 0·006. The other two equal rays 0·12 x 0·008 mm.

Triradiate and Quadriradiate spicules of the Parenchyma. The Triradiates are equiangular with straight, conic, terminally rounded rays. The rays mostly sagittally developed. The unpaired ray longer than the other two pointing outwards and measuring 0·28 x 0·014 mm. The others 0·22 x 0·014 mm, Some regular Triradiates are also met with. Their rays have varying intermediate dimensions between the longer and shorter ones of the sagittal Triradiates. Some of the latter show an incipient fourth ray. Decidedly Quadriradiate spicules are rare. Their rays have the same dimensions as those of the Triradiates, but are generally curved.

Acerate spicules. These measure 1·7 x 0 035, are spindle-shaped and slightly curved. The concave side towards the Osculum. They are immersed in the body of the Sponge about half their length and stand nearly vertical on its surface. Both ends are sharply pointed. These spicules are not very numerous. The sheath, which covers the spicules of calareous Sponges generally, is very highly developed on the protruding part of these spicules, much more so than in any other calcareous Sponge known to me and I have derived the specific name from this characteristsc peculiarity.

Locality : East Coast of Australia, Port Jackson, V. Lendenfeld.

47. SPECIES. LEUCANDRA CUCUMIS. E. Haeckel (1).

This sponge is solitary and forms a cylindrical or spindle-shaped person of 15 to 20 x 7 to 10. The longitudinal axis is mostly more or less arched. Opposite the narrow peduncle there is the round Osculum of 1·5 to 2 mm., in diameter. The dermal surface

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 205 ; Band III., Tafel 33, figs. 1a-1k., Tafel 36, figs 1-3.

of the body is smooth. Gastral cavity 3 to 4 mm., in diameter, the wall of the body 2 to 3 mm., cortex 4 mm. The canals of the cortex are pretty regular and large loculi of 1 mm., in length and 0·3—0·4 mm., in width. They are like the regular radial-canals of the sycones. They communicate by conjunctif-pores, and open outward by the dermal pores, inward into the Parenchyma. The canals of the parenchyma are quite irregular, partly very narrow, partly pretty broad, and open into Gastral pores of very varying diameter.

Skeleton: The main skeleton consists of Quadriradiate spicules. There are 4 clearly distinct separate layers. 1. Outside a dermal layer of Triradiate spicules mixed with single Acerates. 2. A regular layer of large Quadriradiate spicules. 3. An irregular layer of middle-sized Quadriradiate spicules, and 4, a Gastral coating of Triradiates. The first layer consists of Triradiates which are mostly slightly irregular. Their rays are straight, pointed, and measure 0·15—0·25 mm. x 0·02 mm. Between them in varying quantity longitudinal, spindle-shaped Acerates are situated, measuring 0·1—1·5 mm. x 0·01—0·06 mm., these are straight or slightly curved. Below the cortex we meet with a peculiar lacunose layer, which is composed of two layers Quadriradiates. The apical ray is vertical on the plane of the three lateral rays, and is situated centripetally in the outer, and centrifugally in the inner layer. The radial rays join as in Amphoriscus. The inner Quadriradiates are smaller than the outer ones. Radial rays straight and pointed, lateral rays slightly curved. The rays of the Quadriradiates measure 0·6—0·9 x 0·06 mm. The central canal is often particularly well visible. Below these lies the Parenchyma, supported by irregular Quadriradiates. Their rays measure 0·1—0·6 mm. x 0·02—0·05 mm, they are mostly straight or very slightly bent. The wall of the stomach and the larger exhalent canals is quoted with sagittal middle-sized Triradiates. The basal ray measures 0·1—0·4 mm., in length and is situated radially. It forms an angle of 100° with the lateral rays. These measure 0·2—0·3 mm. in length. All rays 0·02—0·03 mm. thick. The skeleton of Peristome consists of two layers, on inner one of Triradiates and an outer of Acerates.

The former are sagittal. They are similar to the Gastral Triradiates described above. The sagittal ray a little longer, the lateral rays curved. Acerates longitudinal packed closely. They measure 0·1—3 x·006—0·012 mm.

Locality: Indian Ocean, Polk Straits, Ceylon, Wright; South Coast of Australia, St. Vincent Gulf, Schomburgk; Bass Straits, Wendt.

48. SPECIES. LEUCANDRA BOMBA. Haeckel (1.)

Solitary Sponge with a proboscis. Bomb shaped, consisting of a hollow sphere with a neck to it; like Sycandra Ramsayi. The diameter is 10-20 mm. The Sponge has no peduncle. The cylindrical proboscis, 2-6 mm. in length. Osculum circular; 2-3 mm. in diameter. The surface of the Sponge is smooth; the Parenchyma very rigid. The body wall is 3-4 mm. thick, and traversed by a large number of parietal canals, which are very short and wide. These are situated radially and branch dichotomously. Their Gastral mouths possess a diameter of 0·5-1 mm. The Gastral cavity is cylindrical or ovate, the direct continuation of the cavity in the proboscis In the middle of the body the diameter of the stomach is equal to the thickness of the body wall. Above and below it is smaller.

Spicules: The skeleton consists mainly of regular Triradiates, which are larger in the Parenchyma than in the cortex. In the latter their rays measure 0·1—0·2 x 0·008—0·012 mm., they are pointed, conic, straight. They are coated by dense masses of minute Acerates which form a cement (Stäbchen-Mörtel.) The component parts of this cement, the minute Acerates, are straight or slightly bent, pointed at one end and truncate at the other, which shows incipient spines. They measure 0·02—0·04 x 0·001 mm. Below this layer we meet with larger Triradiates not so thickly set with minute Acerates. They are regular, their rays measure 0·25—0·35 x 0·02—0·025. The skeleton of the Parenchyma consists of middle-sized regular Triradiates, with mostly straight, conic, and pointed rays, measuring 0·2—0·3 x

(1.) *E. Haeckel.* L.c Band II., Seite 209: Band III., Tafel 33, figs. 2a-2f. Taf. 38, figs. 1-6; Tafel 40, fig. 9.

0·02—0·03 mm. The corresponding rays of adjoining Triradiates generally lie parallel. Here we find also a few very large Acerates, which ars situated longitudinally and increase in number the nearer we get towards the proboscis, they are spindle-shaped, pointed at both ends, straight or curved with the convex side turned outward. They measure 7—1·5 mm. x 0 04 —0·05 mm. The wall of the stomach and the larger exhalent canals is coated with regular sagittal Quadriradiates, the differentiated ray of which protrudes into the cavity. The tangental rays are sagittally developed, the sagittal ray points downwards and is 0·2—0·3 mm. long. (In the Gastral wall.) In the Quadriradiates along the canals these rays are shorter measuring 0 1—0·15 mm. only in length, and much shorter than the tangental rays, which appear strongly curved and embrace the canals. The centripetal protruding ray of the Quadriradiate is either straight or bent hook-like, and $\frac{1}{3}$-$\frac{1}{2}$ as long as the tangental, lateral rays. The rays of the Quadriradiates are 0·008—0·012 mm. thick.

The proboscis consists of a thick wall supported by no less than four different layers of spicules. (1st.) Outside a ring of very large longitudinal Acerates 1 x 0·05 mm. (2nd.) A layer of sagittal Triradiates the differentiated ray of which points downwards. (3rd.) A layer of similarly disposed Quadriradiates. (4th.) An interior layer of extremely slender Acerates measuring 0·6—0·9 x 0·001—0·004 which are situated longitudinally and very closely packed.

Locality: Pacific Ocean, Viti Islands, Graeffe; East Coast of New Zealand, Von Lendenfeld.

49. SPECIES. LEUCANDRA SACCHARATA. Haeckel (1).
LEUCANIA SACCHARATA. Ridley (2).

This Sponge occurs in the shape of solitary persons and also in colonial forms, with or without Oscula. The solitary form with

(1.) *E. Haeckel.* L c. Band II., Seite 228; Band III., Taf. 33, figs. 3a.3e. Tafel 38, figs. 7-74.

(2.) *Stuart O. Ridley.* Report on the Sponge. Report on the Zoological Collections made in the Indian and Pacific Oceans during the Voyage of H.M.S. Alert, in 1881-1882. British Museum Catalogue for 1884, p. 482.

a naked Osculum has the shape of a cylinder or cone and is sometimes compressed leaf-shaped measuring 10—30 x 5—30 mm. It is attached by a broad basis or a rudimentary solid peduncle is developed. The Osculum at the terminal end is circular or oval and measures 3—10 mm., in diameter. Sometimes it is closed. The colonial form without Oscula appears as a large undulating mass with highly projecting gyri and often represents a "range of volcanoes" (Haeckel (1). The largest Sponge seen by Haeckel measured 60 x 40 mm. Carter (2) was therefore wrong to say, that his Teichonella prolifera is "by far the largest Calcisponge on record" I have seen specimens measuring 140 x 80 x 30 mm., which were only fragments brought up by the dredge, so that the upper limit in size to which this Sponge may grow, is unknown.

The canal system.

The body wall is from 2 to 5 mm. thick, the Gastral cavity follows in shape the outer surface pretty regularly, but is not influenced by the external Gyri, the body wall is very much thicker 5 mm. The canal system is simple. The outer cortex is perforated by numerous small pores, which are equi-distant, and measure 0 04 mm. in diameter, the solid parts of the cortex between them are of the same dimensions as the pores. Below the pores the inhalent canals commence with trumpet shaped extensions, and lead centripetally downwards into the Parenchyma. These canals are cylindrical and situated radially, they measure 0·16 mm. in diameter and do not taper towards their centripetal termination, but end *cul-de-sac* like. No tangental inhalent canals are met with ; there exists no anastomosis or sub-dermal cavities. The ciliated chambers measure 0 04 mm. across. The exhalent canal system is slightly more complicated.

Radial canals, parallel to the inhalent ones, lie between the latter and have the same shape and dimensions as these. They do

(1.) *E. Haeckel.* Die Kalkschwämme. Eine Monographie. Band II., Seite 229.

(2.) *H. T. Carter.* On Teichonia, a new Family of Calcareous Sponges, with descriptions of two species. Annals and Magazine of Natural History 5th series. Vol. 11., Nr. 7, p. 37.

not open directly into the Gastral cavity, but coalesce by means of short tangental tubes 5 to 20 of these coalesce to a very short radial tube 0·1 mm. in diameter, which opens into the Gastral cavity with a trumpet-shaped extension.

Spicules : The skeleton consists mainly of large Quadriradiates, to which are added minutes Acerates in the cortex and tangental Triradiates in the Gastral wall. The outer surface is covered by a smooth cortex of a brilliant white color.

The main part of it is formed of a cement of minute Acerates which are peculiar in shape. They consist of a longer conic and pointed centripetal part and springing from the distal thick end of this in an oblique direction a shorter also pointed centrifugal part, which has the shape of a triangular pyramid. From the edges of this pyramid strong spines take their origin, which are as long or longer than the spicule is thick and give the edges of the pyramid a strongly serrated appearance. These minute spicules measure 0·06 x 0·004 mm. In the cortex we meet here and there with middle-sized Triradiates and large Quadriradiates. The largest Quadriradiates are regularly disposed. Their rays are sagittally developed. Three of them extend tangentally in the outer surface, and lie in one plane, the fourth extends centripetally and is exactly radial in its position, standing vertical on the plane of the other three. This centripetal ray is 1 1·5 mm. long and straight. The tangental rays are 0·5—1 mm long and curved inward at the base. All rays are 0·06—0 08 mm thick. These spicules are situated very regularly at equal distance. Below the cortex a layer of Quadriradiates is met with, the sagittal ray of which is situated centrifugally and meets the centripetal ray of the dermal Quadriradiates. Parenchyma smaller triradiates regular, with rays measuring 0·2—0·5 x 0 002—0·004 mm. Parenchymal larger triradiate spicules with rays measuring 0·6—0·8 x 4·006—0·008. Between these regular spicules a few irregular Triradiates are met with. Parenchymal Quadriradiates irregular and variable, slightly smaller than tho dermal ones described above. Gastral and canal walls (exhalent) are coated by a layer of sagittal triradiates, which are situated tangentally.

The surface of the stomach and exhalent canals is consequently perfectly smooth. The lateral rays enclose an angle of 160° and are 0·3 mm.x 0·024, the basal sagittal ray measures only 0·37 x 0·012, mm.

Below the outer surface groups of spindle-shaped cells are met with, which are mesodermal, and which I consider as sensitive, in consequence of their great similarity to the sensitive cells of Cnidaria.

Locality: South Coast of Australia, Bass' Straits, Wendt. East Coast of Australia, Port Jackson, Port Denison, von Lendenfeld.

7. FAMILIA TEICHONIDÆ. Poléjaeff (1.)

Heterocoela, with the outer surface differentiated into two different planes, one bearing pores the other oscula. This family is identical with that established by Carter (2) under the name Teichonellidæ. I have not seen any representatives of this family myself, but am of opinion that they might perhaps be considered as colonies of Leucones or Sycones, as Marshall (3) asserted, before Poléjaeff's essay was published. I take occasion here to draw the attention of the reader to the remark made by Carter (4), who says, concerning the Teichonidæ, established as a family by him, that "it is somewhat laughable that the self-constituted author of the History of Creation should have omitted a whole family of these Sponges" in his Monograph; knowing at the same time that the only Sponges which might be considered as representatives of the new Family Teichonidæ, were never seen or described by Haeckel or any one else before Carter, who accordingly made new species out of the existing specimens six years after Haeckel's Monagraph had been

(1.) *N. Poléjaeff.* Report on the Calcarea. The Zoology of the Voyage of H.M.S. Challenger. Part XXIV., p. 70.

(2.) *H. T. Carter.* On Teichania, a new Family of Calcareous Sponges, with descriptions of two species. Annals and Magazine of Natural History, ser. 5. Vol. II., Nr. 7, p. 35.

(3.) *W. Marshall.* Bericht über die wissenschaftlichen Leistungen in der Naturgeschichte der niedersten Thiere während der Jahre 1876-1879. Von Dr. Rud. Leuckart. Zweite Hälfte. Seite 714.

(4.) *H. T. Carter.* L.c., p. 38 below.

published. Every educated man in the world admires Haeckel's genius, but that his mental powers would be considered sufficient to enable him to know more than six years beforehand what new forms nay be discovered, can only be accounted for by a degree of admiration which one would not expect to find in so cautious a scientist as Carter.

21. GENUS. TEICHONELLA. Carter (1.)

Foliate Teichonidæ. I accept this genus preliminarily, it is very doubtful weather the two species described by Carter belong to one and the same genus and in what relationship they are to the species of Teichonidæ described much more accurately by Poléjaeff as representing a new genus.

50. SPECIES. TEICHONELLA PROLIFERA. Carter (2).

The Sponge consists of a foliate lamina about 4 mm., in thickness which is much folded and may extend to 60 mm., and more forming a complicated folded mass. The surface of the main lamina is uneven bearing sometimes also secondary laminæ of varying size. Oscula amassed on the margin of the lamina varying in diameter the largest measuring 0·54 mm. These Oscula are nearly in a line and 3 mm,, apart. Oscula tubes slightly narrower than the Osculum. Inhalent pores scattered thickly, small. The Anatomy of this Sponge is unknown, so that no decision about its relationship can be arrived at.

Spicules. The skeleton consists of large Quadriradiates, small Quadriradiates and large and small Triradiates. Acerate spicules are absent. Triradirates regular, rays straight and pointed measuring 0·13 mm., in length in the smaller kind and 0·52 mm., in the larger. The smaller triradiate spicules are more numerous than the others. Gastral Quadriradiates with a centripetal differtiated protruding ray curved and smaller than the other three ; of the same size as the smaller Triradiates. Large Quadriradiates

(1.) *H. T. Carter.* L.c., p. 35.
(2.) *H. T. Carter.* L.c., p. 35, pl. II., figs. 7-5.

of the outer surface. Three rays tangental and regular, curved inward, fourth ray sagittal, pointing centripetally and much shorter than the others.

Locality: South West Coast of Australia, Freemantle, Carter.

51. SPECIES. TEICHONELLA LABYRINTHICA. Carter (1.)

Laminæ smooth and wound round a central axis so as to form a labyrinth of screw-shaped fans. Oscula on the concave side of the whole lamina 0·07 mm. in diameter and 0·14 mm. apart. The lamina has a thickness of about 2 mm., the whole Sponge attaining a greatest diameter of 50 mm. The structure and position of the spicules make it apparent, that the canal system is Sycanoid.

The anatomy of this Sponge is likewise totally unknown, so that its name and position here are only preliminary.

Spicules: The skeleton consists of triradiate and acerate spicules. Triradiates sagittal, unpaired ray, straight 0·22 mm. long. Paired rays much shorter, curved, nearly at right angles with the unpaired ray. The long ray situated longitudinally. These spicules form a perfect tubar skeleton. Acerates straight or bent obtusely pointed at the inner, and spear-shaped at the outer end, measuring 0·13 mm. in length. These spicules are disposed in tufts, they are twice as long on the Oscular side as at the other. (To which does the measurement apply. ?)

Locality: South west coast of Australia, Freemantle, Carter.

22. GENUS. EILHARDIA. Poléjaeff (2.)

Teichonidæ of caliciform shape. The surface carrying pores supported by triradiate and minute acerate spicules, that bearing oscula propped by large acerate spicules.

This genus is deservedly dedicated by Poléjaeff to my teacher, Franz Eilhard Schulze, the reformer of Spongiology.

(1.) *H. T. Carter.* L.c., p. 37, pl. II., figs. 6-9.
(2.) *N. Poléjaeff.* L.c., p. 70.

52. SPECIES. EILHARDIA SCHULZEI. Poléjaeff (1.)

The concave surface is dull, the convex has a silvery lustre. The convex surface bears low volcano-like Oscula, disposed at approximately equal distances, one from another; their diameter does not exceed 0·4 mm., usually being still less. The concave surface may be compared to a seive, its pores inconspicuous to the naked eye, are found under the microscope to be round and disposed close together; their average diameter is 0·06 mm. The wall of the calyx 3 mm. to 7 mm. thick near the centre, grows gradually thinner towards its free blade-like margin.

Skeleton. The skeleton of the sieve-like surface consists of sagittal Triradiate and minute Acerate spicules; that of the Parenchyma, of large regular, often sagittal Triradiate, and of minute acerate spicules; that of the convex Oscular surface of large acerate and subdermal triradiate; that of the Oscula themselves of an exterior layer of large acerate, of a middle layer of sagittal triradiate, of an inner layer of quadriradiate, and of minute acerate spicules, supporting the ring-like border of the external opening of the Osculum. The minute acerate spicules are in all parts of the body of the Sponge of the same outline.

Minute Acerate Spicules. Usually 0·05 mm., long, with a diameter of 0·0025 mm. *Triradiate Spicules of tho Sieve-like surface.* Sagittal; all rays lying in the same plane, of the same diameter, tapering from the base to approximately sharp points; lateral rays curved forwards, slightly undulating, each forming with basal ray an angle varying from 115° to 120°, reaching 0 75 mm., in length, usually not longer than 0·5 mm., often still shorter the proportion between the length and the thickness being 15:1; basal ray straight, length inconstant, either rather exceeding that of lateral ray or equal to it, or even less.

Triradiate Spicules of the Parenchyma. Regular, with pronounced inclination to sagittal differentiation by the shortening of basal ray; all rays of the same diameter; the proportion between their length and thickness varying, in lateral rays, from 10:1 to

1.) *N. Poléjaeff.* L.c., p. 70, pl. II., fig. 7; pl. IX., fig. 1-70.

12:1; lateral rays smooth, tapering from base to sharp points; basal ray, if not shortened, also sharp pointed, if shortened, often truncate, in both cases, however, of conical form; size extremely inconstant the length varying, in lateral rays, from 0·15 mm., to 1·8 mm.

Sub-dermal Triradiate Spicules showing a rudimentary fourth apical ray.

Sub-dermal Triradiate Spicules of the convex surface. Sagittal, all rays lying in the same plane, basal rays straight, tapering from the base to a sharp point, $\frac{1}{2}$-$\frac{3}{4}$, as thick as lateral rays and either longer than these latter, not more than twice, or of the same length, or even shorter, forming with each of them an angle varying from 110° to 115°; lateral rays either straight, or slightly curved, average length 0·6 mm., the proportion between the thickness and the length varying from 1:10 to 1:12. In the space between the Oscula these triradiate spicules lie pretty regularly, their corresponding rays being disposed more or less parallel one to another, their basal ray turned to the closed end of the Sponge, and the angle between the lateral rays towards the sharp margin dividing the sieve-like surface from that bearing Oscula. Near these latter as well as near the margin just mentioned, their disposition becomes irregular, they lose their characteristic shape presenting all possible transition forms to the sagittal triradiate spicules of the sieve-like surface, and on the other hand, growing smaller and becoming similar to the rectangular Triradiate ones of the Oscular skeleton.

Large Acerate Spicules of the convex surface lying in several layers almost parallel to the surface, causing its smoothness and silvery lustre. From length and comparative thickness extremely variable, either spindle, club, or lance-shaped, or of quite irregular outline, reaching 1 mm. in length, usually shorter, the proportion between their length and thickness varying from 8:1 to 30:1.

Oscular Acerate Spicules. Spindle or lance-shaped, usually twenty-eight times as long as thick, rarely longer than 0·55 mm., often considerably shorter.

Oscular Triradiate Spicules. Sagittal, basal ray forming with each lateral ray an angle of 90°; basal ray straight, tapering from the base to a sharp point, usually half as thick as lateral rays, often still thinner, occasionally almost of the same diameter; length inconstant, rarely more than 0 05 mm., often not exceeding 0·01 mm. or still less; lateral rays either straight or slightly curved inward, usually sharply pointed, ten times as long as thick, average length 0·01 mm.; connected as regards their form and size with the sagittal subdermal triradiate spicules of the osular surface by a long series of intermediate stages.

Oscular Quadriradiate Spicules. Like the rectangular Triradiate nothing but modified sagittal triradiate spicules of the Oscular surface; lateral rays either straight or slightly curved forwards, tapering from the base to approximately sharp points, average length 0·2 mm. by 0 02 mm., basal ray usually rather shorter, straight, sharp pointed, forming with each of the lateral rays an angle of about 110°; apical ray curved, not seldom undulating, sharp-pointed like the facial rays, usually rather thinner than these latter; length varying from 0·06 to 0·2 mm.

Locality: Station 163A, June 3, 1874, off Port Jackson; depth, 30 to 35 fathoms; rock. Station 163, April 4, 1874; latitude 36° 58′ S., longitude 150° 30′ E.; depth, 120 fathoms; off Twofold Bay, Australia, Challenger.

EXPLANATION OF PLATES.

PLATES., LIX TO LXVII.

Fig. 1a.—Ascetta procumbens. R. v. L. Three colonies on a shell of Mytilus. Natural size painted from life. The middle-sponge is young and consists of only a few separate individuals. These tubes soon grow out to form a felt-like texture as seen in the other two Sponges, and leaving round, trumpet-like Pseud oscula between them. (Port Jackson, Laminarion zone.)

Fig. 1b.—Ascetta procumbens. R. v. L. A colony on the inside of a Mytilus shell. Half the natural size. Photographed from a spirit specimen. The pseudopores small in the specimens figured in 1a attain such a size in this specimen that only narrow parts of the Sponge, consisting of one or more tubes remain between the large pores. In this way the whole attains the shape of a beautiful network. (Port Jackson, 10-15 fathoms.)

Fig. 1c.—Ascetta procumbens. R. v. L. A colony half the natural size. Photographed from a spirit specimen. The reticulation extending in a single plane only in the specimen figured in 1b extends into the third dimension and so a spongious structure is produced. Attached to the sea bottom. (Off Port Jackson, 30-40 fathoms.)

Fig. 1d. –Ascetta procumbens. R. v. L A specimen similar to 1c, with finer pores and different shape, growing all over the fragment of a coral.

Fig. 2.—Ascetta procumbens. R. v. L. Transverse section through a narrow part of the Sponge figured in 1a to the right below. Osmic acid Picrocarmin. The inhalent pores (*P*) appear in the entirely, among Ascones, unprecedented shape of very long and narrow canals, leading from the outer surface into the gastral cavity. The tubes are cylindrical. The outer surface is smooth, only the tips of the rays of a few irregularly disposed spicules protrude from it. The inner surface is extremely uneven and covered with ridges. In the thick Mesoderm numerous ova (*E*) are visible. A., Oc. III.

Fig. 3.—Ascetta procumbens. R. v. L. Transverse section through part of a tube. Osmic acid, Picrocarmin. The section passes through one of the ridges (*l*) in the gastral wall and discloses a spicule and an inhalent canal to view. The outer surface (*a*) and the inhalent canals (*g*) are covered by a low ectodermal Epithelium, which covers also several of the protruding tops of the spicules (*b*). The thick Mesoderm contains no bipolar muscular or tissue-cells. The transparent gallert is filled by numerous multipolar tissue-cells, the processes of which are irregularly disposed (*s*). A young ovum (*E*) appears in the section. Amœboid wandering cells are absent. Around the spicule *(f)* the Mesoderm cells form an Endothel which covers the immersed part of it. The spicules are covered by a highly colourable cuticule and show the axial canals very clearly. The flagellate frill cells cover the whole of the inner surface of the gastral cavity. F. Oc. II.

Fig. 4.—Ascetta procumbens. R. v. L. An adult spicule. The rays are conic and rounded. In other species they do not have this shape. F. Oc. II.

Fig. 5.—Ascetta procumbens. R. v. L. A young spicule. The rays of which are already so thick as those of the adult, only much shorter. F. Oc. II.

Fig. 6.—Ascetta procumbens. R. v. L. Schematic view of the interior of the gastral cavity showing the reticulation of the ridges.

Fig. 7.—Ascetta Maclaeyi. R. v. L. Painted from life. AA. Oc. II.

Fig. 8.—Ascetta Macleayi, R. v. L. Transverse section through the upper part of a colony. Osmic acid, Alumn Carmin, AA. Oc. II. The black dots represent the flagellate cells. In this portion the Sponge represents a tube of large diameter, a pseudosculum in the wall of which small lacunes Ascon individuals or ciliated chambers make their appearance.

Fig. 9.—Ascetta Macleayi. R. v. L. Transverse section through a colony in its thickest part. Osmic acid, Alumn Carmin, AA. Oc. II. The dots represent the flagellate cells. The Ascon tubes in this region of the Sponge are not connected by a membrane as above.

Fig. 10.—Ascetta Macleayi. R. v. L. Transverse section through the solid peduncle. Osmic acid, Alumn Carmin, AA. Oc. I.

Figs. 8, 9 and 10 are selected from a continuous series of sections made through one specimen.

Fig. 11.—Ascetta Macleayi. R. v. L. Longitudinal section through the colony. Osmic acid, AA. Oc. I. The Pseudosculum (*O*) is formed by asimple membrane above. Further down Ascon tubes are found around it. The tube terminates as such below, just above the middle of the Sponge. The central and lower part form a free reticulation (*s*) here the Ascon-persons are not connected by a membrane. (See fig. 9.) Towards the peduncle the Ascon tubes become larger. The solid peduncle (*p*) extends below to form a disc, by means of which it is attached.

Fig. 12.—Ascetta Macleayi. R. v. L. Transverse section through a tube. Osmic acid, Alumn Carmin, F. Oc. II. This section is near the top of the Sponge, where the Ascon tubes are joined by a membrane

(*m*), this contains the ordinary triradiate spicules disposed exactly tangentally. It is formed by Mesoderm—a thin wall with sparsely scattered tissue cells—and a coating of flat ectodermal pavement cells on either side. The surface *a c b* forms part of the *outer* surface of the Sponge, *d e f* on the other hand is part of the surface of the pseudosculum. The pores in the outer surface *(p)* are of course inhalent, they are small, those of the inner surface are not so numerous and much larger *(P)* they are exhalent. The pseudoscular tube very flexible, and following every current of water acts like a moveable chimney, and evidently greatly assists the flagellate cells in producing a strong current of water through the Sponge. If we consider the Pseudoscular tube as a *real* gastral cavity and the Ascon tubes as ciliated chambers, we have an ordinary Leuconide or Syllcibide Sponge before us. Inhalent *(p)* and exhalent *(P)* canals are clothed with low epithelium. The inner surface of the tube *(g h)* is covered by the ordinary flagellate cells. The spicules, regular Triradiates have the shape of low pyramids following absolutely tangentally the curvature of the Ascon tubes. Their points never protrude.

Fig. 13.—Ascetta Macleayi. R. v. L. Transverse section through the solid peduncle. Osmic acid, Alumn Carmin, DD. Oc. I. In the tubes and pseudoscular wall we find only a single layer of spicules. In the peduncle we meet with a strong cote of three to five layers of spicules with numerous multipolar tissue cells in the mesoderm. The central part is destitute of spicules and filled with numerous highly colourable cells *(a)* which appear spherical in the specimens treated with hardening reagents. They may be amorboid cells ; it appears not unlikely that they are young stages of ova or spermatophores. In which case the peduncle must be considered as a kind of sexual organ or brooding place. (Similar to the formation of ova in the hollow peduncle of Homoderma and the Hydrorhiza of some sessil Hydromedusæ.)

Fig. 14.—Homoderma Sycandra. R. v. L. Growing from an Aplysilla violacea, painted from life in natural size.

Fig. 15.—Homoderma Sycandra. R. v. L. Longitudinal section combinated picture. The same kind of Entodermal flagellate cells throughout the Sponge and the Spongorhiza. Ciliated tubes as in Syconidæ. Spongorhiza hairy. Thes ummits of the ciliated tubes crowned by tufts of Acerates. Regular disposition

of the ciliated tubes. Numerous young ova, particularly in the particularly in the Mesoderm of the peduncle. Two oscular frills of Acerates.

Figs. 16-21.—Homoderma Sycandra. R. v. L. The Metamorphosis from the simple sackshaped Ascon to the adult, but smal Sycon.

Figs. 22-23.—Homoderma Sycandra. R. v. L. Acerate spicules of the tufts on the ciliated tubes.

Figs. 24-26.—Homoderma Sycandra. R. v. L. Quadriradiate spicules of the Parenchyma.

Figs. 27-29.—Homoderma Sycandra. R. v. L. Triradiate spicules of the Parenchyma.

Figs. 30-31.—Homoderma Sycandra. R. v. L. Quadriradiate spicules of the gastral wall.

Fig. 32.—Homoderma Sycandra. R. v. L. Transverse section through the middle of Sponge individual. Combined picture.

Fig. 33.—Homoderma Sycandra. R. v. L. Transverse section through half the upper part of the Sponge Osmic Acid. Picrocarmin, F. Oc. II. This section shows the distribution of the different spicules. In the Mesoderm there is a large oval Ovum. The spicules are covered by sheaths, particularly those which protrude into the Gastral cavity show these sheaths very clearly. Protruding triradiates of the regular kind of fig. 27, are exposed in the section. These are rare hidden by the tufts of acerates, which are parallel to one another, and immersed only a very short distance.

Fig. 34.—Leucopsis pedunculata. R. v L. Longitudinal section. Osmic Acid, the dots represent the flagellate cells covering the inner surface of the Ascon tubes which have become in this specie isolated ciliated chambers, with one large exhalent pore to each. The shape of these chambers is irregular.

Figs. 35, 36.—Sycandra Ramsayi. R. v. L. Seen en face (35) and en profile (36.) Photographed from a spirit specimen.

Fig. 37.—Sycandra Ramsayi. R. v. L. Transverse section combined picture. C. Oc. I. The inter or inhalent canals are particularly wide, and both these and the ciliated tubes remarkable for their regularity and straightness. The tufts of spicules are disposed tangentally on the summits of the ciliated tubes.

Fig. 38.—*a* and *b*. Sycandra Ramsayi. R. v. L. Triradiate sagittal spicules of the Parencayma (*a*) which often show an incipient fourth ray (*b*.)

Fig. 39.—*a* and *b*. Sycandra Ramsayi. ·R. v L. Quadriradiate spicules, *a* of the Gastral part of the Parenchyma, *b* of the Gastral wall. The sagittal ray of the former lies centrifugally, that of the latter centripetally.

Fig. 40.—*a b* and *c*. Sycandra Ramsayi. R. v. L. Acerate spicules of the dermal tufts *a* large straight spindle-shaped acerate, *b* and *c* irregular curved spicules numerous at the base of the tufts.

Fig. 41.—Grantessa sacca. R. v. L. Photographed from a spirit specimen.

Fig. 42.—Grantessa sacea. R. v. L. Transverse section, through *a* one of the tufts of spicules conspicuous in fig. 41.

Fig. 43.—Leucandra meandrina. R. v. L. Transverse section. The dermal cortex *a* is penetrated by the pores which open into tangental canals *b*, from which centripetal inhalent tubes *c* take their origin. The exhalent centripetal canals *d* lead into tangental wide and lacunose canals *e* with mostly an oval transverse section, which finally open into others *f*, just below the Gastral wall. These are in connection with the Gastral *g* by irregular pores *P*.

Fig. 44.—Leucandra meandrino. R. v. L. A Gastral quadriradiate spicule.

Fig. 45. Leucandra meandrina. R. v. L. *a* Parenchymal triradiate spicule.

Figs. 46, 47.—Leucandra saccharata, Haeckel. Photographed from spirit specimens.

NOTES ON THE DIRECTION OF THE HAIR ON THE BACK OF SOME KANGAROOS.

By N. de Miklouho-Maclay.

[Plate LXXI.]

The peculiarity in the direction of the hair on the neck of *Dorcopsis Mulleri* (1), *Dendrolagus ursinus* and *Dendrolagus inustus*, has been described and figured already by Schlegel and Müller (2) over forty years ago.

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(1). The *Dorcopsis Brunii* of S. Müller, or the *Macropus Muelleri* of Prof. Schlegel, is after Prof. Garrod, "generically distinct from *Macropus* in its widest sence, and from all it minor divisions, it is also evident that *Dorcopsis Mulleri* must be the name applied to the *Dorcopsis Brunii* of Muller." (Proceed. of the Zool, Soc , 1875. p. 49)

(2). *Herm. Schlegel* and *Sal. Müller. Over drie Buideldieren uit de familie der Kengoeroes.* (Pl. *XIX-XXIV*, published as a part of the: "*Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche over-zeesche Bezittengen door de Leden der Naturkundige Commissie en andere Schrijvers uitgegeven op last van den Koning door C. T. Temminck.* 1839-1844.

Over the direction of the hair of the body of *Dorcopsis Mülleri*, the authors say :—

"De vleug der haren neemt op verscheidene plaatsen van het ligchaam "eene besondere rigting aan. De haren des staarts namelijk loopen, langs de "boven-en onderlijn naar achteren ; die der zijden daarentegen zijn naar "boven gerigt, en op de eerste helft van de lengte des staarts zijn deze haren "in het midden, als het ware gescheiden, door dat de bovenste opwaarts, de "onderste benedenwaarts gerigt zijn. Boven, langs het midden de schouders, "vormen de haren eene scheiding, doordein zij van daar naar voren op den "nek, en van de zijden naar beneden op de armen loopen, en alzoo van de "regt naar achteren loopende haren van den rug afgescheiden zijn. De haren "van de zijden des kops loopen naar beneden, maar die van de bovenste "vlakte zijn naar achteren gerigt, stooten op het midden der kruin aan "elkander, en vormen eene sort van kam, welke zich teganover het achterste "einde der ooren, op de nek, in de naar boven en voren gerigte haren der "achterzijde van den hals verliest. . . . (Loc. Cit. p. 135.)

About *Dendrolagus ursinus* the same authors remark :—

" . . . . Boven op den rug, achter de schouders, vormt het hair eene "soort von kring, van waar het naar alle kanten, als wit een middelpunt, Prof. Garrod, redescribing the *Halmaturus luctuosus* of D'Albertis as *Dorcopsis luctuosa*, which shows the same peculiarity, says:—" All the hair covering the space bounded in " front by a line running transversely across the parietal region, " and behind by two lines joining in the middle line between the " shoulders, to form a right angle seven inches behind the " occiput, and extending forward and outward to the shoulder-" joint, being directed forward, whilst the general body-covering " of hair is directed normally backwards." (1.)

Dorcopsis Chalmersii, described by me in a former paper (2), shows on the neck exactly the same extent of fur, with the hair directed forward, as in *Dorcopsis luctuosa*. The direction of the hair on the tail of *Dorcopsis Muelleri*, mentioned by Schlegel and Müller, does not exist in *Dorcopsis luctuosa* nor in *Dorcopsis Chalmersii*.

The peculiarity in the direction of the hair on the neck of the above mentioned kangaroos is still more remarkable in a new species of *Dendrolagus*, discovered lately on the South Coast of New Guinea. In this species—*Dendrolagus Dorianus*—not only the hair on the neck, out nearly the whole of the hair *on the* back is directed forward. Mr. E. P. Ramsay, in the description of this species, says :—" The whole of the hair on the body is reversed,

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straalvormig heenloopt. Het is om deze reden, dat het hair der achterdeelen van den hals naar voren loopt, en tusschen de ooren, aan het naar achteren gerigte, korte hair des kops stootende, hier eene sort van kam vormt, welke " zich dwars over het achterhoofd, van het eene ovo tot het andere uitstrekt. " , i . . (Loc. Cit. p. 142.)

About *Dendrolagus inustus*, we find the following remarks :—

" Het hair, hetwelk van den hairkring boven de schouders, langs den " achterhals naar voren loopt, blijft die rigting tot op het midden van den " kop behouden, en stoot hier aan het naar achteren gerigte hair der snuits, " aldus op den bovenkop eene lijn vormende, welke zich, in eene half " cirkelvormige bogt, tot aan de de boven-voorhoek van het oor uitstrekt. . . . . ." (Loc. Cit. p. 144,) On the plates 19, 20 and 21 (of the above mentioned paper of *H. Schlegel* and *S. Muller*) the direction of the hair on the neck is distinctly to be seen.

(1.) *A. H. Garrod*. On the Kangaroo called Halmaturus luctuosus, by D'Albertis, and its affinities. Proceed. of the Zool. Soc, 1875. P. 51.

(2.) *N. de M. Maclay*. On a new species of Kangaroo from the S.E. end of New Guinea. Proceed. of the Linnean Soc. of N.S.W. Vol. IX. P. 569.

and meeting that of the head, which is directed backward, forms a ridge between the ears and down the sides of the cheeks, and is similarly directed on the limbs, the hair on the legs and arms being directed forward, as is usual." (1)

Having had the opportunity, through the kindness of Mr. Wm. Macleay, of closely examining in his museum three specimens of *Dendrolagus Dorianus* (adult ♂ and ♀ and a young ♂) (2), it appears to me that some additional remarks about this most interesting animal to the description of Mr. Ramsay will not be out of place.

The principal external peculiarity of the same is, without doubt, the remarkable direction of the hair on its back, a fair idea of which may be gained by the inspection of fig. 2 (pl. 71), representing *Dendrolagus Dorianus* in profile, with the direction of the hair marked with small darts. The converging point (marked with * on fig. 2) of the lines forming the boundary of the hair directed forward and the hair directed backward, is situated in the middle line, near the base of the tail (565 mm., or about 21·1 in. behind this occiput). From this point the lines run forward and outward (the animal examined in the position represented on fig. 2) to the sides of the knee-joints. From this dividing line the hair of the back is directed forward, while on the sides of the body the direction of the hair is gradually bending towards the ventral middle line. The hair of the head directed normally backward in meeting the hair of the neck (directed forwards) forms between the ears a hair-ridge, which is less marked than in Dorcopsis, which extends from the ears to the front along the lower edge of the under-jaw. On the ventral surface of the neck, beginning a little above the episternum, the hair is directed upwards, whilst two narrow bands, with the hair

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(1.) *E. P. Ramsay.* Contributions to the Zoology of New Guinea. Part VII. Proceed. of the Linnean Soc. of N.S.W. Vol. VIII. 1883. P. 17,

(2.) They are the same specimens which have served Mr. E. P. Ramsay for his description of the species—Dendrolagus Dorianus—and so far as I know, the *only* specimens of this species brought, until now, from New Guinea.

turned downwards, run on both sides of the median portion of the chest. The hair on the arms and legs is directed normally downwards. From the dividing line the hair on the hindparts of the body as well as of the tail is as usual directed backwards.

The direction of the hair on the back in the female of *Dendrolagus Dorianus* is exactly the same as in the male (1), and can very distinctly be observed in the young one (2).

Besides the peculiar direction of the hair on the back, which as we have seen, is not to be found in such an extent in the other species of the genus (3), the dentition of *D. Dorianus* shows a very marked differential character, which does not appear in the other two species. I mean the large size and shape of the central incisors (fig. 3), which are in these respects very different in comparison with those of *D. ursinus* and *D. inustus* (4). Although, as Mr. Ramsay, in his paper about *D. Dorianus*, rightly observes, the teeth of the specimens described by him are in "a very bad state, being corroded by the liquid in which the skin was preserved" (5), it seems to me, that the incisors have not suffered much. The length of the central incisors of the male (in the present state), is not less than 13 mm., or about $\frac{1}{2}$ of an inch. Their external surface is rounded, while the internal flat, worn down. Examined from the front (fig. 4) the space between the central incisors on their base is about 2 mm. (or about $\frac{1}{12}$ in.), but they touch each other on their lower margin which is not pointed, but presents a half rounded cutting edge.

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(1). The only sexual differences which I found in the pair of D. Dorianus of the Macleay Museum, were : the smaller size of the female (the total length of the ♂, from tip of nose to end of tail, being 1340 mm., or 52·2 in., tail 560 mm., or 22·1 in. ; total length of the ♀ 1320 mm., or 51·4 in., tail 550 mm., or 21·7 in.) and the hair of the end portion of the tail of the female being longer.

(2). The total length of the young ♂ (from tip of nose to end of tail 665 mm., or 22·3 in., tail 270 mm., or 10·7 in.)

(3). Speaking in this paper about the "other" species of the genus *Dendrolagus*, I refer only to *D. ursinus* and *D. inustus*.

(4). *Schlegel* and *Müller*. Loc. cit., pl. 23, figs. 2 and 5.

(5). *E. P. Ramsay*. Loc. cit., foot note to p. 17. The *D. Dorianus* skins have been preserved, as I have been told by Mr. Ramsay, in common salt, called "brine."

The canines in *D. Dorianus* are very large in comparison with those of the other species of the genus; their breadth on the cingulum is nearly 4 mm. (or not quite 0, 2 in), but their length has been most likely reduced in this specimen by the effect of the mode of preservation.

I am unable to my regret, to add an account about the other teeth of *D. Dorianus*, because they are not accessible for inspection in a stuffed specimen.

In a former paper (1) I have already mentioned that in *Osphranter rufus* the same peculiarity of the direction of the hair of the neck is to be found as in the Genera *Dorcopsis* and *Dendrolagus*. At the time when I wrote the above paper, the only specimen of *Osphranter rufus* showing the peculiarity was the specimen in the Macleay-Museum; but since then, Mr. Ramsay informed me, that another specimen of *O. rufus*, brought alive from the Riverina district and presented lately to the Australian Museum, shows distinctly the same peculiarity as the specimen of the Macleay-Museum.

Two more specimens of *O. rufus* of the same kind have been found amongst the collection of skins in the Australian Museum, so that I had now four skins for my inspection (2). The two old

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(1). *N. de Miklouho-Maclay.* On a new species of Kangaroo, *Dorcopsis Chalmersii*, from the south-east end of New-Guinea. Proceed. of the Linnean Soc. of N.S.W., Vol. IX., p. 569.

(2.) Some measurements of the four specimens of

Osphranter rufus, Demarest.	From tip of nose—end of tail.		Length of tail.		From occiput to converging point on the back	
	Mm.	F. in. (or about)	Mm.	F. in. (or about)	Mm.	F. in. (or about)
♂ from the Murrumbidgee R. (Mcl. Mus.) … …	2515	8 3	992	3 3	457	1 6
♂ from the Lachlan R. (Austr. Mus.) … …	2065	6 9,3	850	2 9,4	290	11,4
♂ from the Riverina distr. (Austr. Mus.) … …	1630	5 4,2	740	2 5.1	490	1 7,3
♀ also from Riverina (Austr. Mus.) … …	1800	5 10,9	690	3 3,1	310	1 0,2

males are of a decided rufus colour, while the young male and the female are grey. The young male is especially interesting—showing the converging point, not between the shoulder, but much lower down on the back than in the other three specimens. Having inspected the four specimens, I came to the conclusion, that in *O. rufus* (as well as in the genera—Dorcopsis and Dentrolagus) the peculiar direction of the hair on the back is not a character of sex or age, and, secondly, that the extent of fur with the hair directed forward, is *not* strictly the same in different specimens. The anterior boundaries of this part of the fur in *O. rufus* differs also from those of the genus Dorcopsis. The hair-ridges on the head (between the ears) and the other running down from the ears on the sides of the neck, which both are very marked in Dorcopsis, are absent in *O. rufus*. (Compare fig. 5 and fig. 6.)

As regards the non-occurrence of the described peculiarity in the greater number of specimens of *O. rufus*, I think the same could be explained by the supposition of the existence of *two* different varieties of *O. rufus*. (1.)

The reasons *why* it appeared to me not without interest to give by description and illustrations a fuller idea about the occurrence of the above mentioned peculiarity in the direction of the hair on the back of some marsupials are: because in the first instance it is, as far as I know, quite an exceptional case in the class of mammals, where, as a rule the hair on the back is always directed downwards (or backwards), and secondly, because this

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(1.) Such a possibility is in accordance with the opinion of Mr. K. H. Bennet and Mr. E. P. Ramsay, who think there are two distinct species of the red Kangaroo, on account of different colour of the young ones; the young of one species being of a *bluish-grey* colour, the other *grey*, tinged with light rufous.

peculiarity contradicts, or at least puts in doubt until further observations, the general validity of the opinion expressed by Wallace (1) and Darwin. (2.)

This opinion was : that *the direction of the hair on the back of mammals is adapted to throw the rain off* (3). As an example of the corelation of the direction of the hair and the rain, the hair on the arms of *Simia satyrus*, observed by Wallace, has been given (4).

Observations of the attitude of the above mentioned marsupials (principally of *Dendrolagus Dorianus*) during rain will be therefore of great interest, and will give a striking evidence in favour, or against the explanation of Wallace or Darwin.

EXPLANATION OF PLATE 71.

Fig. 1.—Upper part of the body of *Dorcopsis luctuosa*, D'Albertis ♂ in profile, showing the peculiar direction of the hair on the neck.

Fig. 2.—*Dendrolagus Dorianus*, Ramsay, ♂ in profile, to show the direction of the hair on the body.

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(1). *A. R. Wallace.* Contributions to the theory of natural selections. A series of Essays, 2nd edition, 1871, p. 344.

(2). *Ch. Darwin.* The descent of man, 2nd edition, 1882, p. 151.

(3). *Ch. Darwin.* "The hairy covering of the body forms a natural protection against the severities of climate and particularly *against rain.* That this is the most important function is well shown by the manner in which the hairs are disposed so as to carry off the water, by being invariably directed downward from the most elevated part of the body." Wallace, Loc. cit., p. 344. ——— "It can hardly be doubted that with most mammals the thickness of the hair on the back and its direction is adapted *to throw off the rain.*" Darwin, Loc. cit., p. 151.

(4). "*A. R. Wallace* remarks that the conveyance of the hair towards the elbows on the arms of the Orang may be explained as serving *to throw off the rain.*" Darwin, Loc. cit., p. 151.

Fig. 3.—Incisors and canine of *Dendrolagus Dorianus* ♂. Natural size in profile.

Fig. 4.—The central incisors of the same from the front. Natural size.

Fig. 5.—Upper part of the body of *Osphranter rufus*, Demarest, ♂ in profile showing the same peculiarity in the direction of the hair on the neck. Converging point of the dividing lines "between the portions of fur" with the hair differently directed. The darts show the direction of the hair on different parts of the body.

Figs. 1, 2, 5 are sketches made with the help of a camera lucida, from stuffed specimens of the Macleay-Museum.

ON TRIBRACHYOCRINUS CORRUGATUS (F. RATTE.) Spec. Nov. FROM THE CARBONIFEROUS SANDSTONE OF NEW SOUTH WALES.

Plate LXVIII.

By F. Ratte, Eng. Arts and Manuf., Paris.

Professor M'Coy first described in 1847 (Tribrachyocrinus Clarkei), for which he created a new genus (1.)

Professor de Koninck later described specimens of this fossil also. (2.)

(1.) Ann. and Mag. of Nat. Hist. Vol. XX., p. 228. Pl. XII., fig. 2.
(2.) Fossiles Paléozoiques de la Nouvelle Galles du Sud," 1877, part the third, p. 161, pl. 6, fig. 5.

The new species which I intend to describe agrees very closely with both Prof. de Koninck and Prof. McCoy's descriptions, but especially with the latter. The specimen is in the Australian Museum.

The chief difference it presents to *Tribrachyocrinus Clarkei*, is in the external appearance, the new species being wrinkled or ridged on the surface, whilst the first one is smooth.

The fossils that Dana has described under the generic name of *Pentadia* (several species) (1), are probably separate plates of *Cyathocrinus*, but they might as well be separate plates of *Tribrachyocrinus*.

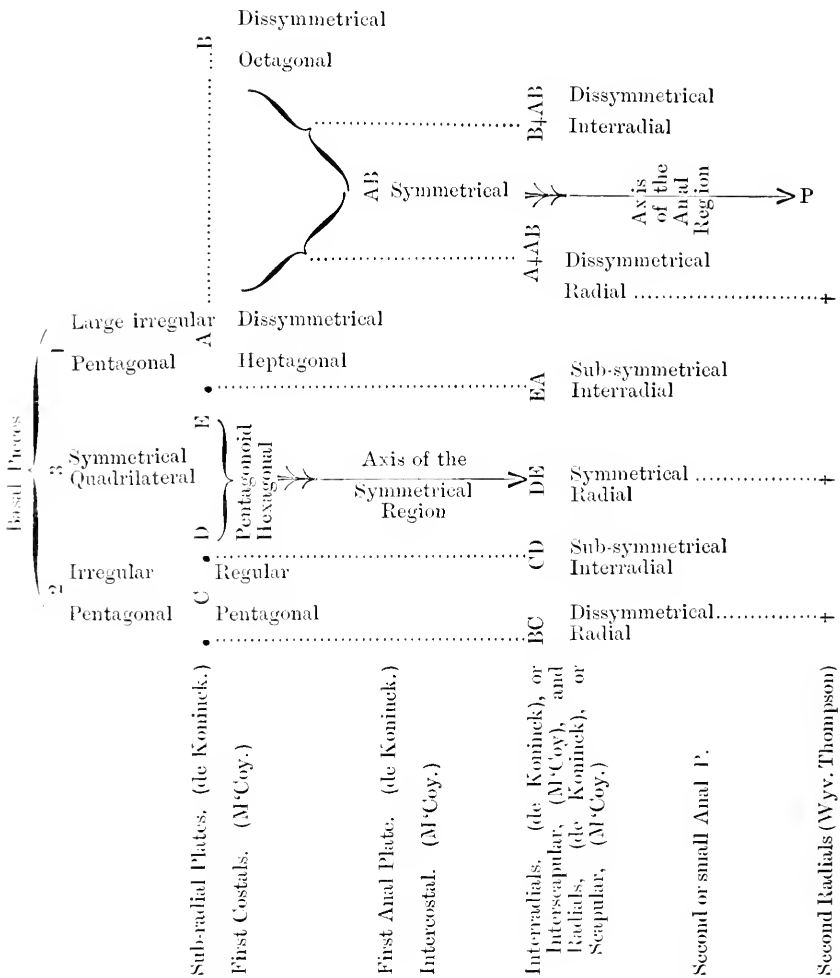
The inner casts of these two genera are often found in the same beds, but in *Cyathocrinus* the basal plate is formed of five articles, whilst in *Tribrachyocrinus* it is formed of three articles only as in *Platycrinus*.

CALYX.

In order to afford, besides the diagrams figured, a ready systematic schema of the relative disposition of the plates forming the calyx, I will name these pieces as follows (fig. 1, pl. 68):— 1, 2, 3 for the three basal pieces, A B C D E for the five adjacent subradial plates.

The anal, inter-radial, and radial plates will be named by composing the letters of the two adjoining plates. For instance, the anal plate being adjacent to A and B, will be called AB, and so on. It will then be easy to read the following tabular disposition:—

(1.) Am. Jour. Science. Vol. IV., 1847, and Geol. U. S. Expl. Exped., p. 713., pl. 4, f. 10.



The region 3, D E. (D E) radiating from 3 can be called the *Symmetrical region*, its plane axis cutting in halves 3 and (D E), whilst the region nearly opposite including the first and second anal, and the adjoining radial and interradial (A + AB), and (B + A B), can be called the *Anal region*, its plane axis cutting in halves (A B) and p.

The detail of this arrangement is the following :—

The tripartite division of the *basal* plates and the situation of the so-called *anal* plates cause the row of five plates which follow the basal and are called *sub-radial (sous-radiales)* by Prof. de Koninck, and *first costals* by Prof. McCoy, to be, necessarily, formed of irregular elements.

Prof. de Koninck, at page 161 has given a geometrical diagram of the plates, of *Tribrachyocrinus Clarkei.* The basal pentagon in this diagram is made regular, and the three sides on which fall the divisions are made straight. The diagram given by Prof. M'Coy of the same species is nearer the diagram I give of the new species (pl. 68.)

The fossil being observed from above, the medial line of division of the basal plate projected downwards and the two lateral lines of division projected upwards, it will be seen that the basal pentagon is not regular, and may even be more exactly considered as an irregular octagon with three re-entering angles at the points of junction of the three segments, the general outline of the figure, however, approaching a regular pentagon. Moreover of the two segments adjacent to the medial division *a i*, one much more extended than the other, is the segment adjacent to the anal region, and, as a consequence, the angle *a i d* is greater than the angle *a i f*.

To follow this first irregularity, the three subradial plates which are not adjacent to the anal region, are not of the same shape, one C, adjacent to *b c*, is pentagonal, whilst the two D and E, adjacent to *cde*, and *efg*, are, we may say, hexagonal with two of their sides only about half the length of the others.

As to the two other subradial plates A and B, those adjoining the anal region, they differ only a little from each other. One of them, B, adjacent to *hab* being irregularly octagonal, whilst the other one, A, adjacent to *gh*, is irregularly heptagonal, both with one re-entering angle.

The intercostal or anal plate, which, as seen in our specimen, presents a re-entering angle at its upper part, exhibits a bilateral symmetry, being octagonal in shape, and is made to fit in the two re-entering angles of the two preceding subradial plates. Lastly, I will remark that the last row being composed as follows, three radials, three interradials, and the second costal or second anal p, forms a continuous set of plates fitting each other by alternating re-entering angles. For instance, the second costal occuping the space between an irregular radial and an interradial, fits on one side, in the re-entering angle of the radial, and on the other, is provided with a cuneiform projection fitting the next interradial plate.

ORNAMENTS OF THE CALYX.

The external ornaments of the Calyx are fairly impressed in the external cast with which it was possible to obtain a *positive* representation in plaster of Paris, of the outer part of the Calyx. These ornaments are composed of coarse granulations which give the fossil an apparent resemblance to *Platycrinus granulatus* (Austin) of the Carboniferous of Belgium. The difference, however, is very great, between the ornaments of *Platycrinus granulatus* and those of *Tribrachyocrinus corrugatus.* In the first they consist of irregular tubercles, sometimes following each other in sequence or meeting together for a short distance, but without regularity. Sometimes these tubercles are rounded, sometimes they are angu lar

In *Trib. corrugatus* the ornaments form a network of ridges, leaving hollows between them, except on the radials where separated tubercles disposed into radiating lines are to be seen as in fig. 7, pl. 68.

Both the external cast and the internal cast are represented. Pl. 68, figs. 2 to 5.

These internal and external casts show, above the three radials, the impressions of the second radials which were not known before. These I was more inclined to call *first brachial articles*; they come into contact with the *radials* by a sharp straight edge, their under surface, as well as the surface of the corresponding part of the radial, exhibiting fine striæ produced by the attachment of muscles which allowed the arms to move in a plane perpendicular to the straight articulation and passing at or near the centre of the Calyx. It was, therefore, acting like a hinge.

The shape of this articulation with the striated surfaces of attachment of the muscles is represented Plate 68, figs. 2 to 12, on a doubled scale.

It is nearly that of an isosceles triangle, the larger base of which is the straight edge. The opposite obtuse angle is provided with an inner groove, which is the continuation of the arm-channels or ambulacral groove, communicating with the digestive apparatus.

The upper side is convex, except round the groove, where it is hollowed in the shape of a saucer to receive the next arm-plate. Moreover, this saucer-shaped hollow is provided with a semicircular *pad* ("bourrelet") or ridge, nearly concentrical with the outer margin of the hollow, as seen in the genera *Platycrinus* and *Poteriocrinus*, on the fixed plates that Prof. de Koninck calls "pièces supérieures" (1.)

ARMS.

Traces of the arms are impressed above the last-mentioned articulation, but not in a sufficient state of neatness for description. I have seen in the collection of the Geological Department a beautiful impression, representing two branches of arms four inches in length and $\frac{3}{20}$ths of an inch in thickness. Each article is cuneiform in shape, say presenting a maximum of thickness at the extremity of one diameter, and a minimum at the other extremity of the same diameter alternately, the thickest part (distal end) giving insertion to a spine. Some *syzygies* also are distinguished. But it is not known if these arm-branches are those of *Tribrachyocrinus* or of *Cyathocrinus Konincki*, which both occur in the same beds.

"VOUTE" (VAULT), OR OUTER PART OF THE CALYX.

Between the arm-plates are seen the casts of very small plates, irregular in shape, which doubtless belong to the so-called "voûte" (vault), or outer part covering the calyx, as in *Rhodocrinus*, for instance. Many of these small plates are four-sided, few are five-sided.

(1.) Desc. des Anim. Foss. Carb. Belg., 1842-4. Plate F.

EXPLANATION OF PLATE LXVIII.

Fig. 1.—Diagram of the plates of Tribrachyocrinus corrugatus, including the second radials articulated with the first radials.

Fig. 2.—Upper side view of the outer part of the Calyx, from a plaster cast obtained from the sandstone hollow cast (negative). The three second radials and a part of the small plates of the vault are seen.

Fig. 3.—Upper side view of the inner cast (sandstone) of the Calyx showing the negative casts of the three second radials and of a part of the small plates of the vault. Taken in the same position as fig. 2.

Fig. 4.—Under side view of the outer part of the Calyx, from a plaster cast as in fig. 2. Showing the three basal plates and the subradial B on the right of the fig.

Fig. 5.—Under side view of the inner cast of the Calyx, taken in the same position as fig. 4.

Fig. 6.—View of the symmetrical radial, showing the granulations of the surface. Double size.

Fig. 7.—Under side of the second radial showing muscular striæ. Double size.

Fig. 8.—Upper side of the same showing socket for the first article of the arm. Double size.

Fig. 9.—Side view of the same. Double size.

Fig. 10.—Medial section of figs. 6 and 7, arranged so as to show the place of the muscle and their relative position. Double size.

Fig. 11.—Section *pq*. of second radial. Double size.

Fig. 12.—Section *rs*. of same.

ON THE LARVÆ AND LARVA-CASES OF SOME AUSTRALIAN APHROPHORIDÆ.

By F. Ratte, Eng. Arts and Manuf., Paris.

(Plates LXIX. and LXX.)

There are several instances of insect larvæ building a kind of shell, if not shell in structure, at least in form. In *Helicopsyche*, a phryganid (Trichoptera), the larva of which lives in the waters of warm countries, the shell is in the shape of an Helix, and is formed of agglutinated sand. This shell often includes bright minerals, such as quartz, garnets, amphibole, mica (New Caledonia.) In a classical instance, it is formed of small *Planorbis* (Westwood). In this country the female of a case-moth lives in a perfectly helicoidal shell apparently formed by agglutinated vegetable matter.

But these are not true shells like those of molluscs or serpulæ.

At the meeting of June last, our President, Mr. C. S. Wilkinson, exhibited helicoidal shells of insects found on the branches of some gum trees at the Hunter River. They are figured in connection with this paper, but were remains of the last year, and had no insects in them. Mr. Brazier found some at the North Shore years ago, but they do not seem to be common everywhere. However, Mr. Ramsay found an empty specimen at Manly, probably of the same species.

Similar shells, but of a conical shape, of two or three different species, are rather common around Sydney, especially on white gum (*Eucalyptus hæmastoma*, var. *micrantha*) and stringy bark (*Euc. capitellata*); it is those which enabled me, with the help of Mr. Macleay, to find the genus to which, most probably, the three or four mentioned species belong. Those are true shells, much resembling some living and fossil serpulæ.

The shell is fixed on the branch, generally a little or immediately above the insertion of a leaf; and its opening is turned upwards. The position of the larva in it is reversed, its head being placed downwards, except in the helicoidal shell, where the insect lies horizontally for the greater part of its larva life. In both instances it follows that the larva, instead of presenting its head at the entrance of its shell, like a mollusc, presents its hind region. The mouth of the larva is transformed into a suctorial apparatus, with which it pierces the bark of the stem, and sucks the sap. For that purpose the shell is provided with a longitudinal slit. It occasionally moves itself backwards and emits a drop of clear water at the entrance of its shell, which is habitually half or nearly full of water. In warm weather especially, the production of water is increased, and drops are seen falling from the top of the shell. A well-known species of Aphrophora, *A. Goudoti* (Benn), of Madagascar, also lives on trees, but does not build a shell. In the state of larva, as well as of imago, it emits a large quantity of clear water. Mr. Goudot says that on a warm day he could obtain in half-an-hour about a bottle-full of water produced by about sixty insects. (1.)

(1.) Bennet. Proc. Zool. Soc., Lond., 1833, and Proc. Nat. Hist. Soc., Mauritius, 1832.

This phenomenon does not occur only in this order of insects. It is said that a kind of ant in Brazil absorbs water, and emits it in abundance. ("Nature," 1881.)

The lime which enters into the composition of the shell is evidently provided from the sap of the tree, and, according to Professor W. A. Dixon, the stems and leaves of gum trees are rich in lime. From a rough assay made by treating the shells with diluted hydrochloric acid, I obtained at least seventy-five per cent as the proportion of carbonate of lime, the insoluble remains being considered as chitinous matter.

The weight of the ornamented shell, the most common species, is about 4 centigrammes, whilst that of the larger one is 6 centigrammes.

The imago was obtained about the end of September, and was identified by Mr. Macleay as belonging to the genus *Ptyelus* nearly allied to *Aphrophora.*

When it is ready to undergo its last change the larva gets out of the shell in the middle of a frothy mass of water like the cuckoospit (*Aphrophora spumaria*, Linn.), and shortly after leaving its skin, appears in the shape of imago.

About the same time, I received from Mr. John Mitchell of Bowning, some living specimens which were far less advanced than those around Sydney, showing that they were at least one month or two later.

It is not known when they deposit their eggs, but it is probable that they live for some time in the perfect state, as they are still to be found now (end of November) on the trees.

These little jumpers don't make great use of their wings and consequently don't go very high on the trees although they run very quickly; their shells are found from two feet to six or seven feet above the ground.

Ten months at least ought probably to be reckoned as the time the insect lives in its larval state, at the same time growing its shell. During that period it apparently undergoes numerous changes, as in the three last months of the life of the larva, it passes through at least six distinct stages including the last one.

By perusing the appended plates we will go rapidly through the details of this study. The scale is marked on the figures.

Plate 69, fig. 1, 1a, 1b and 2. Helicoidal shell. Occurs dextrorsum or sinistrorsum round the stems, section ogival, showing a longitudinal costa. Shell finely striated with lines of growth. Helix of two rounds and one half, diameter 7½ millimetres (fig. 1, etc.) The shell represented by fig. 2 differs somewhat in general appearance from fig. 1, but the striation is the same and it is probably the same species. The last one was found at Manly by Mr. Ramsay.

Plate 69, fig. 3, 4, 6, 8, 8a, 11. The commonest species. Is easily distinguished by the granulations of its lines of growth. These exhibit ornamentations which recall some forms of wall stalactites (fig. 8 and 11.) This shell is also very dark, especially on the tubercles. These ornaments are irregularly disposed in front of the shell, but on each side follow each other, forming a continuous serrated costa Length of shell, 15 millimetres. Attached to the stem along its whole length. Plate 70, fig. 1, 2, 4, 5, 10, represent five different stages of the larva enlarged 10 times and on a smaller scale, the imago from the ornamented shell, (fig. 3 etc.) Fig. 1, as found in July, 3 millimetres. Fig. 1a the shield shaped anal plate enlarged. It acts as an operculum. Fig. 10, the imago drawn only double size. Length of body, 7½ millimetres. Alar expansion, 14½ millimetres. Thorax and scutellum light green and transversely striated. Among the imagos obtained from the common shells there are some much smaller, somewhat differing in shade, having the wings better marked than the others, which are probably the males. Length of body, 4½ millimetres. Alar expansion, 10½ millimetres.

Plate 69, fig. 3a, 10 represent the shell of another species, the largest among the species described. Section ogival, rounded, and narrower at the mouth. The surface is marked with lines of growth and is somewhat lustrous with a light shade of buff, darker near the mouth. These shells soon lose their colours under the sun, those of the preceding year being perfectly white. It is obvious that the younger lines of growth, near the mouth of the shell, are likely to exhibit the colours in a fresher state. Fig. 10 represents a shell which has been broken and mended. A piece of the broken part is seen cemented on the surface in front of the shell. Length 22 to 25 millimetres. Detached from the stem and bent for about 9 millimetres.

Plate 70, fig. 6, represents the larva of the same enlarged five times, as found in July. This larva shows no plates like those represented figs. 1 to 5.

Plate 69, fig. 3b, 4(?), 5, 7 and 9, represent a smaller shell much resembling the preceding one, being only from 15 to 18 millimetres in length. The section is generally more distinctly ogival and the shell presents in front a longitudinal angle, but, as well as in the preceding species the mouth is round or nearly so. A peculiarity which distinguishes this shell is a narrowing which is situated at two or three millimetres from the mouth. From this narrow space to the mouth the shell is dark, nearly black. The general colour is a greyish white. The shell is bent on its upper part and detached from the stem as the preceding one. The larva resembles the one represented fig. 6, plate 70.

From these I obtained a perfect insect apparently differing from the common species by a lighter shade on the wings. Fig. 7 represents an instance of this shell taking a half round.

Plate 70, fig. 7, represents a hind tibia of larva with three articulations, two claws and rings of setæ. This figure and the following ones apply to the different larvæ examined, but especially to the common species.

Fig. 8a, 8b, represent the inferior lip composed of three divisions forming a tube for the setæ, which are four in number (mandibles and maxillæ.) The maxillæ are serrated fig. a,b.

Fig. 9. Antennæ of larva terminating in asingle seta short and stout.

In conclusion I should say that much remains to be done next year towards the study of these little insects.

In the dry parts of the interior it is probable that the water contained in these shells is resorted to for drinking by the ants so numerous in Australia, as if it was a specialty among the small homopterous insects to provide during their life for the *Formicidæ*.

Other insects inhabit the interior of the shell after it has been left by its builder; small cockroaches take occasional refuge in it. It is often also occupied by a small spider.

The larvæ are attacked by small black flies which perhaps deposit an egg or two in the young larva, the product of which feeds on it and ultimately takes its place. I found the pupa of this fly in a black hairy cocoon, but have lost the perfect insect. Similarly some *Coccidæ* are attacked by small *Diptera* and *Hymenoptera*.

NOTES AND EXHIBITS.

The Hon. James Norton exhibited male and female cones of *Araucaria Cooki*, now to be seen in full fructification in the North Eastern Division of Hyde Park. Mr. Norton observed that this tree in its earliest stages was not distinguishable from *Araucaria excelsa*, but when full grown it was more dwarf and compact. As in the case of *A. excelsa*, the male cones grow at the ends of the leaf spires, and the female are produced on the higher branches, but the latter are apparently smaller and more clustered.

Dr. George Hurst exhibited an egg of *Scythrops Novæ Hollandiæ*, taken from the ovarium of a bird shot this month at Kempsey. He mentioned that the only other specimen of this egg ever recorded was obtained in a similar manner and described in Gould's Handbook of the Birds of Australia.

The President exhibited, for Mons. F. Ratte, a number of beautiful drawings, illustrative of his papers; and also a box containing carefully mounted specimens of the insect shells referred to, which have been presented to the Australian Museum.

The President also exhibited four specimens of the shell-like covering of a species of *Phryganea*. These are built up entirely of small round nodules of brown iron ore, fastened together by a silky web. They were obtained on the north end of New Caledonia, by Dr. Storer, in a creek flowing over rocks composed of iron ore.

The President submitted a lithograph of a new fossil plant, found by Mr. R. M. Johnston, of Hobart, in the carboniferous beds of the Jerusalem Basin, Tasmania. It has been named by the discoverer *Lepidostrobus Mülleri*.

WEDNESDAY, 31ST DECEMBER, 1884.

The President, C. S. Wilkinson, F.L.S., &c., in the chair.

The following gentlemen were present as visitors. W. H. Caldwell, Esq., B.A.; C. E. Smith, Esq.; James Mosely, Esq.; Alex. Hamilton, Esq.

MEMBER ELECTED.

George Wall, Esq., of Sydney.

DONATIONS.

"Zoologischer Anzeiger," Nos. 179 to 181., 20th October to 17th November, 1884. From the Editor.

"Transactions of the Royal Society of Edinburgh," Vol. XXXI., Part 1. Vol. XXXII., Part 2, 1881-83, 2 Vols. 4to. "Proceedings," Sessions 1881-82 and 1882-83, 2 Vols. 8vo. From the Society.

"Definitions of some new Australian Plants." By Baron F. von Mueller, K.C.M.G., &c. From the Author.

"Origin of the Fauna and Flora of New Zealand." By Captain F. W. Hutton, F.G.S. From the Author.

"Bulletin de la Société Impériale des Naturalistes de Moscou," Tome LIX., No. 1, 1884. From the Society.

"Science," Vol. III., Nos. 89 to 93. October 17th to November 14th, 1884. From the Editor.

"Studies from the Biological Laboratory of the Johns Hopkins University, Baltimore, U.S.A.," Vol. III., No. 1, March, 1884. Also, "University Circular," April, 1884. From the University.

"Midland Medical Miscellany," Vol. IV., No. 35. From the Editor.

"Catalogue of Papers and Works relating to the Mammalian Orders, Marsupialia and Monotremata." By J. J. Fletcher, M.A., B.Sc. From the Author.

"Scientific Opinion," 3 Vols., 4to, 1869-70. "Intellectual Observer," 16 Vols., 8vo, 1862-70. From Professor W. J. Stephens, M.A., F.G.S.

"Proceedings of the Zoological Society of London," Part 3, for 1884. From the Society.

"Nova Acta Regiæ Societatis Scientiarum Upsaliensis." Series III., Vol. XII., Fasc. I., 1884, 4to. From the Society.

"Monatliche Mittheilungen des Naturwissenchaftlichen Vereins des Regierungsbezirkes Frankfurt." Jahrg. II. No. VII., October 1884. From the Society.

"Second Supplement to R. A. Peacock's 'Saturated Steam.'" 1 Pamphlet 12 mo. 1884. From the Author.

PAPERS READ.

OCCASIONAL NOTES ON PLANTS INDIGENOUS IN THE IMMEDIATE NEIGHBOURHOOD OF SYDNEY.

No. 8.

By Edward Haviland.

The subject of this paper is the plant *Wahlenbergia gracilis*. It belongs to the order *Campanulaceæ*.

This order, although abundant in genera in most other countries, contains, so far as is yet known, but three in Australia. Bentham (Flora Australiensis, Vol. IV.) gives four, *Lobelia, Pratia, Isotoma,* and *Wahlenbergia*; but Baron von Mueller (census Australian Plants, 1882) reduces them to three by uniting *Pratia* and *Lobelia*. Of the genus *Wahlenbergia*, there is but one species, *Wahlenbergia gracilis*, as yet known in New South Wales; and this appears in all the Australian colonies, while in Tasmania there are two, *W. gracilis* and *W. saxicola*; both species being also found in New Zealand. The genus seems to be almost uninfluenced by climate. Bentham mentions *W. gracilis* as being common from the coast to the mountains, being found even at a height of six thousand feet; while *W. saxicola* is stated by Hooker to be found on the coast and also on the summit of Mount Wellington, in Tasmania. *Wahlenbergia gracilis* is an exceedingly variable plant, both in its general stature and in the size of its individual flowers. Mature specimens may be collected side by side, varying from six to eighteen inches in height, and with corollas from two or three lines to three quarters of an inch in diameter. It seems to prefer light open forest land, and in such localities it has been exceedingly abundant during the present spring and summer. In all its forms it is an exceedingly graceful plant; its beautiful blue flowers, when seen at a little distance, bringing at once to memory the English Harebell (*Campanula rotundifolia*), though of course a very different plant when more closely inspected. *Wahlenbergia gracilis* presents a peculiarity, when quite mature, in the apparent loss of its stamens. It is but apparent, however, their peculiar form, together with the early loss of the anthers, lead often to the supposition that the flower has no stamens; but I have not found them altogether absent in any specimen that I have examined. In nearly all, however, after the flowers have reached maturity the anthers have been wanting. The ovary has its dome shaped top level with the bases of the calyx lobes, and the fine stamens have the lower portions of their filaments so broad, that during the early existence of the flower, when they lie flatly upon the ovary, they cover it so closely that they are scarcely distinguishable from it; and as the edges of these broad portions of the filaments are ciliate, the top of the ovary, at that time, presents the appearance of a flattened dome having five ridges extending downwards from its apex. As the flower reaches maturity the filaments become loose, standing more away from the ovary; but looking more like an inner perianth than stamens. Although so broad at the base they end abruptly in a very fine thread-like portion, as long as the broader part, having, through the loss of the anthers the appearance of staminodia, hence the flower appears either to have no stamens or imperfect ones.

If a bud, just before it expands, be opened, the anthers may be seen attached to the almost hair-like portion of the filament ; and forming a close tube round the style, which at that time is only level with them, although it subsequently passes through them, and grows to a considerable length beyond them. Upon the style there are sveral large glands and these secrete a viscid fluid causing the pollen, which has already escaped from the anthers, to adhere to it. The style ends in a stigma of three lobes which at this time are closed, the stigmatic surfaces being inside, so that the pollen that has been deposited can have no fertilising effect upon the flower. Soon after the anthers have thus shed their pollen, as a rule, they disappear, by what means, I am at present unable to say. My first impression was that they were carried away by insects with some pollen still in them. Our friend Mr. Deane however, who has rendered me very great assistance in the study of this plant, suggested, that becoming detached they simply fall out of the corolla by gravity. I am not able to satisfy myself that this is the case ; because, if it were so, I should expect the anther always to be detached at the connective. I find however that this is not so ; but that on the contrary, although sometimes so detached, they are more frequently so by the rupture of the thinner portion of the filament at various points ; and moreover I find that when the filament itself is so broken, the remaining portion always seems to have recoiled, as though from a violent rupture. I do not think the anthers fall from mere gravity, for the flower, although so fragile, is generally quite erect when expanded, becoming pendant only as it closes, thus imprisoning the anthers at the very time when it could fall out by gravity. On this account I have searched for the debris of anthers in the bottom of the corolla but have have found it only in exceptional instances.

I think, however, another suggestion of Mr. Deane's a very happy one, and likely to be the solution of the difficulty. To explain this, I must repeat, that when the bud first opens the anthers and the thin portions of the filaments lie closely round the style, and are to some extent cemented to it by the viscid secretion from its glands. From that time the style grows very rapidly, passing far beyond the stamens. Mr. Deane suggests that this rapid growth of the style, carrying the stamens for a time with it, causes such a strain upon them that the thin portions of the filaments are ruptured. Of course this rupture may occur in any part of the filament, and this is just what I find, sometimes at the connective, at other times lower down and even close to the broader base. The suggestion however, though in all probability right, lacks confirmation by actual observation.

When the style has grown far above the anthers it exposes a large mass of pollen adherent to it. In a few days, as a rule, the whole of this pollen disappears. It does not fall into the corolla, nor can it I think be carried away by the wind, as it is not of the dry dusty nature of the pollen of *anemophilous* flowers. I can therefore only conclude that it is carried away by insects for the fertilisation of other flowers.

It rarely happens that the stigmatic lobes open before the whole of the pollen has been so carried away; then however they open widely, forming a convenient stage upon which an insect may alight, and exposing freely the stigmatic surfaces, densely covered with stiff hair-like glands; which, at the same time, form a brush to sweep the pollen from any insects bearing it, and secrete a fluid to retain it. Thus, like *Lobelia*, in the same natural order of plants, although somewhat in a different way, this plant first offers its own pollen for the fertilisation of other plants, and then exposes its own stigmas to receive that of other plants in return.

REPORT ON THE GEOLOGY AND PHYSICAL GEO-GRAPHY OF THE STATE OF PERAK.

By the Rev. J. E. Tenison-Woods, F.G.S., F.L.S., &c.

Geology.

The Geology of the State of Perak may be briefly described as consisting of :—

1. An immense granite formation passing into schists and slates of very early or ancient geological age.

2. Of a formation of paleozoic slates and clays, forming outliers or detached portions showing that it has been subject to great denudation. It is nearly always decomposed into blue mottled clays, red sandy clays, or highly variegated contorted clays commonly called Laterite. It forms small hills, or lies along the base of the ranges or in the valleys and on plains. It is not now of great thickness but has evidently once covered the whole granite formation.

3. Limestone in detached outliers or isolated hills of precipitous character showing much denudation. It is stratified or crystalline. There are no traces of fossils, or at least none have been yet found. I think, however, that it is probably of paleozoic age. From its wide extension throughout Perak where it crops out in so many places, I should say that it once covered the whole of the granite and paleozoic clays.

4. Drifts and alluvium derived from ancient streams and river beds, formed of material from all the preceding deposits.

In these drifts there are deposits of tin which occur in a manner very similar to the alluvial gold in Australia, that is to say, in "leads" which are the ancient river beds of the country.

Tin also occurs in caves in the limestone and at the junction of the paleozoic clays with the granite. In the former case the ore has been drifted into its present position. In the latter it does not occur abundantly.

5. Above these alluvial deposits there is the usual surface soil, supporting for the most part a dense vegetation.

Physical Geography.

The mountain system of the State of Perak, consists of detached groups of mountains which cover the west side of this part of the Peninsula, with an almost continuous range close to the sea of the Straits of Malacca.

The groups of mountains form parallel chains 20 or 30 miles long and with a direction a little oblique to the true meridional line. Sometimes they are wholly detached groups so as to allow rivers from the eastward to pass between them. Such for instance is seen in the ranges between the rivers Kinta and Perak. This group of mountains declines to the north, so as to allow the Plus River to join the Perak, and to the south the Kinta joins the Perak.

The Islands off the Coast, such as the Dindings, Pula Penang, and those off State Keddah (Pulo Leddas, P. Lankawi, Buton, &c.), are probably portions of similar groups. They usually run in sharp parallel ridges variously modified by oblique spurs which sometimes connect the main chains. These junctions form watersheds which throw off small streams to the north-east and south-west.

The following are the principal groups of mountains known to me, proceeding from south to north.

Dindings.

Off the Coast in front of the Dindings River (Lat. about 4° 12′ N), there is a series of islands of moderate elevation, though one peak in Pulo Pankore may be 800 feet high. All these islands are granitic, with tin and a little fine scaly gold (so it is said.) These are densely clothed with jungle and have fringing reefs of coral. I have visited three or four of these islands, and they are all of the same character.

On the main land there is a cluster of hills called the false Dindings, from the fact, that at a short distance they look like islands. They give rise to small rivers such the Dindings River and its tributaries. This cluster is also granitic, and tin occurs on the alluvial beds derived from it.

Gunong Bubu.

North-east of this group, but quite detached from it, is a series of parallel mountain ridges with a uniform N.N.E. trend. These ridges are eight or nine in number. The central one is the highest, culminating in Mount Bubu, a fine peak of about 5600 feet in elevation. All the ridges are granitic with occasional patches of metamorphic schists, all more or less rich in tin, though there are but few mines in this group. A remarkable character in these mountains is that all the ridges are extremely steep and frequently interrupted by granite precipices of 1000 feet or more. Gunong Bubu is only accessible in one or two places, the summit being surrounded by escarpments of rocks of great height.

Rivers Kangsa and Kenas.

Many small streams join the Perak River from this range. The Rivers Kenas and Kangsa both flow into the Perak from the slopes of this group, the Kenas in a south-east and the Kangsa in a north-east direction. In an ascent made by me to the summit of Mount Bubu, I was able to explore some of the sources of these rivers, which afford a home to many a Rhinoceros, but few other animals except monkeys (Hylobates, Semnopithecus and Macacus.) The rivers descend many hundred feet in a series of cascades, giving rise to some of the finest scenery in the Malay Peninsula.

Gapis Pass.

North of Mount Bubu this group of ridges falls away abruptly, leaving a narrow pass (Gapis Pass) between them and the west group. This pass is about 400 feet above the level of the sea, and therefore too elevated to permit of any river outlet.

Mount Pondok.

In Gapis Pass, or rather at the eastern end of it, there is an isolated hill of highly crystalline limestone. It is an outlier of the great paleozoic limestone formation already referred to. Mount Pondok is about 4000 feet high and quite precipitous. Its junction with the granite or paleozoic clays is not visible. Its bright blue and red precipices, crowned by dark green jungle, makes it a singular and beautiful object, though there are many similar to it, in the State of Perak and elsewhere in the Peninsula.

Mount Ijau.

North of Gapis another group of ranges succeeds, culminating in Mount Ijau. This cluster of ridges appears to be nearly of the same dimensions as the Mount Bubu group, but not so high by 1000 feet or so. I estimate that each group is from 20 to 25 miles long and 14 to 16 miles broad, covering an area of about 400 square miles. This, however, is only a rough estimate formed from views obtained from the summits of Group Bubu. I have not been able to examine closely the termination of Mount Ijau group to the north. From the sea and from the Perak River one can perceive a distinct pass like that of Gapis. It is probably about the same height and does not form the outlet of any river from the eastern side of the range.

Kurau Group.

North of Gunong Ijau is another group which I don't know how to distinguish, except that it forms the watershed of the Kurau River. Its highest point is said to be a mountain also called Ijau. If it be the peak which seems the highest point in the range, it does not appear from a distance to be so high as Mount Ijau to the south.

Mount Iuas.

Mount Iuas, as understood by the Malays of Selama, is the highest point of another detached group north of the Krian and Selama Rivers. At a few miles distance from the foot of this range it seemed somewhat over 4000 feet high, and the highest point of an isolated group of ridges.

Keddah Peak.

North of Iuas in the State of Keddah, there is, close to the sea a detached group of mountains, round the southern base of which the Keddah River flows. Keddah Peak is the highest summit and probably over 4000 feet above the sea.

Other Groups.

In the north of Perak near Patani there are other groups of mountains, notably the Gunong Kendrong Group, which is quite detached from any other hills.

Perak River.

The whole of these groups are sufficientiy connected to prevent any drainage from the central range from flowing directly to the West Coast of the Peninsula. Thus the Perak River which has its source in the Keddah and Patani Mountains flows to the southward in a winding course of over 200 miles. It has many tributaries the most important of which are the Plus and Kinta.

Plus River.

The Plus River has its sources in the high mountain group east of Mount Iuas and in the main range. It flows round the southern end of the Bukit Panjang Range and then joins the Perak.

Kinta Ranges.

South of this junction of the Plus is a group of mountains, called by some the Kinta Ranges. This group is about 25 miles long. It is quite detached from all the others having a generally north and south direction, but sending off spurs, north-east from the eastern side, and south-west from the western. As in all these groups of mountains the spurs on the eastern side are not numerous. The group is entirely granitic but on its lower slopes has extensive deposits of limestone. This belongs to the formation already referred to. Above and below the limestone strata drift tin is worked; below, that is to say, the horizon of the limestone. I am not aware of any instance where the calcareous strata have been bored through.

For about 25 miles this range separates the valley of the Perak River from that of the Kinta, which flows on its western base. The highest peaks rise to about 3750 feet above the sea and give rise to small streams which all flow into the Perak. There is a remarkable uniformity in three or four of the highest summits which are about the centre of the chain. They are all within a few feet of the same height. From these mountains the range falls away gradually to the south. It sends off two considerable spurs to the south-west. Where it ceases the River Kinta joins the Perak.

Kinta Valley.

The valley of the Kinta River is about as wide as that of the Perak. Both rivers flow on the eastern sides of their respective valleys. The eastern tributaries are many and important. On the sides, limestone, granite, and schistose slates crop out. To the eastward there are many detached hills of limestone, fronting the main central chain. They form very characteristic features in the landscape from their precipitous outline and brilliantly coloured escarpments of blue, green and bright red rock. They are also distinguished by a different vegetation.

Perak Valley.

The valley of the Perak River is bounded on the west by the groups of mountains already described. I have previously observed that the stream flows on the eastern side of the valley. This is owing to the many spurs and outliers on the eastern slopes of Mount Bubu and the Ijau Ranges. It would seem as if there had been much less denudation on the eastern than on the western side of the range. This may be owing to the prevailing rains falling more abundantly on the western than on the eastern sides of the mountains.

As a consequence of this, the tin workings appear to be (with no exception known to me) on the western slopes of the ranges, where the waste and wash have been probably greater.

Batu Kurau.

Between Mount Bubu Group, Mount Ijau Group and the sea, there are no hills except small outliers, mostly of paleozoic clay. These have evidently, at one time, been united to the ranges. North of the Larut River there is an isolated limestone mountain near the Kurau River called Batu Kurau. It is similar to Mount Pondok in the Gapis Pass. It is quite unconnected with the main range, and rises out of the plain between the spurs which form the valley of the Kurau River. There is also a small detached range dividing the valley of the Krian River from that of the Kurau.

Main Range.

The geology of the main range is apparently like the rest of the country, namely granite, slates, and limestone, with traces of basaltic rocks. The general structure of the range can best be studied from some of the mountains to the Westward. It forms a most imposing boundary to the whole of the western horizon. In the most northerly portion visible there is a mountain of rounded outline which appears to be very lofty. This range then declines to the southward with a somewhat serrated outline, with an average height of over 3000 feet. At a point near the latitude of the centre of the Kinta range the chain rises, and in the distance is seen a peak which is probably over 8000 feet high. This hill may be the one named the Sugar-Loaf Hill by some. The Malay name is a subject of uncertainty. It is the most distant mountain of its particular group and is a conspicuous object of conical outline. South and west of this the chain rises into a grand cluster of peaks, the highest of which is over 8000 feet at a rough estimate. I think this mountain is the one known as Gunong Robinson. From it the range declines, but is still a bold series of picturesque peaks, many of which must be over 6000 feet high. Other higher points are said to be occasionally visible in the south-east. It is possible that geologically the main range is younger than the groups already referred to.

IDEAL SECTION.

The following is a description of a section through the State from east to west, in about the latitude of Thaiping.

Proceeding westward from the Straits of Malacca we meet :—

1. Alluvial mangrove flats.

2. Light quaternary drifts with much vegetable matter, granite, sand and gravel, lying upon stream tin.

3. Clays and partly decomposed schists and slates, sandstones, red, yellow, blue and grey, commonly called Laterite, from the brick red colour of some portions. This is a paleozoic stratified rock, resembling in lithological character the Ordovecian or Cambrian deposits of other countries. There are no fossils, and as lithological character is by no means a certain clue, though it has a considerable value in these older rocks, it will be understood that I only provisionally refer the rocks in question to any horizon, especially to the Ordovecian which in Australia and other countries are so rich in minerals.

4. Granite rocks of the first range which I shall here distinguish as the Thaiping Range.

5. Alluvial of the valley of the Perak River, consisting of drift from the spurs of the granite mountains, and including stream tin in the valleys formed by these spurs. It is uncertain if the Cambrian deposits re-appear in this valley, but here we meet with—

6. Detached outliers of a highly crystalline limestone with almost perpendicular dip.

7. A second granite range which I distingush as the Kinta Range dividing the valley of the Perak River from that of the Kinta.

8. Alluvium of the Kinta Valley.

9. A low limestone range of crystalline limestone in which a dip and strike may be observed.

10. Alluvial valley.

11. Central granite chain.

I shall now proceed to consider the geology of these eleven formations.

1. *Alluvial Mangrove Flats.*—These are a series of mud islands and flats from two to three miles in width, fringing the whole of the coast line. The vegetation is principally made up of Rhizophoræ. There can be no doubt that such islands and flats are the usual deposits from lands on which great erosion is going on, from numerous and large rivers and an abundant rainfall. They point very clearly also to an absence of any upheaval along the coast line. Like the eastward of Australia in its northern and central portions the waste from the land is gradually extending the limits of the shore and filling up the sea. Such a process has been going on for a very long geological period in the Straits of Malacca. Both the coasts of Sumatra and Malaysia prove this as well as the shallowness of the Strait and the numerous mud banks occurring in it. The rich vegetable mould in this formation is entirely due to the mangrove forests, valuable as timber for fuel and making a very graceful and luxuriant fringe to the shores. I intend subsequently to make a report on the general aspect of the vegetation of the mangrove flats. It is extremely probable that here they cover tin deposits, but the great depth and the water must render them inaccessible.

1. *Quaternary Drifts.*—Probably most of the surface drifts in this State are quaternary, but I restrict the term now to those drifts, which form the alluvial plain between the Mangrove and the Thaiping Range. These range between 10 and 30 feet deep and have all been deposited by the various small streams which now run across the plain. These have been larger and smaller, fewer or more numerous by turns in the history of the filling up of the level. The channels have also shifted to an almost inconceivable extent according as the levels were altered by the deposition of

drift. This is composed of clays, fine sand, fine or coarse gravel which is large near the hills, and finally tin sand, which rests upon blue, white or red clays. The sand is quartzose, angular, composed of transported grains, evidently sifted by water and not abraded. It is transparent, showing much color under the polariscope. The pebbles in the gravel are rounded granite, with black mica, schorl, and grains of tin.

There are also rounded fragments of quartz of various colours, generally opaque white, but also red, brown, rose coloured, and violet. The two latter tints are due to fluor spar. The whole of the deposits have been derived from the granite and the tin has sunk to the lowest level by the force of gravitation. The drifts are sometimes full of stumps of trees and large stems of fallen timber. There are also the remains of jungle swamps which have given rise to deposits of black and brown humus full of roots, stumps, trees, leaves, &c. This deposit loses half its weight on drying, and the remainder burns leaving half its weight of ash. Remains of boats, paddles and fragments of pottery have occasionally been found in the drift. Except when covered with vegetable remains it is of a light colour and gives rise to a poor soil, covered with Calang *(Imperata arundinacea)* or jungle.

3. *Paleozoic Clays.*—These generally form the bottom on which the tin sand rests. They are much decomposed, yet preserve the marks of former stratification. They have been contorted and metamorphosed, sometimes resembling Gneiss. There are cross veins of white quartz and felspar in certain portions, showing metamorphism. Brick red and yellow sandstone bands are frequently intercalated. The common result of decomposition on this rock caused by water containing carbonic acid is to change it into red brick earth, which goes by the name of "Laterite." The use of this term throughout the peninsula is inconvenient and should be discontinued because it groups under one name several formations. Any rocks, such as trap, granite, and gneiss, may decompose into a red earth through the influence of water straining through vegetable matter and containing carbonic acid. A very small quantity of iron being thus converted into peroxide

will stain a large mass of earth. As a rule the laterites of the drift are derived from the paleozoic clays but they are sometimes due to the surface decomposition of granite. In one instance in the Kinta Valley this red deposit is caused by the erosion of a basaltic dyke of a recent tertiary age.

An important question ārises in connection with these paleozoic clays which are found to contain on the surface a little tin combined with rounded grains of iron. The question is how far they may have been the original matrix of the tin sand. If we regard the granite as only a more highly metamorphosed portion of these rocks they may be considered as stanniferous. My opinion is that they are an upper formation lying on the granite, and contain a little tin.

A more important question is whether the clays derived from this rock may always be considered as a true "bottom." For stream tin I should say decidedly yes. There can be no tertiary drift between this formation and the granite. But I am not so sure that in these loose clays stream tin may not sink to a certain depth and be found a little below the first level. At the junction of the paleozoic clay with the granite it is consistent with experience to expect to find granular tin in small pockets or veins. These deposits would be local. It is an open question whether they would repay a search for them. The paleozoic clay is only a few feet in thickness and rests directly upon the granite, so there would be no great expense in testing the question. In looking for a second bottom for stream tin, as the ore would have to sink through soft sandstone or into very loose clay, any search beyond a few feet would be useless.

Granite Rocks.

The whole of the Thaiping Range and a good deal of the rock underlying the stream tin is a coarse blueish or grey granite, containing but little mica, large crystals of orthoclase felspar, with schorl, cassiterite, tungstates of iron (wolfram), fluor spar, manganese, and titaniferous iron imbedded in a quartzose paste. It is clearly a metamorphic rock, as many portions are still schistose, and the marks of former stratification can be traced in the granite. There are occasional bands or veins of quartz and felspar, but no true metalliferous vein has as yet been discovered.

The stream tin which has been found so abundantly at the foot of some portions of this range has been derived from the granite, in which it was scattered or disseminated in small crystals. Probably the tin was nearly confined to the upper part of the granite, especially at its junction with the paleozoic rock. Liberated in the gradual weathering of the stone it has been swept down into the valleys and flats by the almost continuous rainfall. The gravitation of the particles has performed the necesssary sifting. As the tin is found in the lowest strata it may owe this position to three causes. 1. Gravitation facilitated by the repeated washing and sifting to which stream beds are subject, and the heaviness of tin ore. 2. A greater richness in the upper granite at its junction with the paleozoic clays. 3. Stream tin gradually sinking through the strata.

Tin ore is not universally scattered through the matrix of the granite in its upper portions, but it must be so to a very large extent, considering the wide spread character of stream tin deposits in Perak. It may be regarded as a very good indication of the existence of stream tin where there is evidence of another formation, such as the Ordovecian clays or the limestone. In cases where the overlying formation has been denuded away the red clay is a good indication. My reason for this opinion is that all metalliferous formations are richest at the junction of a different deposit. Thus when the upper formation has been denuded away the upper portion of the granite has been very rich in tin. All my experience in Australia has forced these conclusions upon me.

It should also be borne in mind that the gradual wearing away and denudation of the granite has reduced the slope of the mountain at the foot and gradually converted it into a plain. But time was when the upturned paleozoic rock presented steep and jagged edges to the sides of the hills. These acted as ripple tables in which the tin was caught and accumulated. It was not until the drift had silted up within reach of these rocks and reduced all to a plain that light sands would accumulate upon them.

Instances of this are common at Assam Kumbang, where the surface soil is level, but underneath this the paleozoic clays are found to be very uneven and lying in ridges on the summits of which there is no tin but with very rich deposits in the valleys between.

THAIPING RANGE.

The range that bounds the plain from the coast has this peculiarity, that it sends out at right angles a number of long undulating spurs, gradually decreasing in height and becoming a series of small detached hills. The spurs end sometimes abruptly, and sometimes run out into the plains for four or five miles. They give rise to a series of long narrow valleys. Near Thaiping the spurs and the valleys are shorter. Round the sudden termination of the spur on which the Government quarry is situated, is the rich tin field of Assam Kumbang. It is curious to remark how the tin mines curve round the base of the hill, and also to what a distance they extend from it. The Residency Hill is a detached portion of one of the many short spurs abutting from the main range. There is evidence that they are or they were covered with outliers of the paleozoic rock, and to this I attribute the richness of the tin fields around Thaiping.

5. *Valley of the Perak River.*—Jungle and alluvium prevent any close examination of the geology of this portion of the section. There are detached outliers of the limestone formation and in the valleys near them I should look for rich tin deposits. At Salak, about four miles from Enggor there is a fine valley with tin in it derived from the spur of the range. In this case there are schists and hard slates in the bed of the river where the stream tin is found.

KINTA RANGE.

This is another granite mountain chain which is detached from the main axis and trending south. Its exact height is not well known. Those portions which I have seen were overlaid by limestone strata, crystalline but with a clear easterly dip of about 17 degrees. This rock bore a strong resemblance to the Devonian limestones of North-eastern Australia. These are also crystalline but on being treated with acids they manifest organisms, such as Stenophora, Favosites and fragments of Brachiopoda. Here I could discover nothing of the kind. Sections showed the usual striated crystalline structure of calcite but no trace of any fossil. I cannot conceive that such large masses of limestone should be entirely destitute of organic tissue of some kind and I am not without hopes that under favourable circumstances they will yet be found.

I look upon the limestone formation as probably younger than the paleozoic clays but I have seen no section which establishes this beyond question. Apparently the limestone lies directly on the granite and so do the paleozoic clays. But the limestones are on a higher level and show generally a slighter dip. Looking at the physical geography of the river valleys, which in section show granite, paleozoic clays and schists, and then more towards the centre limestone ranges, the inference is that the limestones lie above the clays. Lithological character may also be appealed to. There is very little difference between the Silurian rocks all over the world and even such local characters as the Oolitic of Europe possesses are found to have perfect representatives in the Oolitic of Australia. According to this the limestone may be estimated as Devonian or Lower Carboniferous.

8. *Alluvium of the Kinta Valley.*—This overlies the limestone but not to such an extent as to prevent outcrops. There are also outcrops of granite and in one place a small patch of highly inclined schists and slates. In a journey I made up the Kampar River, which is a tributary of the Kinta, and flows by the side of a small elevation or table land of limestone and granite, I noticed the same sections but more limestone rock. The whole of the alluvium of these rivers, inasmuch as it is derived from the junction of the granite with the two other formations, I regard as probably rich in stream tin. The Malays have tested it to a trifling extent and always with success.

9. *Limestone Range.*—This forms a series of irregular hills lying like a rampart at a short distance from the main central range. Its appearance from any elevation to the westward is very peculiar. It forms a series of detached almost conical hills

seldom above 1500 feet high and presenting precipitous sides of greyish or blueish rock very beautifully variegated with stalactites and various infiltrations of iron oxides. The vegetation on these rocks is to some extent different from that of the granite, and no doubt where it has been examined by the Rev. B. Scortechini, will show most interesting and new features.

It is quite evident that this limestone has been subject to enormous denudation and of a very rapid kind. Like all similar rocks the hills are full of caves situate on the face of the cliffs, inaccessible without appliances. In these caves tin sand is found, evidently derived from the granite. Some of this tin drift with granite detritus occurs in caves several hundred feet above the present level of the plains whence any stream could affect them, and three or four miles from the nearest granite rocks. This will give an idea of the extent to which erosion has worn away these rocks. I shall have occasion subsequently to describe some of the mines worked in these caves.

From near Pappan, and again from the hill on which the residence of Mr. de la Croix is built at Lahat, excellent views may be obtained of this singular range. Its irregular outline and the white faces of its cliffs make it a conspicuous feature, especially as the cliffs and the dense dark green vegetation with which they are always surrounded give strong contrasts of colour.

10. *Alluvial Valley.*—The width of the valley between the limestone hills and the main range is not great, but varies from one to ten miles. It is broken up by many ridges of both limestone and granite amid which flow rivulets and small rivers. In some of these smaller valleys tin is worked and in all it may be expected.

11. *Central Granite Chain.*—The few opportunities I have had of examing spurs of this range convinces me that it differs in no essential particular from the Thaiping Range. It is granitic and rises into greater elevations. Some of its summits are supposed to be between 8000 and 9000 feet above the sea. Seen from a distance the highest peaks have a grand and picturesque aspect. As far as the country is known this range is believed to be the main axis of elevation. All the other granite ranges are detached

from it to the north, so that in reality they are diverging groups distinct from it, and terminating to the southwards. It is owing to these isolated groups that the Malayan Peninsula widens out to so great an extent about the centre of the State of Perak. Looking at the extent to which denudation has taken place, we have clear evidence that the central range has been much higher than it is now, but its reduction has been by erosion, not by subsidence. Much of this has been carried to the sea as sediment, and some spread in the valleys. The upheaval of these large mountain systems is too much involved in obscurity to render any speculations on the subject of use in estimating the physical geology of the country. It may, however, be fairly assumed that the granite was at one time overlaid completely by the paleozoic formation, and probably by the limestone. The upheaval dates subsequently to the deposition of the latter. The granite has broken through both formations, depositing them, and it may be other newer strata on each side of the chain. Erosion through the countless ages has left us the rocks as they stand at present.

The granite being a metamorphic rock was probably at one time stratified and was one of the earliest formations, either Lower Cambrian, or Laurentian. This accords with what is universally observed in connection with tin deposits which are always found in the most ancient rocks. The metamorphism must date subsequently to the deposition of the paleozoic clays and may even have been subsequent to the deposition of the limestone. The breaking through of the granite chain may have been much later. The chronology of the operations thus revealed may be stated thus: 1. The tin was originally disseminated in finely divided masses in the paleozoic strata, of whatever age they were. 2. It was subsequently segregated and brought to the surface of the overlying rocks. 3. It was brought within the influence of erosion by the upheaval of the granitic chain. 4. Denudation distributed it as stream tin in the valleys and alluvium.

There is one more geological question that may here be touched upon. It is generally recognised in the present day that in granite we have one of the results of volcanic action presented to us. It supposed to be more the deep-seated portions of the fusion which at the earth's surface produces basalts, lavas, and scoriæ. That this is very near the truth may be seen from certain sections in Northern Europe whose upper portions have all the characters of volcanic products but gradually merge into granite in the lower sections. Hydrothermal action consequent upon pressure is the assigned cause of all the phenomena, but this is of no moment in our present inquiry. We may therefore conclude that there have been volcanic products in connection with this range, which have now disappeared or nearly disappeared.

It must be borne in mind however, that these cannot be looked for under the recent form of the volcanic series. Local metamorphism has changed them. According to the researches of Phillips and others, basalts, dolerites, &c., would be changed into diorite, diabase, and other rocks, in which augite disappears, and hornblende takes its place. Time and that constant interchange of particles which takes place in even the most solid rocks would effect these changes.

Furthermore, even if there had been no erosion, we could not expect to find these metamorphosed volcanic products widely distributed. Probably they are only connected with those outlets where the pressure was less, the gases and steam were able to expand, and the chemical influence of oxidation felt.

But nearly all of these products belonging as they did to the upper portion of the granite have been swept away by erosion. Yet not quite all. In the section of the Kuala Kangsa pass at about 14 miles from Thaiping, there is a wide dyke which is trappean. It has been much metamorphosed, and at present has considerable resemblance to a porphyritic rock. I have not examined sections as yet, and therefore cannot give any further information as to its character. This is the only dyke or rock of a trappean character which I have seen in connection with the granite, nor would this have been visible but for the cutting connected with the road through the Pass at Gapis.

It should be mentioned here that one of the greatest difficulties experienced in exploring the geology of this country is the absence of any sections. The only roads are those made by the Government during the last six years. On none of these are there any extensive cuttings. On the rivers it is extremely rare to see a section of rock exposed ; in fact, I only know of two instances, amongst all the rivers I have visited. The rest of the country is jungle where outcrops of rock are covered with dense vegetation.

Near Pappan, in the Kinta District, on the road between Batu Gadja and Pappan, there is a small cutting through a recent volcanic rock. It is basaltic, and the appearance is very like the doleritic lavas of Australia. A small section showed crystals of Augite in a glassy paste with abundance of microliths and magnetite. In the drifts about this neighbourhood I found many rounded waterworn pebbles of basalt, the vesicles of which are either filled with zeolites or lined with chalcedony. I believe this is the first discovery of recent volcanic rock in this portion of the Malay Peninsula, and of course there must be more than this example. It is most interesting as showing the former connection of this land with the great volcanic belt which runs through Sumatra, Java, and the islands to the eastward. Whatever connection there was has now completely died out nor does it appear probable that its manifestation has in any important degree modified the physical geography of the Peninsula.

The Tin Mines.

I shall now proceed to give an account of the various tin mines I have visited throughout the State.

Thaiping.

The mines of Thaiping are stream tin deposits underlying drifts derived from the Larut River and some small tributaries. They are situated at the ends of some small spurs running westward from the Thaiping granite range. They also run up the valleys between these spurs as far as the base of the range. The geology of these spurs is granite, covered with a red earth which is seen from other sections to be derived from the paleozoic clays already referred to. In a few instances these clays remain as outliers with well defined stratification. Towards the gaol and at the foot of the quarry hill the paleozoic formation may be seen, with much contorted bedding, and ribbon like structure, forming bands of red, yellow, and white. It is evident that the present river valleys have all been cut through this rock on to the granite and that the materials forming the drift have been derived from both. I consider that the paleozoic clays play a most important part in connection with the tin deposits, according to what has already been said. The rich tin sand has its matrix in the granite, but more abundantly at its junction with the paleozoic clays than elsewhere.

All the tin workings at Thaiping are in drift, and therefore in what has at one time or another been a portion of a river valley. The depth of the drift is never more than 30 feet and sometimes much less. Near the range it is less and the gravel coarser, often mingled with boulders of granite of a ton or so in weight. The tin sand is also coarse. The general run of the sections is:— 1. Alluvium of yellow clay. 2. Sand of yellow colour with occasional drift wood of large size. 3. Blue and yellow clays with infiltrations of much bright red oxide of iron. 4. Coarse waterworn gravel composed of granite and various coloured quartz and felspars. 5. Tin sand, in clay or sand or pipeclay. The tin is fine in quality. The crystals usually not much abraded and seldom much larger than two millimetres in diameter. In speaking of tin ore or tin, tin sand, cassiterite or oxide of tin ($Sn\ O_2$) is meant, that is to say, pure metallic tin 78·62 and oxygen 21 38. It occurs in short prisms with four or eight sided pyramidal summits or complicated by twin crystals. Generally however it is so abraded and broken as to leave scarcely any trace of crystallization. It is blackish like graphite, sometimes reddish brown or ruby red, often transparent but rarely colourless. Its fracture is hackly and its lustre vitreous. In many specimens of fine tin from Thaiping small broken prisms of transparent olive green are not uncommon. In this there appears to me to be a distinct difference between the tin ores of Perak and those of Australia, especially those of Victoria. The latter contain a much larger proportion of hyacinth-red crystals. Samples from the above named countries could easily be distinguished by those who have had a little experience in tin ores.

Without entering into detail I may refer generally to all the mines about Thaiping as affording instances of the origin of the stream tin deposits. The Residency of Thaiping is built on a small isolated hill, capped with red clay, about 100 feet or so above the plain. Very rich mines were formerly worked at the foot of it. There are other hillocks of the same kind at the base of which tin is now worked, and there are others further out in the plain where the yellow clays give a fair indication that tin deposits may be looked for at a moderate depth.

Five samples of pure tin ore carefully picked and separated from impurity gave the following results for Specific Gravity.

Sample	1. Thaiping	6·78
	2. Thaiping	6·80
	3. Klian Pow	6·77
	4. Kamunting	6·80
	5. Assam Kumbang...	6·78

Most of the specimens are hard enough to scratch glass.

It is remarked that the stream tin of Australia is rich in sapphires and other gems. In Perak there appear to be none.

Assam Kumbang.

Due north of the town of Thaiping, a spur from the range extends, and round the foot of this in a direction N.N.W. from the town are the mines of Assam Kumbang. They commence about a mile from the town, and continue round the foot of the mountain for three or four miles. These mines are mainly distinguished for the great distance they extend from the range. It will be understood from the conditions under which stream tin accumulates, that it cannot be looked for far from the influence of rapid streams, or from where rapid streams have formerly been. At the mines referred to, the spur of the range is very steep, and the wash from it may on that account have been carried out much further. As a matter of course, the further from the hills, the finer the tin, as only small particles of the ore can be carried any distance by water. Two miles seems to be about the limit to which the very fine particles of tin have been carried into the plains by floods.

These mines seem to confirm the view that the rich tin deposits have been formed by the wearing down of the paleozoic clays at their junction with the granite. There is less oxide of iron and coloured clays in these mines than in those at Thaiping. White porcelain clays and sands are the rule. In many places however, the drift lies upon the softened and almost disintegrated paleozoic clays, showing that they still lie at the foot of the hills, and must have been very much worn away in the wash and denudation that have laid the granite bare.

Kamunting.

These mines are at the foot of the range about three miles north of Thaiping. The drift lies upon the paleozoic clays in some mines and in others upon the granite. They are all very close to the base of the mountain from which they have been derived. It appeared to me as if the deposits could be shown to follow the course of more than one ancient stream bed. Both here and at Assam Kumbang, there are deposits of vegetable matter some eight to fourteen feet thick. Large trees and stumps with logs are found, the stumps and roots being often in the position in which they grew. This shows that the locality has been alternately the bed of a stream and the site of a forest, probably when the stream took a different course and left the banks and bed free to receive a forest vegetation.

Another peculiar circumstance connected with the clays in these localities is the water standing in any of the old workings becomes a beautiful pale blue colour. Neither by microscopic examination nor chemical tests was I able to find any satisfactory reason for this. The water is quite colourless in small quantities. I am inclined to think it is due to a hydrated silicate of alumina (Halloysite) derived from the clays, but it may be also a minute diatom (Tryblionella ?) which is sparingly found in the water. *See Note.*

The tin in all these mines is abundant, rather coarse, and often in two strata of a foot or more in thickness. It is generally in the lowest portion of the drift, covered with coarse water-worn sands and gravel, fine yellow and white sands and vegetable matter in regular strata.

Salak.

This mine is situated in a valley formed by granitic spurs from the range on the eastern side of the Perak River. It is about four miles east of Enggor, a village on the river about five miles north of Kuala Kangsa. The workings are in a small river valley which at the time of my visit (February 6th, 1884) was nearly dry. All the workings were in alluvial drift with coarse gravel, but with much fine sand above. In the bed of the river there were outcrops of very hard stratified quartzite forming bars across the stream. These have acted as "ripples" and consequently much drift tin was accumulated on the upper sides of them. I was told that there were indications of a tin vein here but I saw none. The whole of this valley must be rich in tin, but it is only worked to a small extent as yet, by Chinese. The tin is excellent, with grains of a large size. I saw some crystals half an inch in diameter with little signs of abrasion.

Note.—The action of water holding carbonic acid in solution (derived from the vegetation) accounts for most of the changes in the clays and sands of these localities. The orthoclase felspar containing potash becomes easily soluble in carbonized waters. Thus the potash becomes carbonate of potash and the silica of the felspar is set free, partly in solution, and partly as siliceous sand. Nearly all the water in these pools gives a slightly alkaline reaction. I need hardly say that carbonate of potash is a very soluble salt and easily carried away by running water. Soda felspars are not so common in the granite here, but if present a similar process of solution goes on, only that the product is carbonate of soda.

PAPPAN.

This is a stream tin deposit in the valley of the Kinta. The limestone formation crops out at a short distance, and in fact flanks the whole of the range, but does not here rise into such a high series of hills as on the eastern side of the valley. The Pappan mines are in river drift composed of sand with granite gravel. This is much mixed with occasional waterworn fragments of basalt three inches or so in diameter. The vesicles of this rock are filled with infiltrations of lime and chalcedony. The drift varies very much in thickness. In some parts of the flats near the Shanghai Company's works it is scarcely 20 feet, while further up the valley it increases enormously. In some old Malay workings on the hill at the back of the village the deposit of drift is between 60 and 70 feet. This is scarcely a quarter of a mile up the valley. The drift here is very fine grained and has hardened into an almost compact sandstone. Much of it is stained a deep red especially where the water from the surface has free access to it.

The old workings are abandoned and now form a large square waterhole nearly 30 feet deep, surrounded by picturesque cliffs of compact yellow, white, and red drift. The water in the mine is, like nearly all the deep mining waters in this country, of a clear light blue of a beautiful tint, quite different from that of sea-water.

There must be two or three strata of tin sand in this locality. On the path by the side of the workings a small but very rich seam crops out. I washed a small sample and found an unusual amount of tin in coarse grains. This was being worked by a native chief, but only on the surface, with the help of a few Malays.

The accumulation of so much drift above the tin in which no metal is found would seem to point out that the granite in its lower portions is barren of ore. In shallow drifts the river gravels have most probably been turned over by the water again again, and so in this manner the tin sand sifted out and gradually settled at the bottom. Or in very thin layers of sand permeated by water, tin may easily sink through to the clay. Such large accumulations of sand as we have in the case of Pappan, if they have slowly been gathered by the weathering of granite, have probably not been sifted by water, and ought to contain all that the granite contained. The absence of tin ore in this drift is therefore significant. There may however, have been a large river here, and this may have been a sandbank. The present aspect of the valley is against such a supposition, but as denudation is evident to the extent of a thousand feet and more in the limestones on the other side of the Kinta valley, equal erosion may be supposed to have taken place here. I am, however, inclined to think that the rich tin deposits were found on the upper part of the granite at its junction with the limestone or the paleozoic clays already referred to.

Altogether, I consider the Pappan district as very rich in stream tin and offering most favourable prospects when properly mined.

Poussin.

About two miles from Pappan on the road between that village and Batu Gadja there is a small mining community of Malays. They work upon a low ridge on which white limestone crops out. It is crystalline, but retains its marks of stratification which dips about 17° east. The rock is very much eroded, and cut into pinnacles, and sharp angles of fantastic appearance. Much of the stone is covered with clay and light soil. This the Malays remove by cutting narrow trenches, never more than ten feet deep. In the crevices and amid the pinnacles of the limestone thus uncovered, they find tin sand. It must be abundant and of great richness, for though the methods of mining are so rude, and confined to mere narrow pockets, and though the ore is smelted in a small charcoal furnace with a piston bellows, yet they manage to make a good deal of money out of these mines.

Amid the gravel above the limestone were many rounded and angular fragments of the basalt already referred to. It appeared to me as if the clay and gravel were derived from granite and that there were marks of river action.

Between these mines and Pappan there is the small outcrop of basaltic rock already referred to. The cutting has only revealed a very small portion of the decomposed surface, so that it cannot as yet be said whether this is a dyke or a more extensive outpouring of trap.

Lahat.

Separated from the valley of Pappan by a low granite spur from the main range is the valley of Lahat, a stream tin deposit taken up by the Company, of which Mons. J. Errington de la Croix, is the manager. It is as usual a stream tin deposit, but is not yet uncovered sufficiently to enable one to pronounce upon its richness. The drift appeared to be of moderate depth and mostly of fine sand and clay, with a good deal of vegetable deposit. The drift has been formed by the river Kinta which winds around this spur. I could see no outcrop of any rock except granite, but the limestone is all through the adjacent valley.

Mons. de la Croix has cleared the timber from a portion of the side of the valley. This has given him a beautiful site for his residence and the houses of his assistants at a height of 170 feet above the river. The view from this is very extensive. The Kinta ranges appear of moderate height to the westward. To the east were high ranges of mountains from 5000 to 8000 feet, fronted by limestone cliffs and hills, some about 1200 feet in elevation. These are thickly wooded, and all around the plains was dense jungle.

Goping.

This is an extensive valley of stream tin deposits about 10 miles from Lahat. The mines lie on the eastern side of the Kinta and on the eastern side of the limestone range, in a valley formed by spurs from the main range. It is said that the stream tin has been nearly worked out. The mines are few in number and apparently have been inefficiently worked. From the habit the Chinese have of throwing the stripping or spoil heaps in all directions, it is very probable that much ground is covered which has never been worked at all. It seems to me very improbable that such a large valley can have been completely tested, much less exhausted.

TECCA.

Between Lahat and Goping there is a small mining village at the foot of a spur from the main range and close to limestone rocks. I did not examine the workings here which are small. There are also other small tin workings ot the base of the limestone hills. But it appears to me that all the valleys at the junction of the limestone ought to be rich in tin. The indications are exactly the same as those of the rich mines mentioned already.

KAMPAR RIVER.

Along this river Malays have worked for tin successfully in the sand-banks left dry by the stream. Or they have turned the course of the river and found abundance of tin sand in its former bed. All along the course of this stream there are outcrops of both limestone and granite, showing every favourable indication at the junction of the two deposits.

KUALA DIEPANG.

About four miles from the junction of the Diepang with the Kampar River, the new Government road passes close to the limestone range. Here Malays and Chinese are working for stream tin in the limestone caves which are found at various levels above the river valley. Payable tin has been taken out of mines 1000 feet above the valley. The tin is in fine earth of dark brown colour, mingled with glossy rounded pea iron ore. It is very unlike the tin drift of the valleys but the difference is due to its mode of preservation. Much of the earth is a kind of guano, chiefly derived from the decomposed excrement of bats and birds. The remainder is probably derived from decomposed granite materials of which the siliceous particles still remain.

If as I suppose this tin sand is derived from the granite it affords evidence of the great erosion to which the limestone has been subjected. We must suppose that the limestone strata where the caves are now where once the bottom of a valley connected with the granite, the nearest portions of which are three or four miles away. Limestones are however so easily dissolved by water containing carbonic acid that there is nothing astonishing in this denudation. The highest point at which the tin is found is said to be 1000 feet above the present level of the valley. This I did not see. The Malays and Chinese were working in caves 300 or 400 feet up the face of the cliff. The ore was sent down in baskets running on wire.

DINDINGS.

At the Island of Pulo Pankore, one of the Dindings Group a small quantity of tin sand is obtained by washing the sand in the valleys. The island is entirely of granite with much red clay on some small hills I did not see any other indications of the paleozoic formation. There are no regular mines. The tin sand is washed from the surface by a few Malays, and smelted in a small charcoal furnace of the rudest construction. The Datu of the locality said that gold was also found in the sand but could not show me any specimens. He brought me however, to a narrow valley about two miles north of the landing place. The spot pointed out was in the bed of a small stream full of large boulders. We washed several panfuls of sand but without seeing a trace of the precious metal. Nevertheless, the Datu insisted that if we would only get some of the sand from under the very large boulders we should find plenty of gold, but as no one had ever done so, this was merely his opinion. It would take a good deal of dynamite to remove even the smallest of the rocks.

It is very possible that minute scaly gold may be found in connexion with the granite. It is so found at Batang Padang at no great distance to the south-east. It may be also mentioned that the first discovery of tin sand in Australia was made in connexion with gold in the drifts of the Oven's River. Gold in granite is however, rare in Australia, but it is not uncommon, and even rich deposits have been found at the junction of granite with lower paleozoic slates and schists. I believe that at some former time small quantities of gold have been found at Pulo Pankore.

Selama.

These mines are situated near the Krian River, which forms the boundary between Keddah and the State of Perak at the Kuala Selama. They are very rich in drift or stream tin derived from the decomposition of the paleozoic clays at their junction with the granite. Close to the village of Selama there is an outcrop of paleozoic rock. It is highly ferruginous sandstone, the external appearance which at the outcrop has been much modified by the action of water. The sandstone is a brown mottled with red, and those various colours which mark the presence of ferric oxide. The outcrop forms a regular ledge, and appears like a dyke about 15 feet above the ground. It is possible that there is a vein or lode near it though I saw none. The tin found at the surface in the mud of a swamp at the foot of the outcrop is very rich. The Malays easily gather small quantities of good ore without digging at all, in fact most of the families in the village contribute in this way to their own support.

The workings in the neighbourhood appear to have been conducted on no plan. No one with sufficient capital to drain the mine effectually appears to have worked a claim. The mines are a series of small holdings, and the ground has been turned over in a wasteful manner. The consequences are that the spoil heaps are an obstacle to any working with small capital, and the mines are almost abandoned. Yet it appears to me to be a singularly rich deposit of tin, and only wants the employment of capital to render it as flourishing as any in Perak. A large extent of clear ground which must contain tin, and in many places has been proved to contain tin, is quite unworked.

CONCLUSION.

From what has been said in the preceding report it appears that we may form the following conclusions.

1. That stream tin deposits are the only ones worked hitherto in the State of Perak.

2. These are drift formations derived from the weathering and wearing down by water of the granite and other overlying strata on the neighbouring hills.

3. They have accumulated very slowly in the beds of ancient or existing streams.

4. It is probable that the tin has been mostly derived from the wearing down of the paleozoic clays and granite at their point of junction.

5. Tin must therefore be sought for only at the base of hills in ancient drift beds. Generally also the western slopes are the richest.

6. Red and yellow clays, or better still an outcrop of slates at the foot of a range are favourable indications.

7. True tin lodes or mineral veins have only been found in the northern part of the State, and these have not been worked.

I may state further that the general impression left on my mind is that only a small portion of the tin deposits of Perak has yet been worked. The similarity of the formations throughout the State gives good ground for believing that tin may be expected on the western bases of all the mountain groups I have referred to. I cannot speak so certainly as to the main range, which geologically may be more modern and belong to an entirely different mountain system.

ON THE TEMPERATURE OF THE BODY OF ORNITHORHYNCHUS PARADOXUS. Blumenb.

By N. de Miklouho-Maclay.

The low temperature of the body of *Echidna hystrix* (28° C. or 82°, 4 F.), (1) as compared with that of other mammals made me desirous of ascertaining also the temperature of *Ornithorhynchus paradoxus*. Through the kindness of Mr. Wm. Macleay, to whom a specimen of this animal has been sent alive from Penrith, I had the opportunity a few days ago of making the desired observation.

The elongated narrow bulb of a sensitive thermometer (2) having been introduced into the cloaca of the animal (a young ♂) the mercury gradually rose to 24°, 4 C. (or 75°, 9 F.), and remained stationary. The water in the tub in which the animal was kept, had a temperature under 23° C. (73°, 6 F.), and the temperature of the air in the room (observed with another thermometer) was 20°, C. (or 68° F.)

The thermometer having remained in the cloaca not more than two minutes, it appeared to me that a slight possibility of a higher temperature of the body of the *Ornithorhynchus* was not quite excluded. I was therefore very glad to have a chance of trying the same experiment again on the same animal two days later.

This time I let the thermometer remain in the cloaca, over 5 min. and obtained the temperature of 25° 2 C. (or 77° 3 F.), the temperature of the air being that afternoon 23° O. (73°, 6 F.), and of the water of the tub. 24° 3 C. (75° 8 F.)

(1.) My paper on the temperature of the body of *Echidna hystrix*. Cuv. Proceed. Linn. Soc. of N.S.W. Vol. 8, p. 425.

(2.) The scale of the thermometer used (of Patz and Foehr in Berlin), was divided into degrees (centigrade) from 24° to 46° C. The tenths of a degree were carefully and distinctly marked on the scale.

The animal being then in a dying condition, presenting no chance of living much longer, I made a small incision near the linea alba, and introduced the thermometer into the abdominal cavity. It then showed, after lying there for a few minutes, exactly the same temperature as in the cloaca (*i.e.*, 25° 2 C., or 77° 3 F.) Taking the mean of the two observations, the temperature of the body of *Ornithorhynchus paradoxus* is—24° 8 C, or 76° 6 F.

NOTES AND EXHIBITS.

Mr. W. H. Caldwell, B.A., exhibited several specimens which he had recently obtained in Queensland, showing the stages in the development of the Monotremes from the laying of the egg to the hatching.

Mr. J. Mitchell of Bowning, exhibited a large number of Silurian fossils collected by him in the neighbourhood of Bowning. They consisted of a variety of Molluscs, Corals and about sixteen species of Trilobites. Among the Trilobites are *Phacops caudatus*, *P. longicaudatus*, *P. encrinurus punctatus*, and *P. Jamesii* (?), *Calymene (Lenaria ?)*, *Harpes ungula*, *Staurocephalus Murchisonii*, *Bronteus*, and several of the genus *Acidaspis* one of which attained a considerable size. The molluscs included representatives of *Pentamerus*, *Orthoceras*, *Avicula*, *Strophomena*, &c.

Mr. Macleay exhibited a specimen of *Ophiophagus elaps*, a venemous snake of the Indian region, and the largest known species of the venemous Colubrine snakes. He had received it from the Rev. J. E. Tenison-Woods from Perak. The specimen measured 142 inches in length, but the species had been known to attain a length of 170 inches. As its name implies, it preys on other snakes, and its venom is so deadly, that it is said to kill a man in three minutes and an elephant in a couple of hours.

Mr. Gervase F. Mathew, F.L.S., of H.M.S. Espiègle, exhibited four boxes containing a collection of many hundred Lepidopterous Insects, which he had obtained during his last cruise on the South East Coast of New Guinea. The collection contained a few Microlepidoptera, but by far the greater part of it consisted of Diurnal Butterflies of the most gorgeous hues and of wonderful variety.

Dr. Cox exhibited some fine samples of a Mushroom grown at Potts' Point on an artificial bed. The spawn (Mycelium) of these Mushrooms was obtained from a clump of bamboos and was placed in the bed in July last. The mushrooms have when half expanded a strong white membrane reaching from the pileus to the stipes, and when this breaks the mushroom expands. Professor Stephens considered that the Agaric shown belonged in all probability to the sub-genus *Amanita*, and that they were, to say the least, suspicious as articles of diet.

Dr. Cox also exhibited and presented to the Society for safe custody a dried specimen of a plant recently described by Baron Sir F. von Mueller from the mountain region of the Clyde River, and named by him *Eriostemon Coxii*. The plant is believed to have valuable medicinal properties.

Mr. E. P. Ramsay, F.R.S.E., exhibited for Mr. E. G. W. Palmer a native Bees' Nest which had been obtained in the neighbourhood of Smithfield. For the last seven years it had been suspended from a branch of a pear tree in Mr. Palmer's garden, and a quart of honey had often been obtained from it, but during the last winter a caterpillar formed its cocoon in the only aperture and so effectually closed it that all the bees were killed.

Drawings were exhibited of some fossil bones which Mr. R. D. Fitzgerald, F.L.S., had received from Lord Howe's Island. The bones have been forwarded to Sir Richard Owen, and are believed to be those of two species of extinct lizards, probably allied to the gigantic horned *Megalania* and *Notiosaurus*, which have been found in the Pleistocene deposits in Queensland and New South Wales.

ANNUAL GENERAL MEETING.

28TH JANUARY, 1885.

The President, C. S. Wilkinson, F.G.S., F.L.S., in the Chair.

PRESIDENT'S ADDRESS.

It is again my privilege to address you on the occasion of our Meeting here this evening to celebrate the 10th Anniversary of the Linnean Society of New South Wales.

The Members must I feel sure be gratified with the progress that has been made during the past year—progress that is manifested in the increased amount of valuable original research which has been contributed through the Society to the Science of Natural History.

The number of Members has also increased to 164, as against 153 at the end of 1883, notwithstanding, as it is our painful duty to record, the loss of six by death—Dr. Badham, Mr. J. F. Bailey, Hon. Joseph Docker, Dr. Joseph, Monsignor Lynch, and Dr. Palmer.

During the year M. Theodore Lefèvre, Secretary of the Royal Malacological Society of Belgium, has been elected an Honorary Member; and Mr. G. F. Angas, F.L.S., C.M.Z.S., of London, and Mr. F. Jeffrey Bell, M.A., F.Z.S., Professor of Comparative Anatomy, King's College, London, have been elected Corresponding Members.

The Act for the Incorporation of the Linnean Society of New South Wales received the Royal assent on the 1st February.

The following is a list of the Papers read at the monthly meetings of the Linnean Society, 1884 :—

1. Supplement to the "Descriptive Catalogue of the Fishes of Australia." By William Macleay, F.L.S., &c.

2. "On some Batrachians from Queensland." By Charles W. De Vis.

3. "Occasional Notes on Plants Indigenous in the immediate neighbourhood of Sydney." No. 6. By E. Haviland.

4. "Studies of the Elasmobranch Skeleton." Plates I. and II. By W. A. Haswell, M.A., B.Sc.

5. "A Monograph of the Australian Sponges." Part I. By R. von Lendenfeld, Ph.D.

6. "The Scyphomedusæ of the Southern Hemisphere." Part I. By R. von Lendenfeld, Ph.D.

7. "Notice of New Fishes." By W. Macleay, F.L.S., &c.

8. "On the Improvements effected by the Australian Climate, Soil, and Culture on the Merino Sheep." By P. N. Trebeck, Esq.

9. "Plants which have become Naturalized in New South Wales." By W. Woolls, Ph.D., F.L.S.

10. "The Australian Hydromedusæ." By R. von Lendenfeld, Ph.D.

11. "The Scyphomedusæ of the Southern Hemisphere." Part II. By R. von Lendenfeld, Ph.D.

12. "On some Fossil Plants from Dubbo, New South Wales." Plate IX. By the Rev. J. Milne Curran, F.G.S.

13. "On the Preservation of Tender Marine Animals." By R. von Lendenfeld, Ph.D.

14. "On the Scyphomedusæ of the Southern Hemisphere." Part III. Plates III. and IV. By R. von Lendenfeld, Ph.D.

15. "Note on the Development of the Versuridæ." Plate V. By R. von Lendenfeld, Ph.D.

16. "A Monograph of the Australian Sponges." Part II. By R. von Lendenfeld, Ph.D.

17. "The Australian Hydromedusæ." Part II. Plate VI. By R. von Lendenfeld, Ph.D.

18. "Revision of the Recent Rhipidoglossate and Docoglossate Mollusca of New Zealand." By Professor F. W. Hutton, F.G.S.

19. "Notes on Hybridism in the Genus Brachychiton." By Baron Sir F. von Mueller, K.C.M.G., F.R.S., &c.

20. "Notes on the Claspers of Heptanchus." Plate V. By W. A. Haswell, M.A., B.Sc.

21. "New Australian Fishes in the Queensland Museum." By Charles W. De Vis, M.A.

22. "The Australian Hydromedusæ." Part III. Plates VII. and VIII. By R. von Lendenfeld, Ph. D.

23. "The Digestion of Sponges Ectoderm and Entoderm?" By R. von Lendenfeld, Ph.D.

24. "The Eruption in the Straits Settlement and the Evening Glow." By R. von Lendenfeld, Ph.D.

25. "Occasional Notes on Plants Indigenous in the immediate neighbourhood of Sydney." No. 7. By. E. Haviland.

26. "New Australian Fishes in the Queensland Museum" No. 2. By Charles W. De Vis. M.A.

27. "On a Marine Species of Philougria." Plate XI. By Charles Chilton, M.A.

28. "The Australian Hydromedusæ." Part IV. Plates XII. to XVII. By R. von Lendenfeld, Ph.D.

29. "On the Occurrence of Flesh-spicules in Sponges." By R. von Lendenfeld, Ph.D.

30. "Note on the Slimy Coatings of certain Boltenias in Port Jackson." By R. von Lendenfeld, Ph.D.

31. "Report on a Collection of Echinodermata from Australia." By. F. Jeffrey Bell, M.A.

32. "Revision of the Recent Lamellebranchiata of New Zealand." By Captain F. W. Hutton, F.G.S.

33. "A Record of Localities of some New South Wales Zoophytes." By Baron Sir F. von Mueller, M D., F.R.S., &c.

34. "New Fishes in the Queensland Museum." No. 3. By Charles W. De Vis, M.A.

35. "Census of Australian Snakes with Description of two New Species." By William Macleay, F.L.S.

36. "On a New Species of Kangaroo from New Guinea." By Baron N. de Miklouho-Maclay.

37. "On Some Peculiarities in the Brain of the Australian Aboriginal." By Baron N. de Miklouho-Macleay.

38. "The Australian Hydromedusæ." Part V. By R. von Lendenfeld, Ph. D.

39. "Muscular Tissues in Hydroid Polyps." Plate XXX. By R. von Lendenfeld, Ph.D.

40. "Notes on the Fibres of Certain Australian Hircinidæ." By R. von Lendenfeld, Ph.D.

41. "On the Myrtaceæ of Australia." By the Rev. W. Woolls, Ph.D., F.L.S., &c.

42. "On the Marine Annelides of the Order Serpulea; some Observations on their Anatomy, with the Characteristics of the Australian Species." By W. A. Haswell, M.A., B.Sc.

43. "On a New Crustacean found inhabiting the Tubes of Vermilia." By W. A. Haswell, M.A., B.Sc.

44. "Notes on the Young of Pristiophorus cirratus." By W. A. Haswell, M.A., B.Sc.

45. "New Fishes in the Queensland Museum." No. 4. By Charles W. De Vis, M.A.

46. "Note on the Eyes of Deep Sea Fishes." By R. von Lendenfeld, Ph.D.

47. "The Insects of the Maclay Coast of Guinea." By William Macleay, F.L.S.

48. "On a Sub-genus of Paramelidæ (Brachymelis) from New Guinea." By Baron N. de Miklouho-Maclay.

49. "Descriptions of Australian Microlepidoptera." Part XI. By E. Meyrick, B.A.

50. "Critical List of Mollusca from the North-west Coast of Australia." By John Brazier, C.M.Z.S.

51. "Synonymy of Some Land Shells from New Guinea." By John Brazier, C.M.Z.S., &c.

52. "The time of the Glacial Period in New Zealand." By R. von Lendenfeld, Ph.D.

53. "Catalogue of Papers and Works Relating to the Orders Marsupialia and Monotremata." By J. J. Fletcher, M.A., B.Sc.

54. "On Two New Birds from the Austro-Malayan Region." By. E. P. Ramsay, F.R.S.E., F.L.S.

55. "New Fishes in the Queensland Museum." No. V. By Charles W. De Vis, M.A.

56. "Observations on the Temperature of the Sea on the East Coast of Australia." By Baron N. de Miklouho-Maclay.

57. "A Monograph of the Australian Sponges." Part III. By R. von Lendenfeld, Ph.D.

58. Addenda to the Australian Hydromedusæ." By R. von Lendenfeld, Ph.D.

59. "On Colour Varieties of Scyphomedusæ." By R. von Lendenfeld, Ph.D.

60. "The Metamorphoses of Bolina Chuni." By R. von Lendenfeld, Ph.D.

61. "Revision of the Marine Tænioglossate and Ptenoglossate Mollusca of New Zealand." By Captain F. W. Hutton, F.G.S.

62. "Suggestion as to the Mode of Formation of Barrier Reef in Bougainville Straits, Solomon Group." By H. B. Guppy, M.D., Surgeon, R.N.

63. "Record of an Undescribed Correa from New South Wales." By Baron Sir F. von Mueller, K.C.M.G., F.R.S., &c.

64. "On Volcanic Activity on the Islands near the North-east Coast of New Guinea, and the Evidences of Rising of the Maclay Coast of New Guinea." By Baron N. de Miklouho-Maclay.

65. "Note on a Beroid of Port Jackson." By R. v. Lendenfeld, Ph.D.

66. "The Histology and Nervous System of the Calcareous Sponges." By R. von Lendenfeld, Ph.D.

67. "Addenda to the Australian Hydromedusæ." No. 2. By R. von Lendenfeld, Ph.D.

68. "Note on the Flight of Insects." By R. von Lendenfeld, Ph.D.

69. "List of Recent Shells found in Layers of Clay on the Maclay Coast, New Zealand." By John Brazier, C.M.Z.S.

70. "A Revision of the Australian Læmodipoda." By W. A. Haswell, B.A., B.Sc.

71. "A Revision of the Australian Isopoda." By W. A. Haswell, B.A., B.Sc.

72. "On a New and Remarkable Instance of Symbiosis." By W. A. Haswell, B.A., Sc.

73. "On the Pycnogonidæ of the Australian Coast, with Descriptions of New Species." By W. A. Haswell, B.A., B.Sc.

74. "Notes on the Port Jackson Crustacea." By Charles Chilton, B.A.

75. " Descriptions of Australian Micro-Lepidoptera." By E. Meyrick, B.A.

76. " A Monograph of the Australian Sponges." Part III. By R. von Lendenfeld, Ph.D.

77. " Notes on the Direction of the Hair in some Kangaroos." By Baron N. de Miklouho-Maclay.

78. " Note on Tribachycrinus Clarkei, McCoy." By F. Ratte, M.E.

79. " On the Larvæ and some Larva Cases of some Australian Aphrophoridæ." By F. Ratte, M.E.

80. " The Geology and Physical Geography of the State of Perak." By the Rev. J. E. Tenison-Woods, F.G.S., F.L.S.

81. " On the Temperature of the Body of Ornithorhynchus paradoxus." By Baron N. de Miklouho-Maclay.

82 " Occasional Notes on Plants Indigenous in the immediate vicinity of Sydney." By E. Haviland, Esq.

It will be seen from this list that the number of Papers read during the year exceeds that of the previous year by thirty-four. The subjects dealt with embrace each of the six sub-kingdoms of the Animal Kingdom ; whilst a few other papers contain chiefly observations upon Botanical and Geological subjects.

The Hon. W. Macleay has contributed, besides other papers, a supplement to his " Descriptive Catalogue of the Fishes of Australia." Another important work is the " List of Papers and Works relating to the Mammalian Orders, Marsupialia and Monotremata." By J. J. Fletcher, M.A., B.Sc. These are valuable additions to the already advanced list of works of reference which have been published by this Society :—

" Catalogue of Australian Birds, showing the distribution of the Species over Australia and New Guinea." By E. P. Ramsay, F.L.S.

" Catalogue of Accipitres." By E. P. Ramsay, F.L.S.

ed

"Census of Australian Snakes." By Hon. W. Macleay, F.L.S.

"Descriptions of Australian Microlepidoptera." By E. Meyrick, B.A.

"Mollusca of the 'Chevert' Expedition." By John Brazier, C.M.Z.S.

"Contributions to Australian Oology." By E. P. Ramsay, F.L.S.

"On the Edible Oyster found on the Australian Coast." By J. C. Cox, M.D., F.L.S.

"On the Australian Amphiopoda." By William A. Haswell, B.Sc.

"The Echini of Australia." By the Rev. J. E. Tenison-Woods, F.L.S., F.G.S.

"Australian Fishes—new or little known." By Count F. de Castelnau.

"The Flora of Tropical Queensland." By. F. N. Bailey.

"Contribution to South Queensland Flora." By the Rev. B. Scortechini, L.L.B.

"Forage Plants Indigenous to New South Wales." By Rev. W. Woolls, Ph.D., F.L.S.

"On the Fungi of New South Wales and Queensland." By Rev. J. E. Tenison-Woods, F.LS., and F. M. Bailey, F.L.S., &c.

"A Monograph of the Australian Sponges." By R. von Lendenfeld, Ph.D.

"The Scyphomedusæ of the Southern Hemisphere." By R. von Lendenfeld, Ph.D.

"The Australian Hydromedusæ." By R. von Lendenfeld, Ph.D.

"Contributions to Zoology of New Guinea." By E. P. Ramsay, Chilton, "On the Coal Flora of Australia." By Rev. J. E. Tenison-Woods, F.L.S., F.G.S.

"Occasional Notes on Plants Indigenous in the immediate neighbourhood of Sydney." By Edwin Haviland.

"Synonymy of Australian and Polynesian Land and Marine Mollusca." By John Brazier, C.M.Z.S.

"New Australian Fishes in the Queensland Museum." By Charles W. de Vis, M.A.

"Revision of the Recent Lamellebranchiata of New Zealand." By Captain F. W. Hutton, F.G.S.

"The Myrtaceæ of Australia." By Rev. W. Woolls, Ph.D.

"Plants which have become Naturalized in New South Wales." By Rev. W. Woolls, Ph D.

"Marine Annelids of the Order Serpulæ. Some observations on the Anatomy, with the Characteristics of the Australian Species." By W. A. Haswell, M.A., B.Sc.

Besides numerous special Papers upon various subjects of Natural History, by Baron Sir Ferd. von Mueller, K.C.M.G., F.R.S., Dr. James C. Cox, F.L.S., Professor W. J. Stephens, M.A., Dr. H. B. Guppy, R.N., Baron Miklouho-Maclay, M. F. Ratte, M.E., and other authors mentioned in my previous address.

The Paper on the "Mode of Formation of Barrier Reefs in Bougainville Straits, Solomon Group." By Dr. H. B. Guppy, R.N., is specially interesting as throwing additional light upon the origin of the Barrier Reefs. Dr. Guppy states that these Barrier Reefs have evidently been formed, during a period not of subsidence but of upheaval, and that the intervening channels represent belts of detritus upon which the reef building corals could not live; and he arrives at the conclusion that in the case of reefs which possess such a gradual slope that the lower margin of this band of detritus lies within the zone of reef-building corals, a line of barrier reef will be ultimately formed beyond this band with a deep channel inside; but in the case of reefs which possess a more rapid sub-marine slope, so that the lower limit of the band of detritus extends far beyond the depths in which the reef corals thrive, no such Barrier Reef will be formed. He also thinks it probable that reef corals may commence to build in depths greater than those usually assigned.

The Rev. J. E. Tenison-Woods, F.L.S., in a Paper which was read at our December Meeting, gives a very graphic description of the Physical Geography and Geology of the State of Perak. The lofty mountains rising to a height of 8000 feet, fronted by precipices of limestone of various colours, and at their base plains covered with dense jungle, must appear truly grand. But of more practical interest are the extensive tin-bearing deposits. Mr. Tenison-Woods states that the original source of the tin ore was the granites near their junction with the Palæozoic sedimentary rocks. This mode of occurrence of the ore is in many respects similar to that which has been observed in the tin mining districts of New England in New South Wales.

Dr. R. von Lendenfeld who joined the Society at the commencement of last year, read over 30 Papers, mostly on the lower marine animals of the Australian Seas. The experience and material collected by him during his three years stay in different Australian Colonies, is utilized in these Papers. The Hydromedusæ and the Scyphomedusæ are finished, some new Ctenophoræ have been described, and a Monograph of the Australian Sponges commenced. It may be hoped that the indefatigable Author will be able to finish this in the way it has been begun, and so fill up a very large gap in our knowledge of Australian animals. Many of his Papers dwell on Comparative Morphology. He has discovered several interesting facts of a general scientific interest. The development of one of our large Jellyfish was found to be totally different from what was hitherto known about their Metamorphosis. In a Paper on the Geographical distribution of Medusæ, the influence of ocean currents on the Marine Fauna was illustrated. A most important discovery was that of certain cells in Sponges which the Author considers as Nervous elements. Their existence in the Sponges furnishes a proof that these organisms are more highly developed Matazoa than was hitherto supposed. Some interesting changes which one of the large Jellyfish in our harbour has undergone during the last forty years were described in another Paper. It appears that the specimens collected in Port Jackson in the early part of this century until 1845, when Huxley found this animal, were always blue, as they are to this day in Port Phillip. Here in Sydney their colour has changed and now they are brown; so that a new variety has been formed within the last forty years. In other Papers the Author dwells on several physiological facts concerning the digestion of Sponges, &c. Some short Geological Papers in the Glacial Period in New Zealand, and the Eruption of Krakatoa were also furnished by Dr. R. von Lendenfeld.

The interest of our monthly meetings has been much enhanced by exhibits of Natural history specimens, many of which have been brought forward in illustration of the papers read. At our last meeting Mr. W. H. Caldwell, B.A., exhibited some specimens showing certain stages in the development of the *Monotremes*. And at a meeting of the Royal Society he gave an account of the results of his recent discoveries in this colony and Queensland in reference to the embryology of Marsupials, Monotremata and Ceratodus. These embryological researches of Mr. Caldwell are of the highest value, and will awaken in all scientific circles a lively interest in the study of the unique fauna of Australia. Probably in no other part of the globe can the principles of the descent of animal and plant life through vast periods of time be studied with greater advantage.

The Honorary Librarian, Mr. W. A. Haswell, M.A., B.Sc., informs me that during the year nearly 1500 additions have been made to the Society's Library. In no previous year has such a large number of works been received in exchange from the Society's foreign correspondents; and two gentlemen have made very munificient donations of books. These are the Hon. William Macleay and Monsieur Theodore Lefèvre, Secretary of La Société Royale Malacologique de Belgique, from the latter was received a large collection of Belgian Scientific publications.

Other donations have been received from Professor W. J. Stephens, M.A. ; Mr. W. A. Haswell, M.A., B.Sc. ; Mr, E. C. Merewether ; Baron Maclay ; Mr. H. C. Russell, B.A. ; Dr. R. von Lendenfeld, ; Mr. R. M. Johnson ; Professor Ralph Tate ; Baron Sir F. von Muéller, K.C.M.G.; Mr. Harrie Wood ; Mr. J. F. Bailey ; Dr. Schutte ; Mr. E. P. Ramsay, F.L.S., C.M.Z.S. : Mr. Thomas Whitelegge ; Professor Edward Mowen ; Mr. A. J. Campbell ; Capt. Hutton, F.R.S., F.G.S. ; Dr. Finsch ; Professor Liversidge, F.R.S. ; Dr. Thos. Dixon, M.R.C.S. ; Mr. J. J. Fletcher, M.A., B.Sc. ; Professor J. von Haast.

It may be well for the members to know that the following most important works are now in the Library :—

"Annals and Magazine of Natural History," 103 vols. ; Proceedings of the Zoological Society, London," 55 vols. ; "British Museum Catalogue," 100 vols. ; "Archiv jur Naturgeschichte." 94 vols. ; "Suite á Buffon," 84 vols. ; "Revue de Zoologie," 53 vols. ; "Bulletin de la Société Imperiale des Naturalistes de Moscou," 58 vols. ; "Philosophical Transactions of the Royal Society of London," 23 vols. Two vols. (IX. and X.) "Challenger Report (Zoology)," published during the year ; "The final decade of the Eucalyptographia," by Baron von Mueller, also published during the year.

We are indebted to the energetic editorial labours of the Honorary Secretaries. the Hon. William Macleay, M.L.C., F.L.S.. and Professor W. J. Stephens, M.A., for the prompt issue of the Society's Proceedings ; three of the quarterly Parts of Volume IX., have been published, and Part IV., is in the printer's hands.

I have been informed that the prize of £100 which had been munificently offered by a Member of this Society for an Essay on "The Life History of the Bacillus of Typhoid Fever," will not be awarded, for though three Essays have been received, none of them are considered to have fulfilled the conditions required for the treatment of the subject. That the results have not realized our expectations is to be regretted, especially at the present time when Typhoid Fever is so prevalent throughout the country. It is interesting to know that the Germ-theory of some forms of disease was mooted so far back as the year 1726. In the *English Mechanic* of April 1883, the following extracts are given from an old book published in its fifth edition in 1726, and entitled, "New Improvements of Planting and Gardening, both Philosophical and Practical," by Richard Bradley, Professor of Botany in the University of Cambridge and F.R.S.

In the Chapter on Blights of Plants, he says:—"I am very apt to believe that the most epidemical distempers mankind is subject to proceed from poisonous insects, which are either eaten unregarded or sucked into the stomach with the breath, as that worthy gentleman Mr. Batte so curiously observes in a letter I have received from him relating to infectious distempers, which I shall annex to this chapter, as it contains many observations which may help to explain and confirm what I shall offer concerning blights." The letter is as follows:—

"To Mr. Bradley, &c.,

"Sir,—Upon discoursing with you some time since upon blights upon trees, you seemed to be of opinion that they were the effect of insects brought in vast quantities by the easterly winds, and by lodging upon the plants proper for their nourishment, they produce there the distemper which is known as a "Blight or Blast." You was then desirous of what observations I had made concerning pestilential distempers subject to mankind, which I believe to proceed from the same cause that produced blights, *i.e.*, from insects. It is a common received opinion, that the plague proceeds from an infection in the air, and so undoutedly it does. . . . . . .
He then shows that it cannot be the sole operation of "poisonous vapours from minerals," or such as are found in the *Grotto del Cane*, or in mines, though "they are plainly more destructive to animal life than any others that have been known, in that they act much quicker upon the spirits of animal bodies than those which are said to occasion the plague and other pestilential diseases. And there is this difference likewise between them, that a body poisoned by the first will not communicate that poison to another,

as people infected by that vapour which causeth the plague are known to do; therefore, I think it is plain that the most nauseous vapour of itself will not cause any distemper that is epidemical."

"It seems then, that the plague proceeds from some other cause, and that I suppose to be insects of that extraordinary smallness that they are not to be discerned by the naked eyes; they are so light that they float in the air, and so are sucked in by the breath. Such insects not being among us commonly, but only when they are either brought to us from some remote place by the wind, or hatched or nourished by some intemperance of air, or from some poisonous vapours, arising from bogs, ponds, ditches, or some such unwholesome funds of stagnating water.

"The insects are various according to the nature of the water or air they are bred in; their eggs being first laid by some flying animals which are then hatched and passing through several changes common to insects, at length take wing, and being drawn in with the breath, may perhaps be either killed in our bodies and cause a violent ferment in the juices; or else finding a proper nourishment they breed in the lungs, stomach, and other parts within in us, and probably may occasion those biles and breakings out in the tender parts of the body that are called plague sores. But these insects, are some of them so extremely small that they are only capable of being discerned with good microscopes."

The following papers were read at the General Monthly Meetings of the Royal Society of New South Wales, during 1884:—

May 7th. — Anniversary Address by the Hon. Professor Smith, C.M.G., &c., &c.

June 4th. — (*a*) Paper by Mr. Edwin Lowe, "On Rain and its Causes."

(*b*) Paper by Mr. Walter Shellshear, A.M., I.C.E., "On the Removal of Bars from the Entrances to our Rivers."

July 2nd. — (*a*) "Notes on Gold." By Dr. Leibius, M.A., F.C.S.

(*b*) "On the Oven Mounds of Aborigines of Victoria." By Rev. P. MacPherson, M.A.

Aug. 6th. — "Notes on the Trochoided Plane." By Mr. L. Hargrave, with explanatary models.

Sept. 3rd. — "On a New Form of Actinometer." By Mr. H. C. Russell, B.A., F.R.A.S.

Nov. 5th. — "Notes on Some Mineral Localities in the Northern District of New South Wales." By Mr. D. A. Porter.

Nov. 5th. — "Exhibits of Minerals from Mittagong & Berrima." By Professor Liversidge, F.R.S.; and from Silverton, by Mr. C. S. Wilkinson, F.G.S.

"Exhibition of Hughes's Induction Balance and Sonometer." By the Hon. Professor Smith, C.M.G.

Dec. 3rd. — (*a*) "Notes on Doryanthus," illustrated by specimen of a new species. By Mr. C. Moore, F.L.S.

(*b*) "Notes on a Self-registering Anemometer." By Mr. H. C. Russell, B.A., F.R.A.S.

(*c*) "On Water Supply in the interior of New South Wales." By Mr. W. E. Abbott.

Dec. 17th.— At "Special Meeting," Mr. Caldwell, Fellow of Caius College and Balfour Student of Cambridge, gave a resumé of his investigations lately carried on by him in Australia, with regard to the "Echidna, Platypus and Ceratodus," illustrated by specimens and diagrams.

The Geographical Society of Australasia, of which Sir Edward Strickland is Vice-President, is now making arrangements for sending an exploring expedition to New Guinea, which is likely to lead to important discoveries of great interest to our Society.

During the last year Baron von Mueller has made several additions to his valuable "Census of Australian Plants," a work which affords the means of tracing the geographical limits of species, and estimating their numbers in the Australian Colonies respectively. He has just published the Tenth Decade of his *Eucalyptographia*, thereby completing a handsome volume containing descriptions of figures of one hundred species of the genus *Eucalyptus*, a genus which, since the days of R. Brown, has been a source of intense difficulty to botanists. Though some thirty or forty species remain to be described, they are for the most part of a shrubby nature, and not of the same economic value as those mentioned in the present volume. This work is one of the greatest in which the Baron has been engaged, and must ever remain as an enduring monument of his ability and perseverance.

In addition to several new plants described by him in Melbourne periodicals during the year, he has issued a supplement to the *Fragmenta Phytographiæ Australiæ* containing a list of Australian Fungi enumerated by the eminent mycologist Mr. C. Cooke. His latest efforts have been directed towards geographical discovery in Australia, he having been elected Vice-President of the Victorian branch of the Geographical Society recently formed.

Mr. C. Moore, F.L.S., Director of the Botanical Garden, has published, "A Census of the Plants of New South Wales," compiled from Baron von Mueller's list and arranged according to the system of the *Flora Australiensis*.

Mr. R. D. Fitzgerald, F.L.S., has issued another part of his elegant work on Australian Orchids, in which he has figured and described several new species.

Mr. F. M. Bailley, F.L.S., of Brisbane has made some important additions to his *Synopsis of the Queensland Flora*, in describing new species and furnishing some interesting accounts of Cryptogamous Plants.

Mr. J. E. Brown, F.L.S., has in course of publication, under the auspices of the South Australian Government, an elegant work on

"The Forest Flora" of that Colony with illustrations of Eucalyptus &c. Mr. Brown acknowledges his obligations to Baron F. von Mueller for the elucidation and classification of Plants.

Some of the latest information respecting Western Australian Plants is contained in Baron F. von Mueller's descriptions of the collections made by the Hon. J. Forrest, C.M.G., &c., around Sharks Bay and its vicinity.

Dr. Woolls, F.L.S., has sent to the Linnean Society of New South Wales during the last year Papers on "Naturalised Plants," "The Myrtaceæ," and "Protaceæ." He is also printing in a popular form a List of the Plants of New South Wales with occasional notes on the same.

The Botanical world has sustained a great loss in the death of the venerable George Bentham, F.R.S., C.M.G., &c., for many years one of the most distinguished and indefatigable Botanists of Europe. His name will be ever associated with the Flora of Australia from the fact of his having devoted, in connection with Baron F. von Mueller, sixteen years to the preparation and publication of the "Flora Australiensis" in seven volumes.

In my last address I alluded to the possibility of effecting improvements in our fodder plants, fruits, cereals and flowers, by means of artificial cross fertilization.

In reference to this interesting subject, I am assured by my friend, Mr. W. Farrer, B.A., L.S., who takes a special interest in this branch of practical science, and particularly in the production of improved varieties of wheat, that systematic work is being done, and during several years has been done (and especially in America) in this direction. Two of the numerous hybrid wheats that Mr. Pringle has produced—the "Defiance" and "The Champlain"—are pretty well known in Australia. Professor Blount, also, of the University of Colorado, has taken in hand the production of new and improved varieties of wheat by this means; and from a letter lately received from him by my friend, I learn that he has 41 varieties which he himself has originated by hybridization, and one of them has been pronounced by the Government Chemist at Washington, to be the best milling wheat in America. Professor Blount also mentions in his letter that in the case of corn, by means of systematic selection, combined probably with hybridization, during a period of ten years, he succeeded in increasing the amount of grain per stalk from 10 oz. to 48½ oz. average; reduced the period of maturity from 131 days to 98; and increased the proportion of grain to stalk from 28% of grain and 72% of stalk to 50% of grain and 49% of stalk. He also says that 10 years ago, when he began his labours, there was not a single wheat cultivated in the State of Colorado that contained in its grain a greater quantity of gluten than 10%; and that at the present time none is cultivated that stands below 12%; and when we consider that gluten is the most valuable constituent of the wheat-grain—that by means of which the loss of muscle or brain substance, which follows the doing of work, is repaired—we can see how important an improvement this is.

It ought, however, be stated that since Professor Blount began his labours, a revolution has taken place in the method of milling in America, in consequence of which it became desirable to cultivate hard wheats which are richer in gluten, instead of soft wheats, with which alone the old-fashioned stones could deal. When I mention that before roller machinery was invented, our efforts to produce and cultivate wheat that possessed in a high degree rust-resisting qualities were defeated by the fact that our milling machinery was unable to deal with the hard grain which is produced by, and is in correlation with, the hard straw that resists the rust, we can see how important is the bearing of this invention likely to be on the future of wheat-growing in Australia, and especially in our moist coast districts. As soon as our millers adopt the roller-machinery we shall be in a position to cultivate sorts that are not only rust-resisting, but produce grain that is actually more nutritious.

So decided has the preference for hard wheats become in America, that (as Professor Blount mentions) the milling qualities of a wheat are now judged by the proportion of gluten (albuminoids) it contains.

With regard to fruits, I am glad to say something is being done in Australia towards getting improved varieties by means of cross-fertilization. The Messrs. Cole of Melbourne, give us from time to time delicious new fruits. One of the last they gave us, viz., the pear "Madam Cole," was produced by crossing the two delicious pears "Beurré Clairgeau" and "Winter Nelis," and this new pear is said to combine in a marked degree, blended together, the excellencies of its two parents.

In the case of the potatoe, we know that many new varieties are produced by artificial hybridization; for it is quite an ordinary thing for nurserymen (Americans especially) to give with a new variety its parentage.

Artificial hybridization is also largely used in the production of new varieties of our cultivated flowers. In the case of the rose, it is by no means uncommon to give with a new variety, its pedigree. In fact, some of the English Rose Catalogues contain a separate list of new pedigree roses.

The late Mr. Ellwanger of Rochester, New York, gives in his book on "The Rose" a list of 26 roses, which are claimed to be the result of artificial crossing; and amongst them are the names of some of our most beautiful varieties.

In my last Anniversary Address I made reference to the economic mineral resources of New South Wales. I also briefly alluded to the fact that the chief characteristic physical features of Australia are represented within the limits of our own colony; and that upon our favoured geographical position, and the varied nature of the land features, we must naturally look for a corresponding variety in the climate and in the Fauna and Flora. Now in investigating these we are inevitably led to a consideration of their origin, and as this at once involves geological research, I beg that you will allow me to make a few remarks on one of the most interesting and important periods of geological history as affecting this question. In doing so I will ask you to accompany me not very far back into the history of the earth, but as it were only one step from the present into the past—geologically speaking, from the Recent to the Pleistocene period—a period when some of the living forms of animals and plants co-existed with many that are now extinct. No marked line of division can be drawn between these so-called periods; like all other epochs they are as inseparable and continuous portions of the earth's history, as are the individual "years" of a man's life. We must however make certain divisions for the purpose of recording in their order of succession the events and changes which have brought about the natural history phenomena which it is the especial work of this Society to study.

During the periods referred to the main physical features of the country have remained pretty constant. There have been no great local disturbances; our most recent volcano, Mount Canobolas, near Orange, whose conical summit 4565 feet above the sea level towers above the surrounding country, had already ceased to cloud the atmosphere with its steam and dust. The Great Dividing Range, with all its main valleys, and the low lying country of the interior, presented the same general outline at the commencement of the Pleistocene period that we observe at the present day.

All these principal physical features were shaped prior to the Pleistocene period by different causes—volcanic irruptions at various times, faultings, and the unceasing atmospheric denuding agencies which have operated since the last main elevation of the Dividing Range in early Mesozoic times.

Then earlier than this, in the Carboniferous period, there was a stretch of ocean where now our picturesque Blue Mountain stand, which extended from the Shoalhaven ranges on the south, to beyond the point where the tunnel of the Great Northern Railway pierces the Dividing Range near Murrurundi. And the mountains of New England are not much older, for we find that the granites composing them have upheaved and tilted the lower Carboniferous or Devonian strata surrounding them.

We have no evidence to show that the higher points of our Dividing Range, or those over 4000 feet above the sea level, have again been submerged since the general upheaval, after the deposition of the Hawkesbury formation of our Blue Mountains. There is little doubt but that the first surface undulations which appeared as the land rose from the sea were the guiding features for the development of our ranges and deeply eroded valleys. The marsupials, ceratodus, araucarias, zamias and other ancient forms of animal and vegetable life which are now found upon the continent also attest the antiquity of the land; and the different Tertiary "deep leads" or buried river-beds, and the later deposits in the principal valleys, are also evidence that the Dividing Range has been subject to atmospheric influences varying in intensity from a very remote period to the present time. There is, perhaps, no portion of this epoch of greater importance than the Pleistocene period.

The Pleistocene deposits are indicated by such vast accumulations of the drift and diluvial sediment which have been derived from the erosion of the deep valleys in the highlands, and spread out over the low lying country, as to point to a time of much greater rainfal than obtains at present.

Were we from a great height to look down upon, or as it were to take a bird's eye view of our country, or what would serve the same purpose, to look upon an accurately made model of it, the great Coast Range, the Barrier Ranges beyond the Darling, and all the other surface prominences would resemble some railway or other earth embankments, whose sides have been furrowed by the action of rain, whilst the great plains of the Darling, and Riverina, with their network of Billabong drainage channels intersecting them, would appear like the patches of silt filling the hollows near the denuded earth embankment with the little water rills crossing them. Our comparison would not be an inappropriate one; for many of the minor surface appearances are due to the same cause, sub-ærial denudation, which in the one case has produced these effects in a few years, whilst in the other the erosion is the work of ages.

But on closely examining the country we find that the present surface features are but the production of the latest of many changes that have taken place.

As an instance I will give you a splendid section which is exposed in the Moorabool Valley between Geelong and Ballaarat. I measured the section myself some years ago. The river flows over the upturned edges of an old slate formation, traversed by quartz reefs; upon this are layers of conglomerates and sandstones, probably freshwater deposits, containing fossil plants believed to be of the lower Miocene age. The surface of this formation had been worn into hollows, thus marking the lapse of some time before it was covered by the next deposit which consists of limestone abounding in marine shells of Miocene age; this is overlaid by a thick mass of basalt. Then comes a layer of marble limestone full of Miocene shells; and above this is another flow of basalt, upon which is a bed of Upper Miocene limestone, composed almost entirely of bryzoa and corals; this is covered by a thin Pliocene quartz pebble drift, and lastly, forming the summit of the hill we have climbed, is basaltic lava which extends as a wide sheet over the surrounding country, and forms vast stony plains as far as the conical volcanic hill whence it issued. Now it is evident that the rain water draining from the higher Dividing Range, gradually cut through this sheet of basalt, and formed a channel, which during the Pleistocene period, developed into the grand Moorabool Valley, which is here about 300 feet deep. Upon the sides of the valley there are terraces of drift which indicate intervals of time when the eroding water flowed with diminished force.

We will take another instance in this colony. In the Cudjegong Valley near Gulgong we find in section, granite, slates, and carboniferous rocks overlaid by quartz drifts and clays believed to be of Miocene age; then, basalt, and next in order of time the rich gold bearing leads containing numerous fossil plants of Pliocene age; and above these basalt. All the four last named formations lie within a valley which was eroded probably in Miocene times. But what I desire to draw your attention to is the fact, that not only have the upper basalt and the other Tertiary formations been cut through by the drainage water of the Pleistocene period, but that the present valley has been eroded to a greater depth than the old one; and, as in the case of the Moorabool Valley, we have here also terrace banks of gravel.

Similar evidence of enormous erosion having taken place during the Pleistocene period, is afforded in almost every part of the country, but it is unnecessary to adduce other instances than the two above mentioned ; for as these are given from such widely separated localities, we may be assured that the physical conditions which they indicate prevailed also over the whole country. And this is further supported by the occurrence of those extensive plains of the interior which have been formed by the deposition of the gravels and earthy sediment washed from the hills. Reference was made to this subject at one of our monthly meetings when Mr. J. G. Griffin, C.E., exhibited samples of the fluviatile deposits of the Riverina plains near Deniliquin.

The rainfall of the Pleistocene period must have been considerably greater than that of the present.

Excepting in places where the declivity of the ground is steep, or where the protecting covering of vegetation has been removed by traffic of stock or artificial cuttings, allowing running water access to soft earths or drifts, the tendency chiefly is for the alluvial debris from the hills, not to be swept away by the running streams, but to accumulate and form alluvial flats in the valleys. And the highest floods now experienced, though in places, as on the Darling, Murrumbidgee, and other rivers, they overflow the country for many miles on either side of their ordinary channels, yet they do not rise so high as to cover other portions of the great plains which have clearly been formed under the flood waters of the Pleistocene period. Mr. Russell, the Government Astronomer, in his pamphlet on the "Physical Geography and Climate of New South Wales," after describing the Macquarie and other tributaries flowing into the Darling from the south-east, says "Beyond all these, to the N.W., the Darling at one time must have been fed by very large tributaries bringing the water from tropical Queensland ; the courses of several of these can still be traced to the Darling, but except in great floods they never contain water and cannot now be called tributaries. There are many unmistakeable proofs that the Darling was at one time subject to much greater floods. In addition to these now little-used water-courses, the banks of the river are higher than the back country, and have evidently been made so by alluvial deposits where floods never reach now."

Then again the occurrence of numerous remains of crocodiles (reptiles which are now extinct in the valley of the Darling) at Cuddie Springs on the flat country, 15 miles south of the Darling, and far from other watercourses, points to a time when abundance of water or swampy marshes existed over that now dry country.

Professor Ralph Tate, of the Adelaide University, is also of opinion, from the distribution of the Diprotodon, that the Pleistocene was a period of great rainfall.

As to the cause of this interesting pluvial period over a large portion of the Southern Hemisphere—for its effects have also been observed in New Zealand, South America and South Africa—I will state briefly some of the theories which have been put forward upon the subject.

We know that the Pleistocene deposits &c., just described, bear the same relation to the present physical features, as do those of the so called "Glacial Period" of the Northern Hemisphere; and it has been asserted that during the glaciation of portions of the latter, a more humid climate than the present must have prevailed in the Southern Hemisphere—an assertion which the geological facts above mentioned unquestionably favor. Various causes of the Glacial Period have been suggested; but the views advanced by Dr. Croll, Dr. Geikie, Professor Ramsay, Mr. A. R. Wallace, and some others, have received much support. These eminent authorities have suggested "that the combined effect of the precession of the equinoxes and of the excentricity of the earth's orbit"; together with "changes in the distribution of land and water" are sufficient to produce the phenomena observed.

Owing to the precession of the equinoxes the inclination of the earth's axis towards the sun is reversed every 10,500 years and it happens that whichever hemisphere is turned from the sun when the earth is in aphelion during the period of great excentricity which, according to Dr. Croll, lasted for 160,000 years ending about 80,000 years ago, the winter of that hemisphere is so long and cold as to induce a large accumulation of snow and ice upon high lands situated within regions of great precipitation: at the same time the opposite hemisphere would experience equally long and cool summers. When the excentricity had attained its maximum, about 210,000 years ago, the length of summer in one hemisphere exceeded that of the winter in the other by about twenty eight days

At the time that the Northern Hemisphere was glaciated, the long summer of the Southlrern Hemisphere would have been cool and like "a perpetual spring." When the alternation took place 10,500 years after, and the southern regions were subjected to the cooling influences, the Antartic ice would be so greatly extended as to produce on a larger scale and nearer to the Australian Continent, the fogs, rain and snowstorms which now prevail in the Antarctic Ocean. The present glaciated condition of the Antarctic regions being due to the winter of the Southern Hemisphere occurring in aphelion, we may readily perceive how these conditions must have been intensified in the Pleistocene period when the eccentricity was three and a-half times greater than it now is. And it is thought that, owing to the then extreme difference between the temperature of the South Pole and that of the tropics, the south-east trade winds, which are now stronger than the north-east trades, would blow with greater force over a large area of ocean surface, and so the upper counter trades would return laden with an increased amount of aqueous vapour. Therefore, during the long glacial period, the southern regions must have experienced a proportionately increased rainfall; of which we may now adduce another proof in the recent discovery by Dr. R. von Lendenfeld of former glacial action on Mount Kosciusko, the highest mountain in Australia.

Near the summit of the mountain, Dr. von Lendenfeld found the granite rocks—*roches moutonnées*—rounded off and polished to a height of 500 feet above the bed of the valley, showing that the valley to that extent had been once filled by a glacier. Traces of glacier action were not seen at a lower level than 5800 feet above the sea; and the extent of country above this height, embracing valleys which may have contained glaciers, is said to be 150 square miles. No glaciers exist there now; but patches of snow lie on the sheltered slopes of the hills and never disappear. It is interesting to know, as Dr. von Lendenfeld points out, "that the patches of eternal snow are found on Mount Kosciusko in a latitude of 37° S., about 1500 feet lower than in the European Alps in a latitude of 47° N. To find a place in Europe where everlasting snow comes down to 6000 feet, we would have to go up to latitude 52°. Here in Australia the snow comes as far down in 37°, as in Europe in 52°. In New Zealand the snow and ice are also very much more extensive than in Europe at a similar latitude. We have, therefore, another proof of the old statement that the Southern Hemisphere is colder and damper than the Northern."

The greater rainfall during the Glacial epoch would no doubt have produced much surface water here and there over the flat country in the interior, besides filling the lake-depressions to the north of Adelaide, evaporation from which would to some extent increase the humidity of the westerly winds.

In 1877 the late Mr. T. Belt suggested that the great precipitation of snow upon the polar ice rings during this period would become fixed as ice, and that the water being in this way stored up and not returned to the ocean, would have the effect of lowering the level of the ocean some 2000 feet; and thus while plants and animals would be able to migrate between lands which are now separated by shallow seas, the mountains would, in relation to the sea level, be increased in height, and consequently induce a greater rainfall. This suggestion has been more or less reservedly accepted by Wallace and others as affording an explanation of the geographical distribution of some animals and plants. But apart from its consideration, we have the more certain geological and astronomical evidence above-mentioned.

It is my present purpose to indicate the nature of these changes that have taken place since the Pliocene times, rather than to discuss the question of the origin and distribution of the Fauna and Flora of Australia.

Nearly all the available information bearing upon this subject has been referred to by Captain F. W. Hutton, F.G.S., in his

Annual Addresses to the Philosophical Institute of Canterbury, New Zealand, 1883-4. I cannot agree with some of the views expressed by the Author.

I may, however, here mention that the learned Palæontologist, Baron von Ettingshausen, is now engaged upon an examination of an extensive collection of fossil plants which were obtained by Mr. T. W. E. David, F.G.S., Geological Surveyor, and myself, from the Lower Tertiary deposits in New England, and the result of his labours will be awaited with much interest. In acknowledging the receipt of this collection the Baron writes that "he recognized instantly several types common with the Tertiary Flora of Europe and other Tertiary Floras, and strange to the living Flora of Australia. There is no doubt that the Tertiary Flora of Australia contains besides the elements of the living Flora, also the elements of other Floras extinct in Australia, but developed now in other parts of the globe. We have found the same mixture of the elements of the Floras in the Tertiary Flora of Europe, of America, and of Asia. When such a thorough going analogy as this is found to run through all Tertiary Floras we have investigated, no other explanation is possible, but that the Tertiary Flora in general is an original Flora which contains the elements of the living Floras, and from which all living Floras must have descended. The descendants only have developed and varied off from it in different directions."

It may be well also to note the evidence which the fossil remains afford regarding the temperature of the climate of the period immediately preceding the Pleistocene.

The fossil plants from the upper Pliocene auriferous drifts of Victoria and New South Wales, which have been described and figured by Baron Sir F. von Mueller, indicate the prevalence during that period of a warmer climate than the present. In reference to these fossils and their living representatives the Rev. Dr. Woolls, F.L.S., remarks that "the Phymatocaryon Mackayi which was taken from the Haddon Gold Field at a depth of about 150 feet approaches in many respects some species of the Sapindaceæ, of the fossil genus *Cupanoides,* and yet at the present day, no species of *Cupania* extends to Victoria, the great majority of the species being semi-tropical. *Trematocaryon McLellani* found in the auriferous drift of the Pliocene formation in the same locality belongs apparently to the Sapindaceæ and yet no genus now existing in Australia is represented by it. In all probability it flourished under climatic conditions very different from those now prevailing. *Rhytidotheca Lynchii* (a fossil found under similar circumstances) may have belonged to some plant of the *Meliaceæ*, though at the present day no genus of the order is found in Victoria, the species occurring for the most part in the Northern District of New South Wales and Queensland. Baron Mueller remarks in reference to this fact that 'The newly discovered remnant of a past Flora indicates a clime formerly warmer and more humid and equable than that of the spot where now vestiges of extinct forests are buried.' *Celyphina McCoyi* had a fruit resembling *Helicia prœalta* of the Proteaceæ from the warmer parts of eastern Australia. *Odontocaryon* is unlike any existing genus; but *Conchotheca rotundata* from the Pliocene formation at Nitingbool seems very like some extinct species of *Grevillea* of that section now exclusively tropical. *Eisothecaryon semiseptatum*, found at Gulgong in the Upper Pliocene layers, comes very close to *Villaresia*, a genus now represented in Eastern Australia by two species, the one in Queensland and the other not known farther south than Clarence River. *Araucaria Johnstonii* of Tasmania, found imbedded in the yellow Tertiary freshwater limestone near Hobart, is supposed to be allied to *A. Cunninghami*, "the Moreton Bay Pine," a species ranging from Queensland to the Hastings and Clarence. *A. Bidwilli* or "The Bunya Bunya" is peculiar to Queensland, and *A. excelsa* to Norfolk Island. The occurrence of an *Araucaria* in Tasmania is highly interesting, and as it has been found in company with fruits of plants exhumed from the gold drifts of Victoria and N. S. Wales, it may well be associated with the Flora of the past as indicating a warmer climate in Victoria and N. S. Wales. The wood and fruit of *Banksia* and the foliage of *Eucalyptus obliqua* were enumerated by Prof. McCoy, from auriferous drifts, but as these are probably identical with living species, the Rev. W.

B. Clarke appears to have assigned them to a more recent period. Amongst the auriferous drifts from which specimens have been described by Baron von Mueller in the Geological Survey of Victoria, no fruits or leaves of *Eucalyptus* have been mentioned, and indeed such is the difficulty of determining the species without a specimen of the flowers and fruit, that it would be somewhat hazardous to offer any opinion from leaves only. From a consideration of the fossils, so far as yet known and described, it is not chimerical to affirm, that, in the Eocene and Miocene periods, and in the Pliocene also, the climate of Victoria and New South Wales was different from what it now is, being probably adapted to the growth and perpetuation of tropical and semi-tropical plants, which have long ceased to flourish in these colonies, and whose living representatives are now found in the north and north-eastern portions of Australia or in India. It would appear also that previous to some changes which occurred during the Tertiary period, the genus *Eucalyptus* which at the present time is so widely spread over the Continent and is almost restricted to it, did not constitute the large forests of Eastern Australia, but that these were composed to a great extent of Sapindaceous, Meliaceous, Capparideous, and other trees which imparted a semi-tropical character to the vegetation. Regarding Western Australia as the grand repository for types purely Australian, it is very remarkable that the fossils now found in auriferous drifts have few or no living representatives in that colony. No species of Meliaceæ, with the exception of *Owenia reticulata*, has been found there, whilst 32 species occur in New South Wales and Queensland. Of the Sapindaceæ, *Dodonæa*, *Diplopeltis* and *Heterodendron* only are represented there; whilst species of 14 genera (of which *Cupania* and *Nephelium* are the chief in point of numbers) belong to Eastern Australia. So again as regards the *Olacineæ* only two species are western, whilst 13 in which two Villaresias are included, are eastern. As but little progress has yet been made in the fossil Botany of Australia, it may be advisable to exercise caution in forming any conclusions too hastily."

Baron von Mueller remarks "the discovery of these organic remains in a far distant tract of country in New South Wales, is not without considerable interest, inasmuch as thereby now is shown, that the pristine forests, which have left us these vestiges, were of wide geographical extent." He then modestly adds "we as yet possess no data to reconstruct imaginarily in their integrity these Australian trees of the last of past epochs."

Having this evidence of the existence of a semi-tropical Flora in south-eastern Australia in the Pliocene period and of its subsequent banishment from this region, it follows that a great change of climate must have supervened in Post Pliocene times. That this change was due to a general lowering of the temperature of the Southern Hemisphere during a glacial epoch seems probable from the arguments already adduced. And an interesting discovery lately made by Mr. R. D. Fitzgerald, F.L.S., Deputy Surveyor General, appears to favor these views I refer to a small pine which has only been found under or close to the Falls at Katoomba on the Blue Mountains, and which has been named by Baron Sir F. von Mueller, *Pherosphæra Fitzgeraldi.* The cold, shady, constantly wet cliffs adjoining the Falls appear to be its last retreat, and there only a very few plants cling to the crevices, their trailing branches taking root in the mud and sphagnum and their glaucous foliage always dripping with spray. It grows about nine feet high and is intermediate between a Lycopodium and a Juniper. The genus is Tasmanian, and there the only other species belongs to the "high Alpine flats." The nearest allied genus *Dacrydium* is also Tasmanian but extends to New Zealand, New Caledonia and even the Indian Archipelago. The species found in Tasmania is known as the "Huon Pine."

But the evidence which Fitzgerald's Pine affords of a former colder climate is perhaps not so conclusive as is that of the animals which have survived from the Pleistocene period. Entombed with the remains of *Diprotodon* and of the other extinct animals occur in the Wellington Caves bones of the "Pouched Tiger," the "Tasmanian Devil," and of a rat, *Mastacomys fuscus*—animals which, as Mr. E. P. Ramsay informs me, are now only living in

Tasmania, where the mean annual temperature is 7° below that of the locality in which these remains are found.

These facts favour the supposition that the climate of N. S. Wales in the Pliocene period was warmer than at present and that in Post-Pliocene times it became more humid and colder than now.

Before considering the probable influence of these changes on the fauna of N. S. Wales, it is necessary to refer briefly to the principal types of animals inhabiting South-eastern Australia during the Pleistocene Period, when they attained their greatest development.

Amongst the Diprotodonts one of the most remarkable forms was the carnivorous Pouched Lion, *Thylacoleo,* considered however, by Professor Flower to have been herbivorous. *Thylacoleo* was furnished with carnassial teeth somewhat similar to those of the Sabre-toothed Lion, whose remains are found in the cave deposits of Europe. It was provided with "non-retractile, sub-compressed, decurved, pointed claws, equalling or excelling those of the lion or tiger in size;" and from the size and form of its carnassial teeth, Sir Richard Owen infers that it was one of the fellest and most destructive of predatory beasts.

Of the large herbivorous Diprotodonts the most conspicuous form was *Diprotodon,* an animal taking the same place amongst Australian mammals that the Pachyderms do amongst the Fauna of other Continents. Its great size may be inferred from the length of its skull, which in one specimen measured three feet. "This genus," says Sir Richard Owen, "has near affinities to the Kangaroo with an osculant relationship to the Wombat." Its hind pair of limbs were much shortened and strengthened (as compared with those of the Kangaroo) while the fore pair were lengthened as well as strengthened. This monster probably walked like an elephant, and "brought down the tempting foliage by erosion of the (tree) trunk, not by the strong haul of forcible grasp," (like the *Megatherium,* the great extinct Sloth of South America). Allied to *Diprotodon* was the *Nototherium,* another large herbivorous mammal, somewhat resembling the South American tapir. The Kangaroos, Wombats, and Echidnas of the Pleistocene period also attained far larger dimensions than they do now; while the lizards were represented by the huge horned lizard "*Megalania prisca*," and the flesh-eating *Notiosaurus*.

The bones of *Dromornis* may be taken as belonging to a species of bird of which the emu is the smaller modern type. Remains of Crocodiles have also been found, associated with those of *Diprotodon* in a manner presently to be described.

All these large mammals, with the exception of *Thylacinus*, *Sarcophilus* and *Thylacoleo* were herbivorous, and as their remains are found not only in the Pleistocene deposits of the Dividing Range and in Caves, but also in the now arid plains of the western interior, it may be inferred that the whole country, wherever the soil was favourable, was more or less clothed with a luxuriant growth of vegetation capable of supporting these huge herbivores.

As to the precise character of this vegetation no certain clue has as yet been found: it would be premature therefore in the present state of our knowledge to affirm that it has altogether died out. This much is certain, that these gigantic animals have been entirely extirpated; and it remains to be considered what was the probable cause of their extermination. Sir Richard Owen has suggested that they were killed off by man, aided possibly by the *Dingo*, which may have immigrated with him from the Papuan Continent: but of this, as Sir Richard Owen remarks, we have as yet no conclusive proof. On the other hand striking evidence has been afforded by the dryness of the last few seasons, of how quickly, through want of rain, and overstocking, savannahs of waving grass may be converted into desert-like plains; and the immediate influence of these climatal changes on the Fauna is fully attested by the numbers of Kangaroos and Emus, which died last year through want of sustenance on the western plains.

Fragments of the bones of the extinct Pleistocene Mammalia are met with in the deposits of gravels and clays of that age at a depth of over 70 feet from the surface; while others more perfectly preserved have been found at a depth of only a few feet. A locality, in which their remains have been discovered in great abundance is at Cuddie Springs, 15 miles south of the Darling River, near Brewarrina.

These are boggy springs, situated in a small depression, one quarter of a mile in diameter, and five feet deep, on the open plains. In the centre of this hollow a shaft was sunk 28 feet deep in mud full of bones. Amongst these were bones of *Diprotodon*, *Sthenurus*. *Macropus Titan*, large wombats, large birds probably emus, crocodiles, and a gigantic carnivorous lizard, *Notiosaurus*, which has lately been described by Sir Richard Owen. These bones are found only within a few yards of the centre of the Spring, which is ten miles distant from the nearest watercourse.

The occurrence here of the remains of crocodiles shows, as has been already stated, that previous to their dying out, there must have been abundance of water in this now waterless country; and the association of their bones with those of the animals above mentioned, in such numbers in this small boghole, is very significant as to the cause of their extinction. Nothing but want of water could have brought together such a heterogeneous assemblage of animals to the same drinking-place; and what must have been their last terrible struggle for existence, as the supply of water failed, must be beyond description.

This one instance may be taken as typical of the general cause of the disappearance of these animals since Pleistocene times, viz, want of water; and want of water must have been consequent on diminished rainfall, which in its turn probably led to the gradual dying out of the once rich Pleistocene Flora.

Stinted of their food supplies, and being unable from their great bulk to migrate rapidly or adapt themselves readily to the altered conditions of life, *Diprotodon* and the other large herbivores, perished by degrees from the combined effects of want of sustenance, the raids of predatory beasts, and possibly the attacks of man.

Their likeness, however, is still to be traced in the Native Bear, Wombat, Kangaroo, &c., which still survive on our mountain ranges and plains, as the comparatively pigmy types of their gigantic predecessors.

Apart from Natural History considerations, the Geology of the Pleistocene period has perhaps a more immediate and practical bearing upon the future development of a large portion of our territory than that of any other period. From the fact of the old river channels having been silted up and buried beneath alluvial deposits, we may be certain that in the lower portions of the main valleys, and passing under the wide alluvial plains beyond, there exist underground streams of water which, when discovered by systematic exploration by boring and sinking, may be made available for increasing the pastoral and agricultural capabilities of the country. And besides this, where the Pleistocene deposits cover old river channels which have been eroded through auriferous and tin-bearing formations, miners may with confidence expect to find in them payable "leads."

At our previous Annual Meeting, I informed you of a deep bore which was being put down in the Cretaceous formation at Tarkanina in South Australia. It has since been carried to a depth of 1230 feet, when good water was struck, which rose in the bore and flowed from the pipes 20 feet above the surface of the ground. In another diamond drill bore, also in the Cretaceous strata at Hergott in the same colony, water was met with at a depth of 340 feet, and it rose to a height of 60 feet above the surface. As you are already aware, artesian water flowing from the pipes 10 feet above the surface, has been obtained in a bore near Bourke. As the Cretaceous formation extends westward from here almost without a break to the Flinders Range in South Australia, there is little doubt but that artesian wells may be obtained in any part of it, and that this enormous tract of now arid land may be made by proper enterprise a splendidly watered country.

The occupation of the country under our new land laws, and the settlement of large numbers of people in places like those where the important discoveries of silver have lately been made, will necessitate the improvement of the natural advantages we have indicated; let us hope that they may be speedily utilised. And may our Society in its scientific sphere continue its labours in revealing the availability of nature's rich stores, for the direct and indirect advancement of the varied and progressive human interests —advancement which in the past has proceeded on definite lines through the mineral and vegetable kingdoms into the animal kingdom, and in humanity leads on to a higher—the Spiritual Kingdom of God.

A vote of thanks was accorded to the President on the motion of Dr. MacLaurin for his interesting and valuable Address.

The Treasurer, Hon. James Norton, M.L.C., reported on the finances of the Society, showing a credit balance of £77 11s. 3d.

Mr. Macleay moved in accordance with notice given—"That from and after this 1st February, 1885, the Annual Subscription of each Member shall be £2 2s., without Entrance Fee."

Mr. Griffin moved—"That henceforth Ladies may be admitted by election as Associates of the Society for £1 1s. per annum, with all the privileges of Ordinary Members except the right to attend the Meetings of the Society."

These resolutions were both adopted, and the Council were instructed to make the necessary changes in the Rules.

The Meeting then proceeded to the election of Officers for the current year, with the following result :—

PRESIDENT :

PROFESSOR W. J. STEPHENS, M.A., F.G.S.

VICE-PRESIDENTS :

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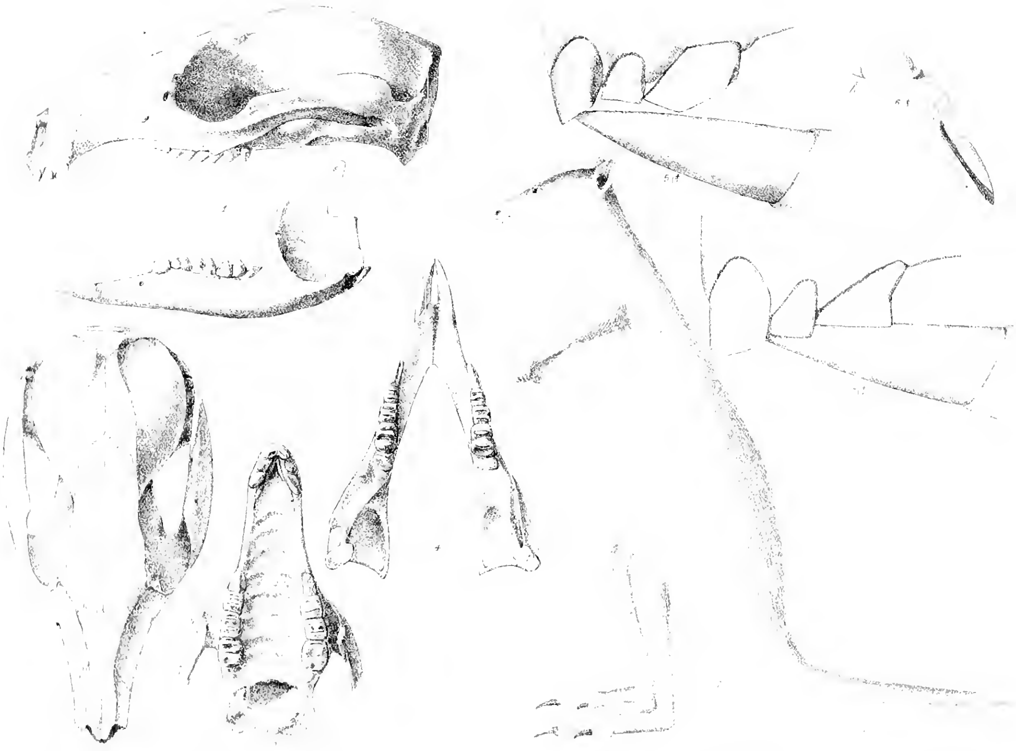
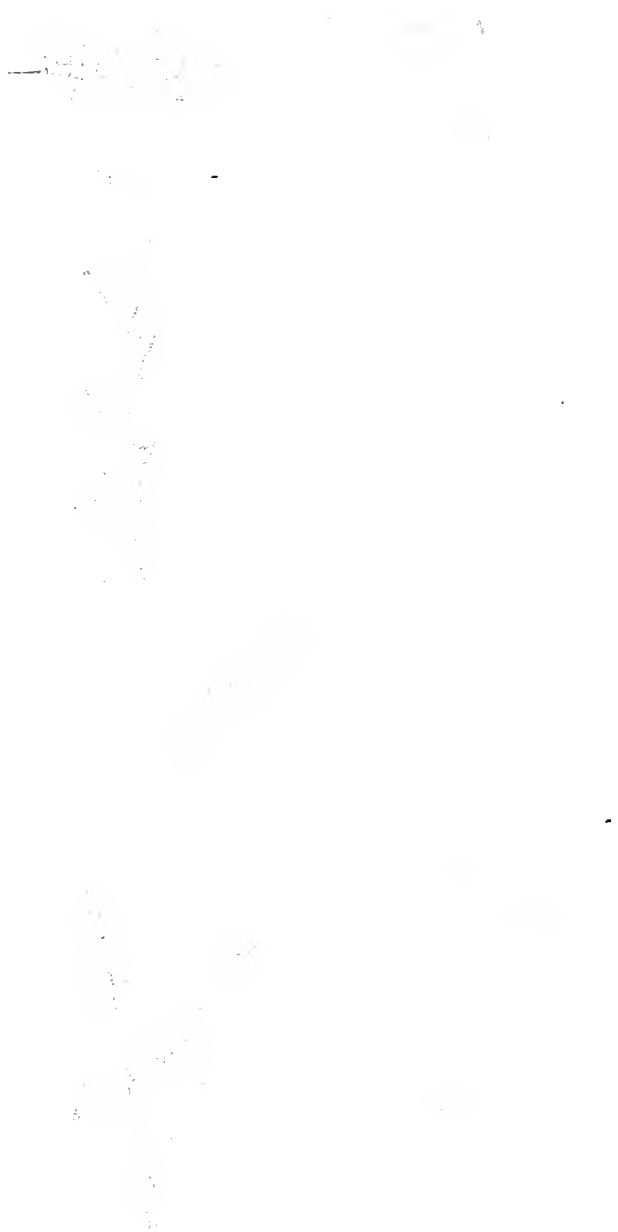


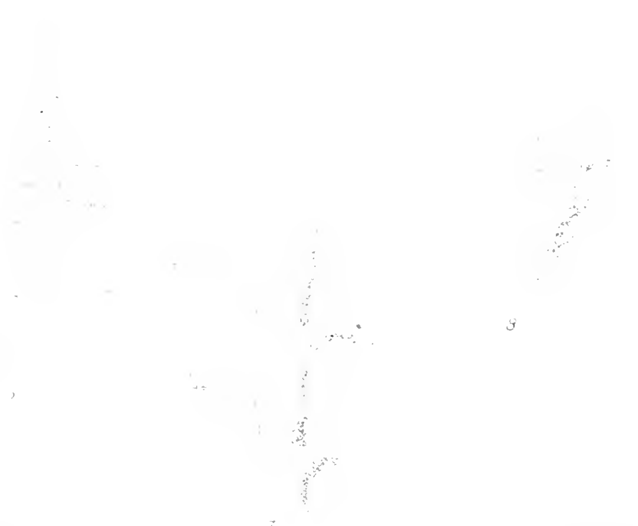
Maclay del.

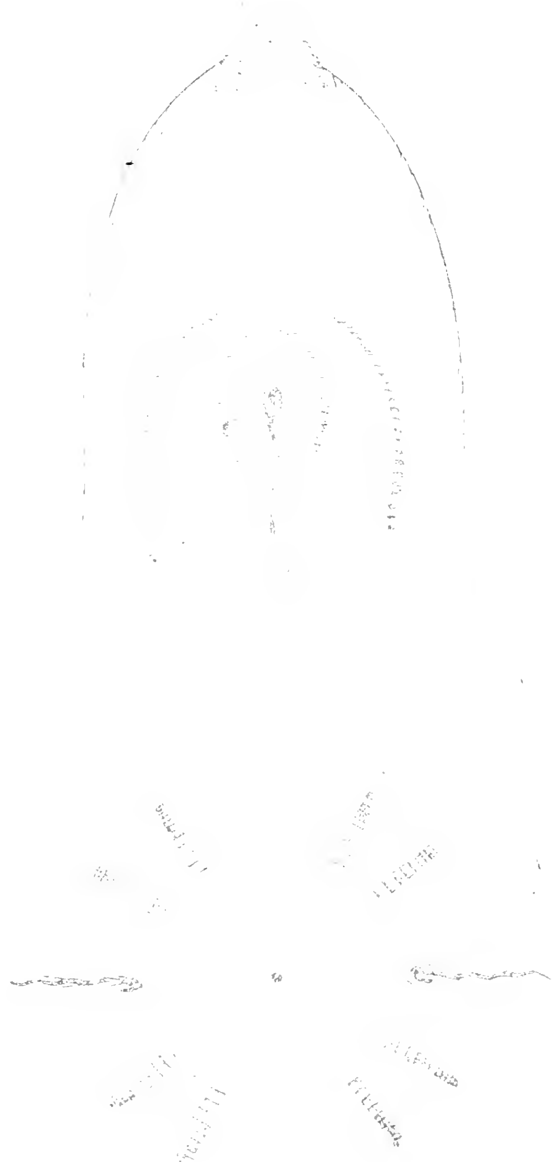
MACROPUS [illegible] Macl.
Fig. 2–5

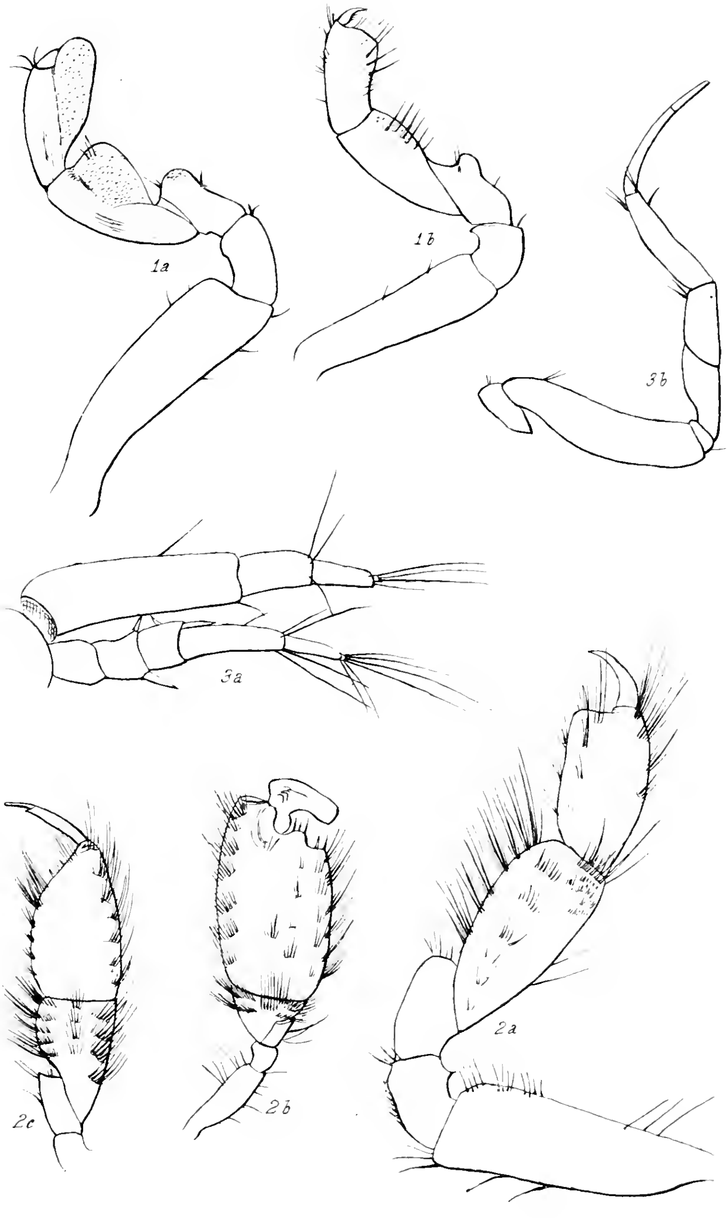
MACROPUS GRACILIS Macl.
Fig. 6–7

[illegible] lith.









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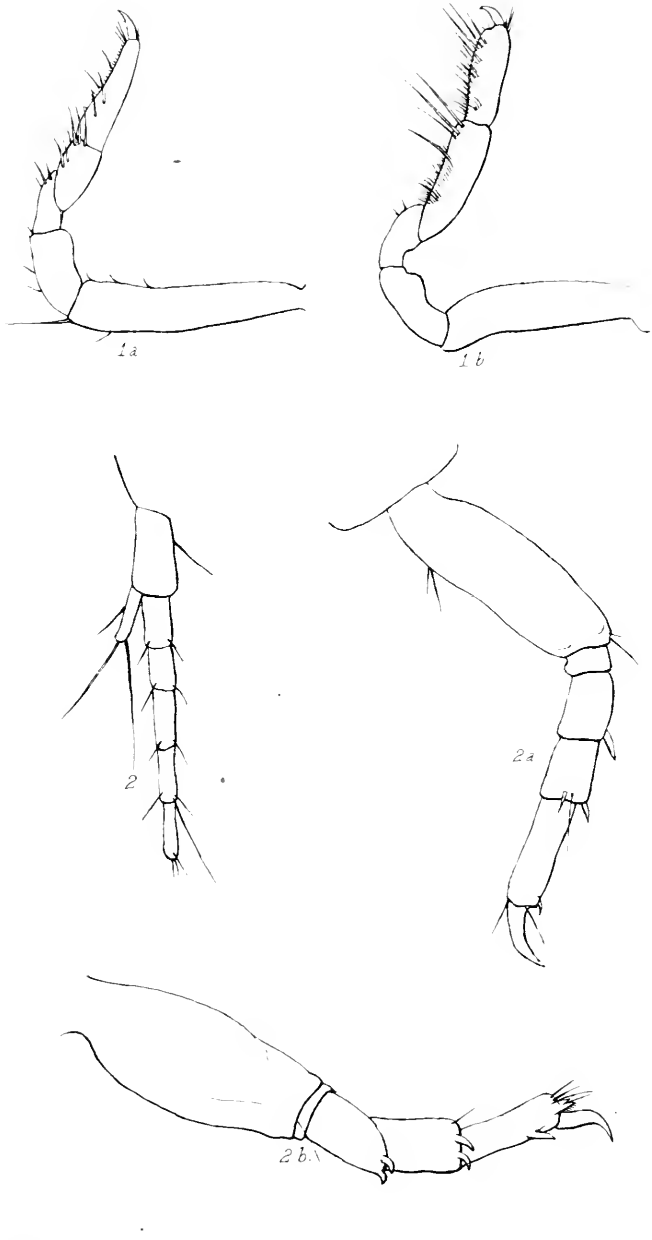

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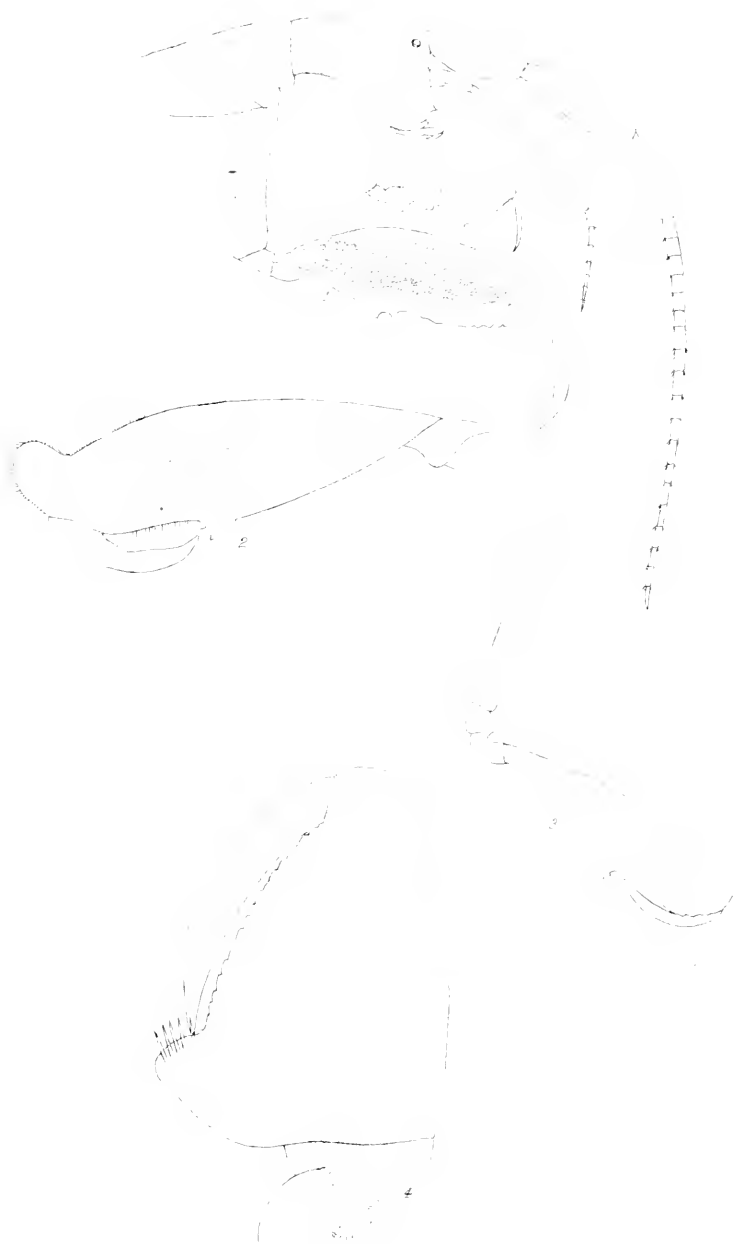

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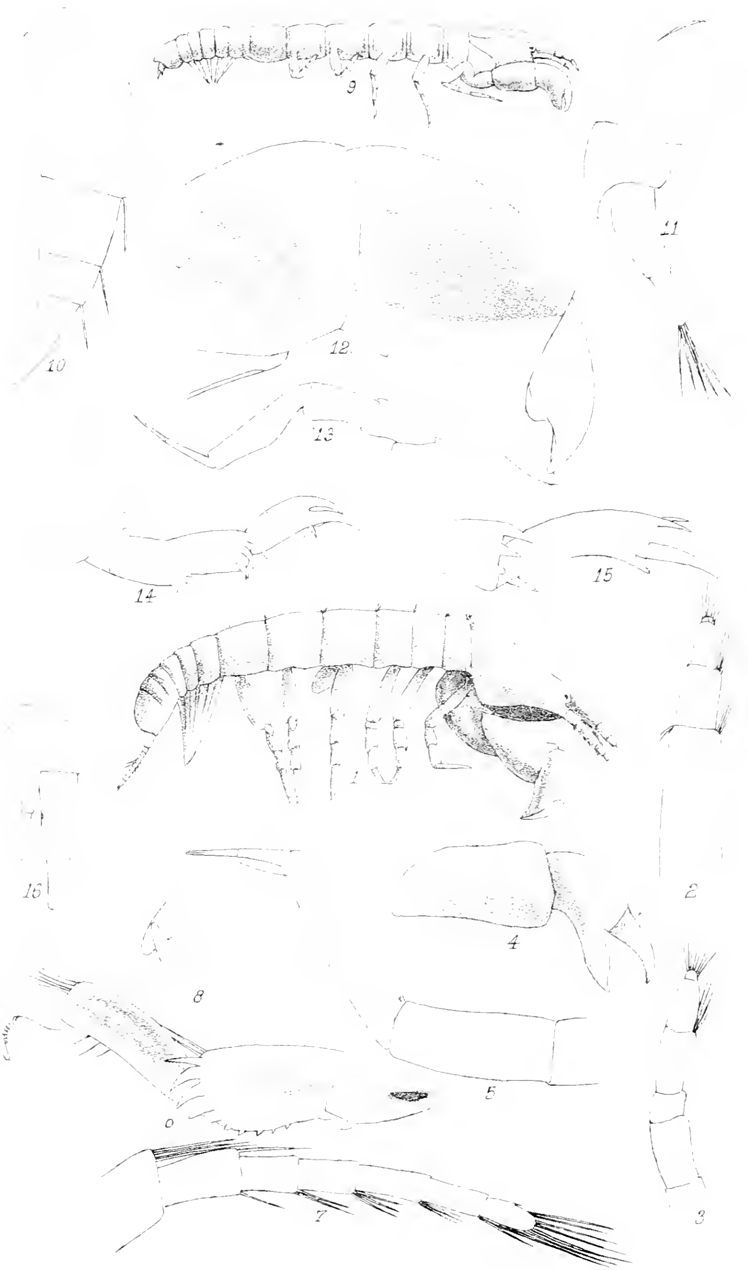

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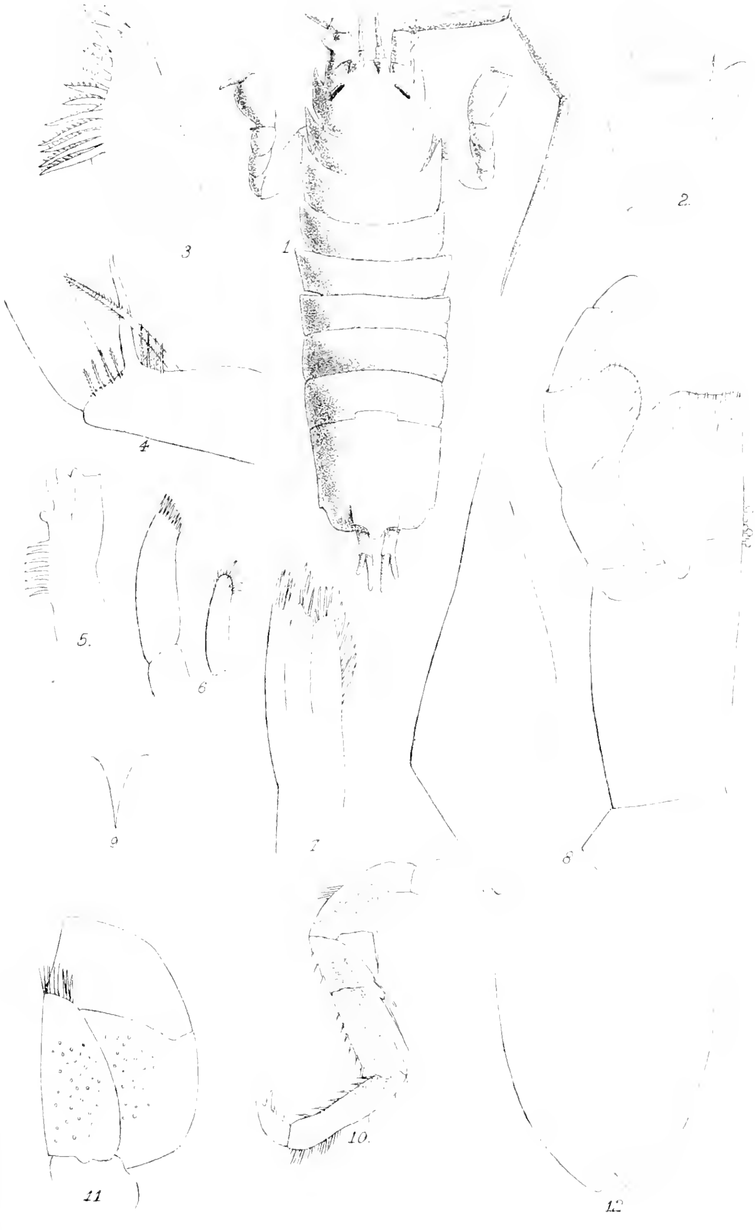

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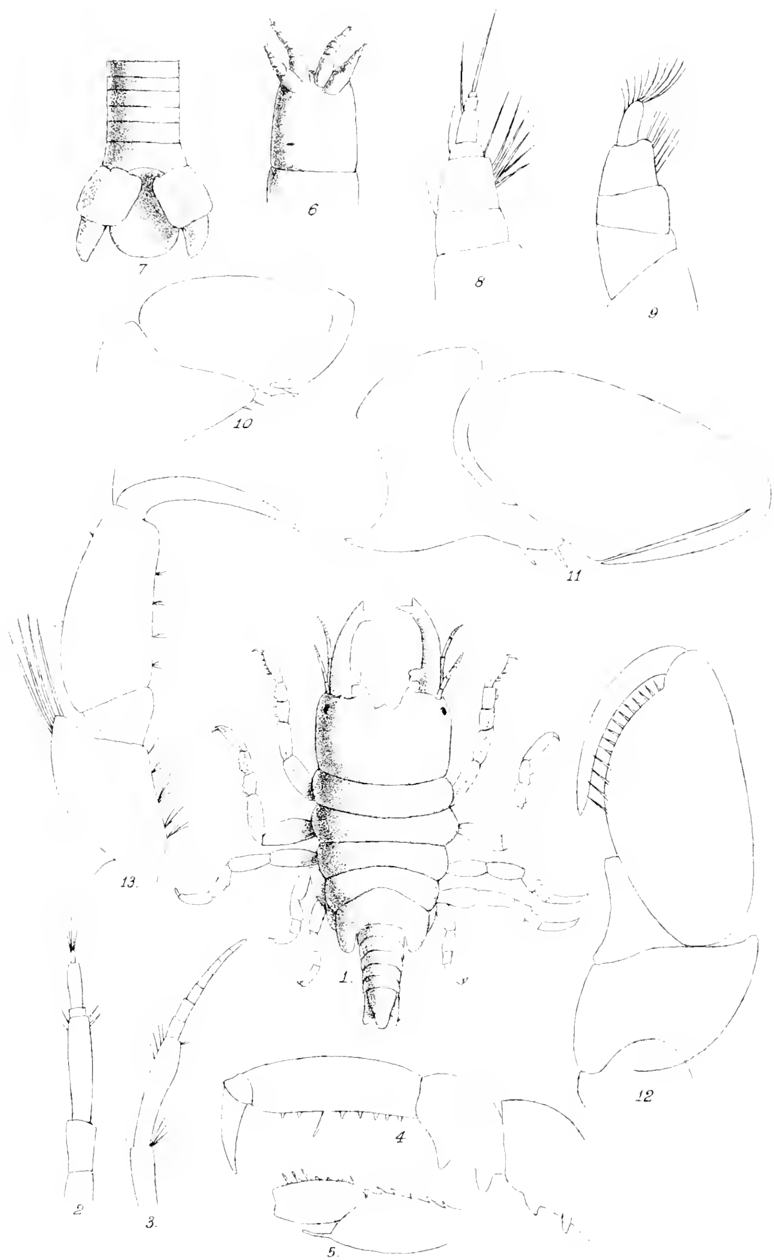

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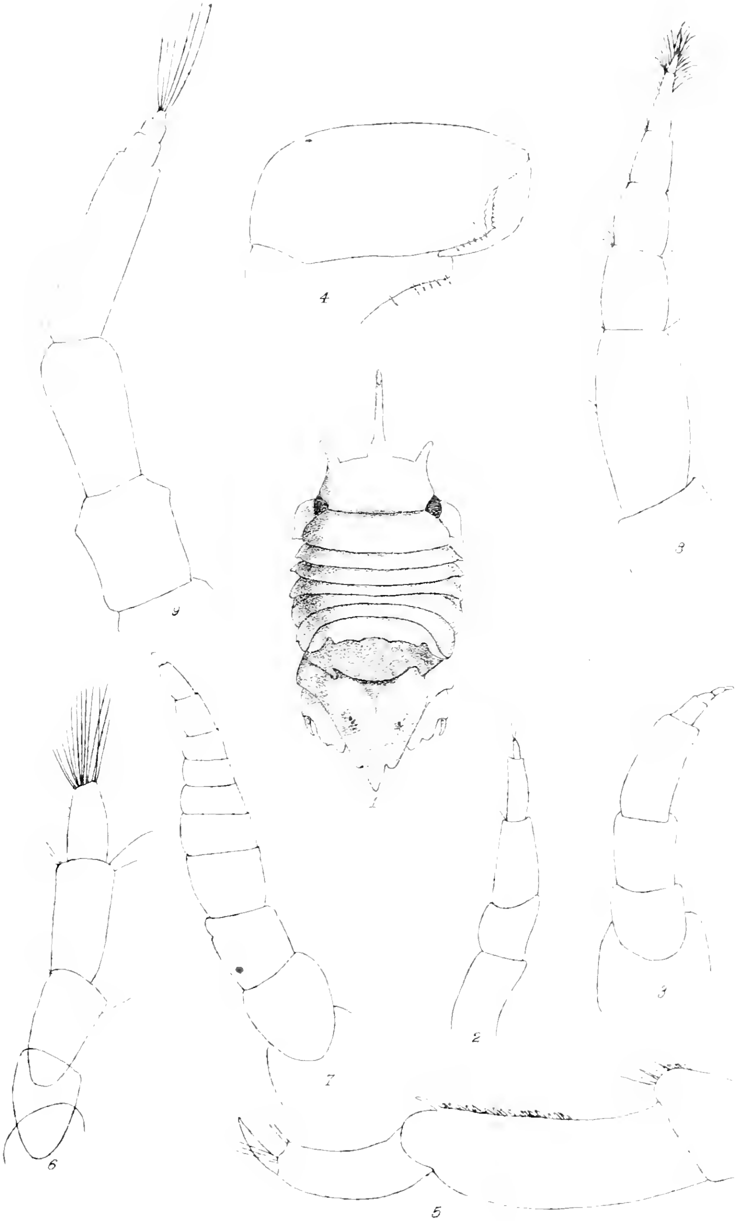

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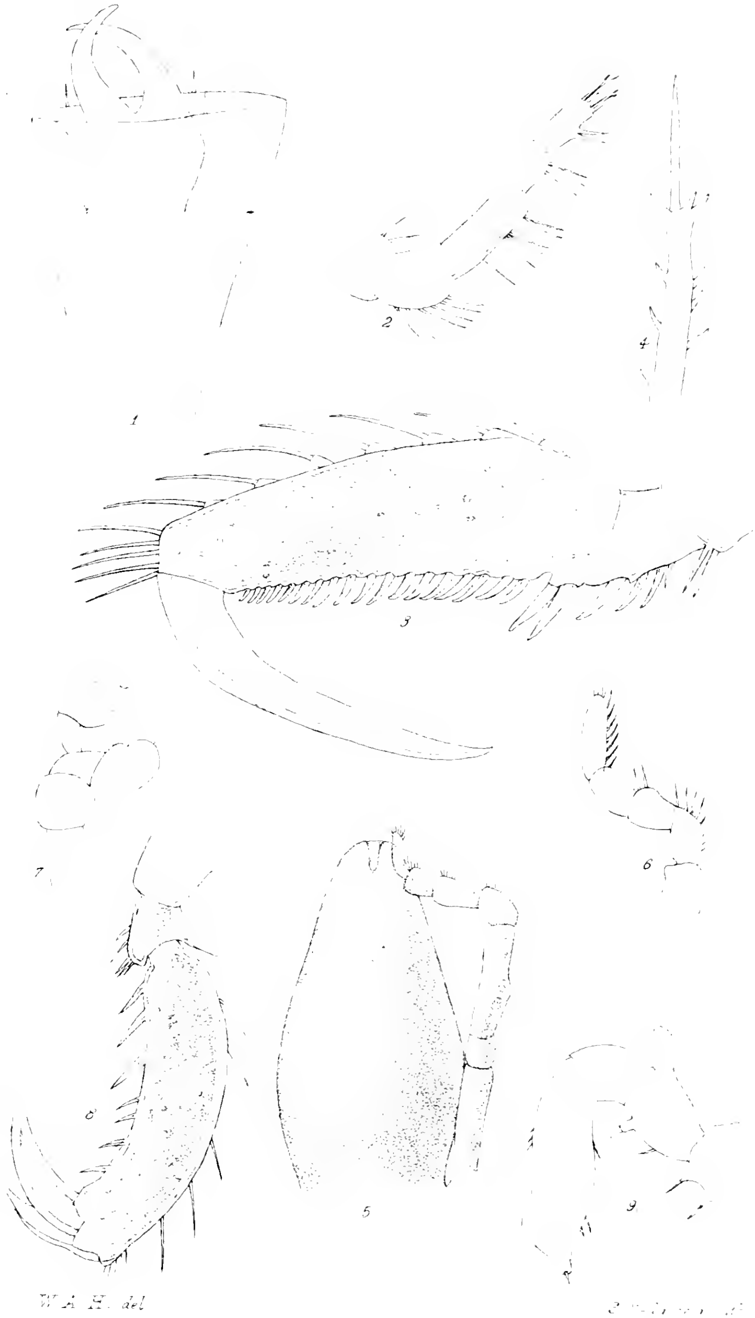
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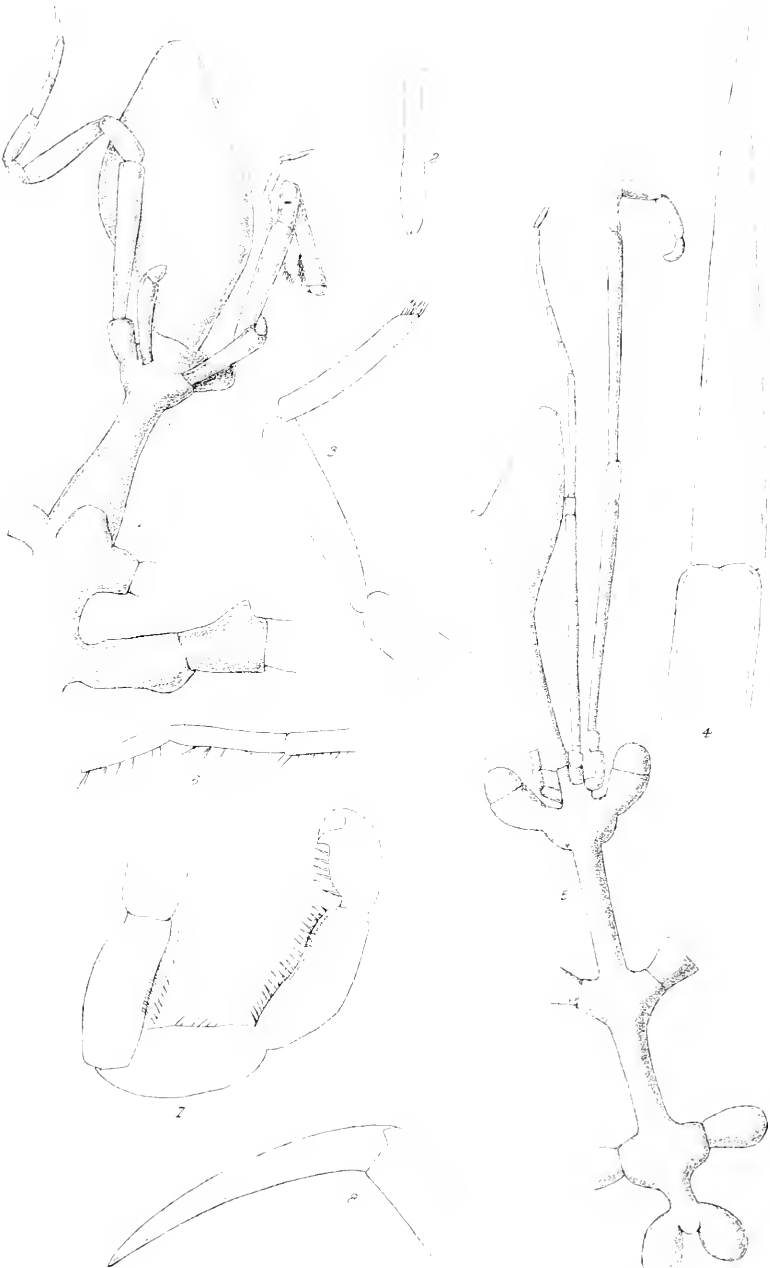

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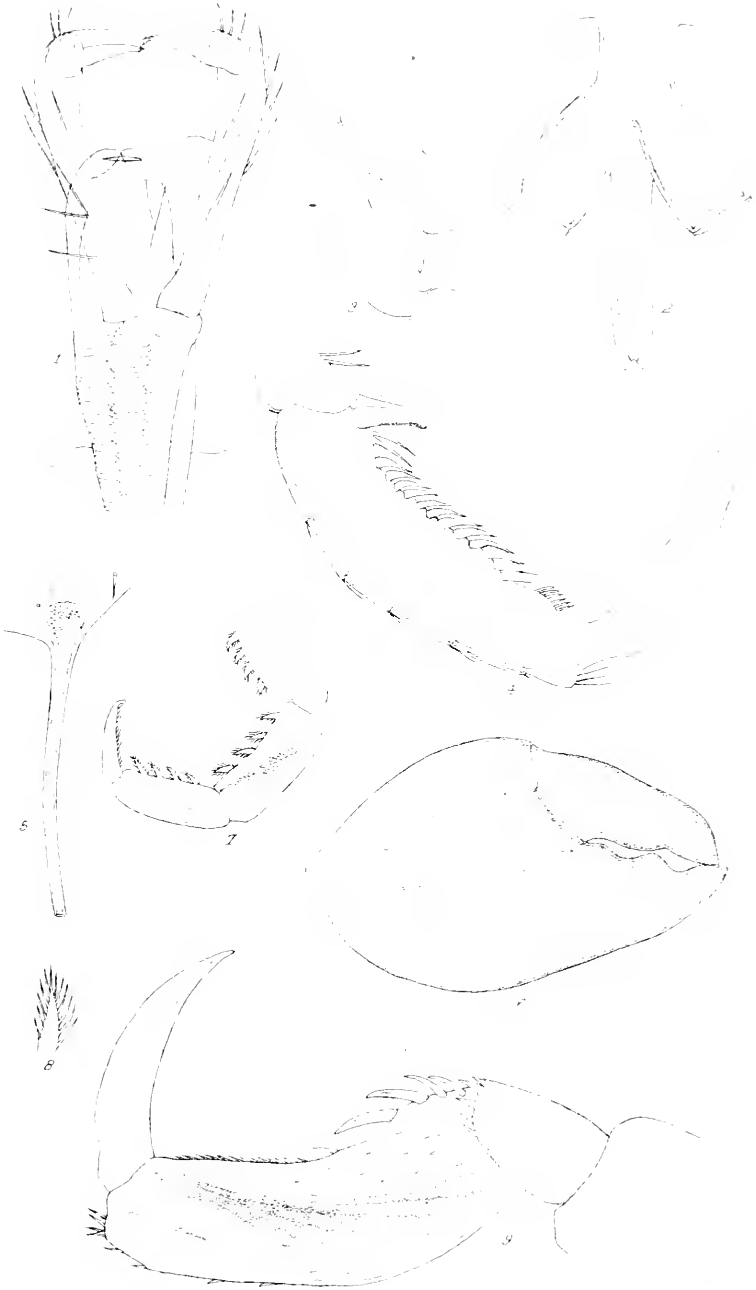


W A H del.

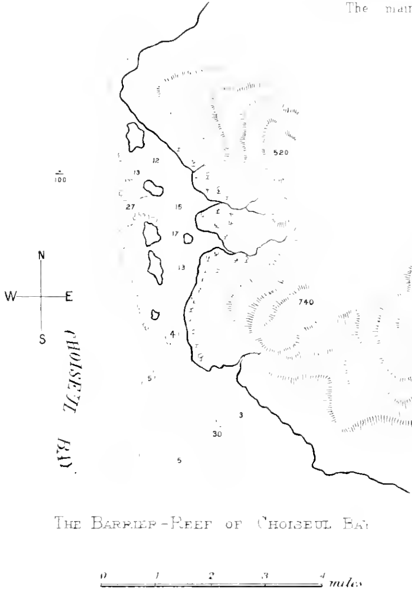
SECTION OF THE SHORTLAND I^D

The main island of Alu — Double line of elevated barrier-reefs

A *Hill of Volcanic Formation*

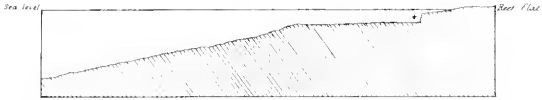
(B *Inland ridges representing ancient barrier reefs. The*
(C *coral limestone is here shown overlying the soft pteropod-deposit*

(D *Present lines of barrier reefs with interior lagoon channels*
(E *the inner line* D *has been upheaved about a hundred feet above the sea, the outer line* E *about forty feet, and both are composed of coral limestone. The depth of the inner lagoon channel is about five fathoms, of the outer channel about twelve fathoms.*

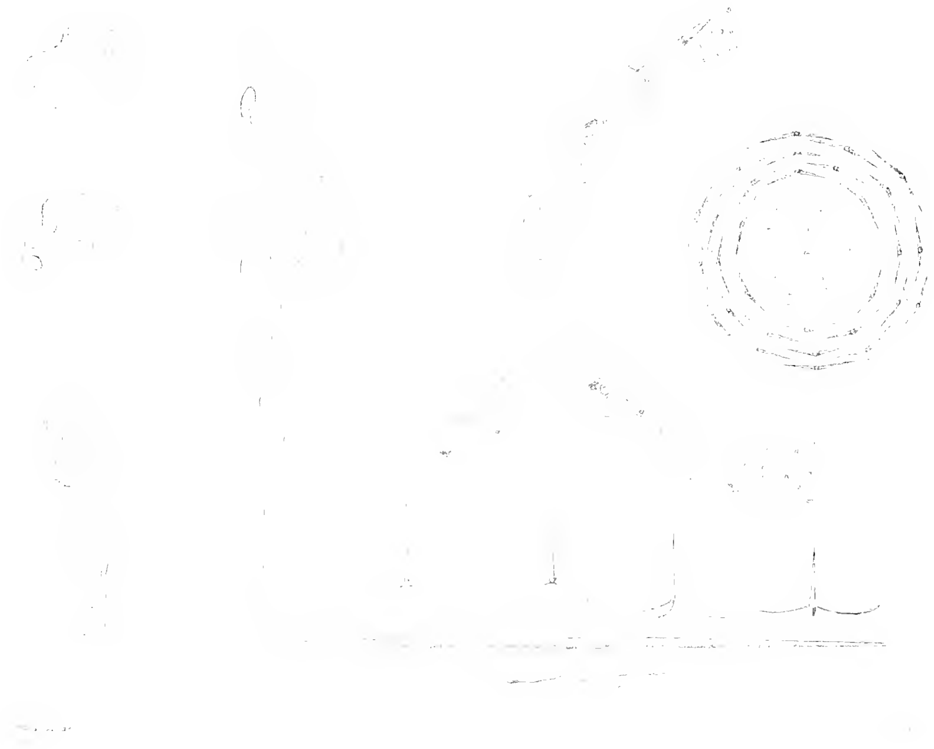


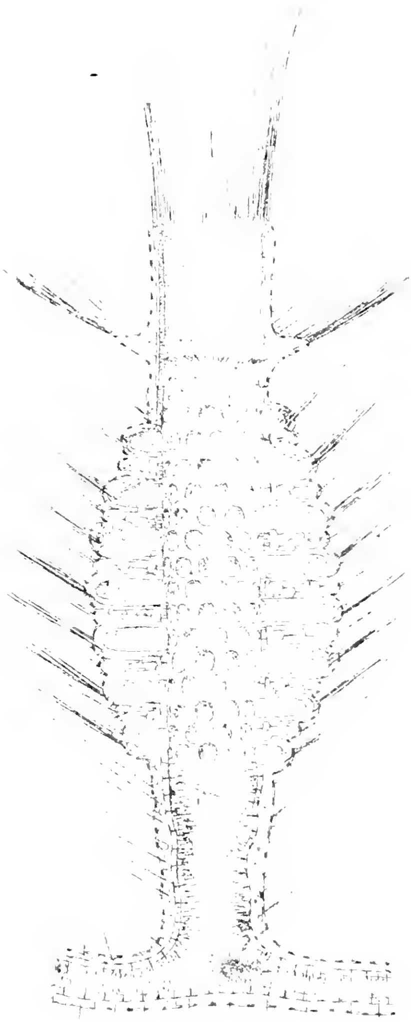
THE BARRIER-REEF OF CHOISEUL BAY

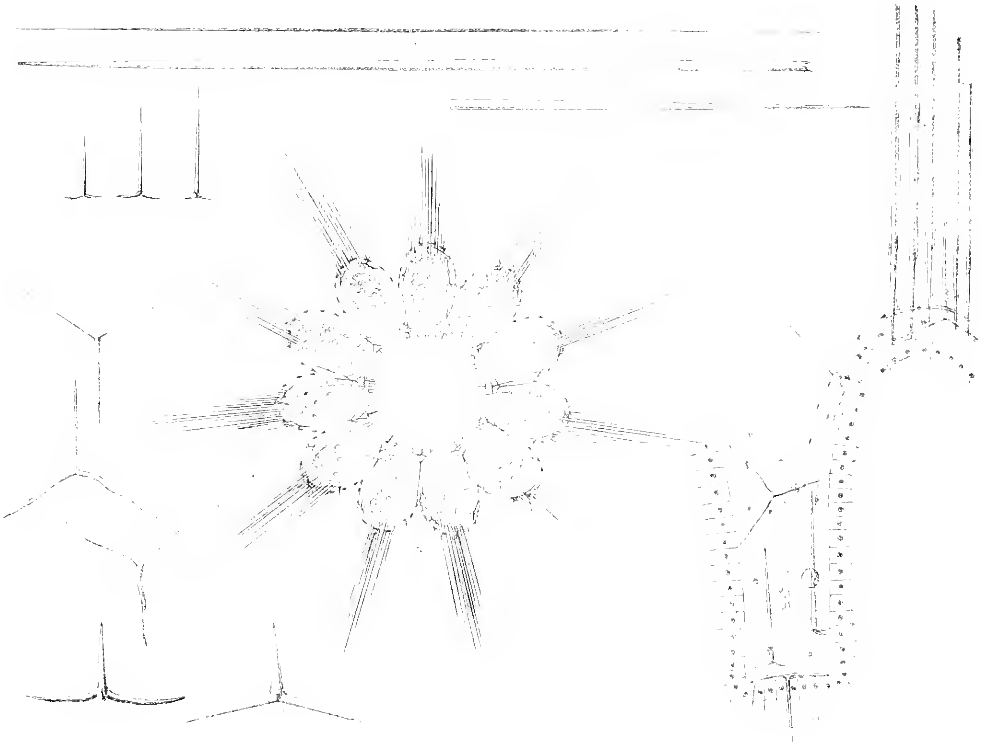
PROFILE OF THE BARRIER-REEF OF CHOISEUL BAY

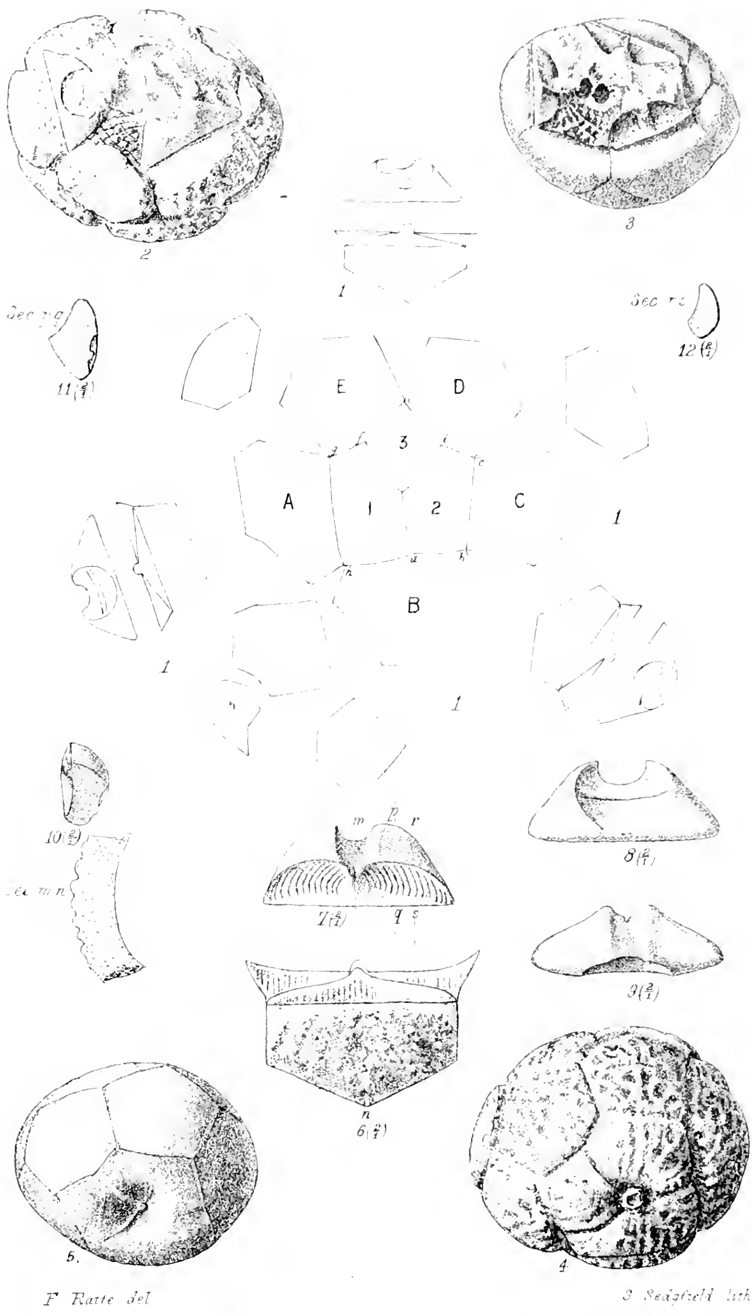


Seaward slope of the Barrier-Reef of Choiseul Bay
(drawn on the true scale to the hundred fathom line 1250 yards from edge of reef flat)









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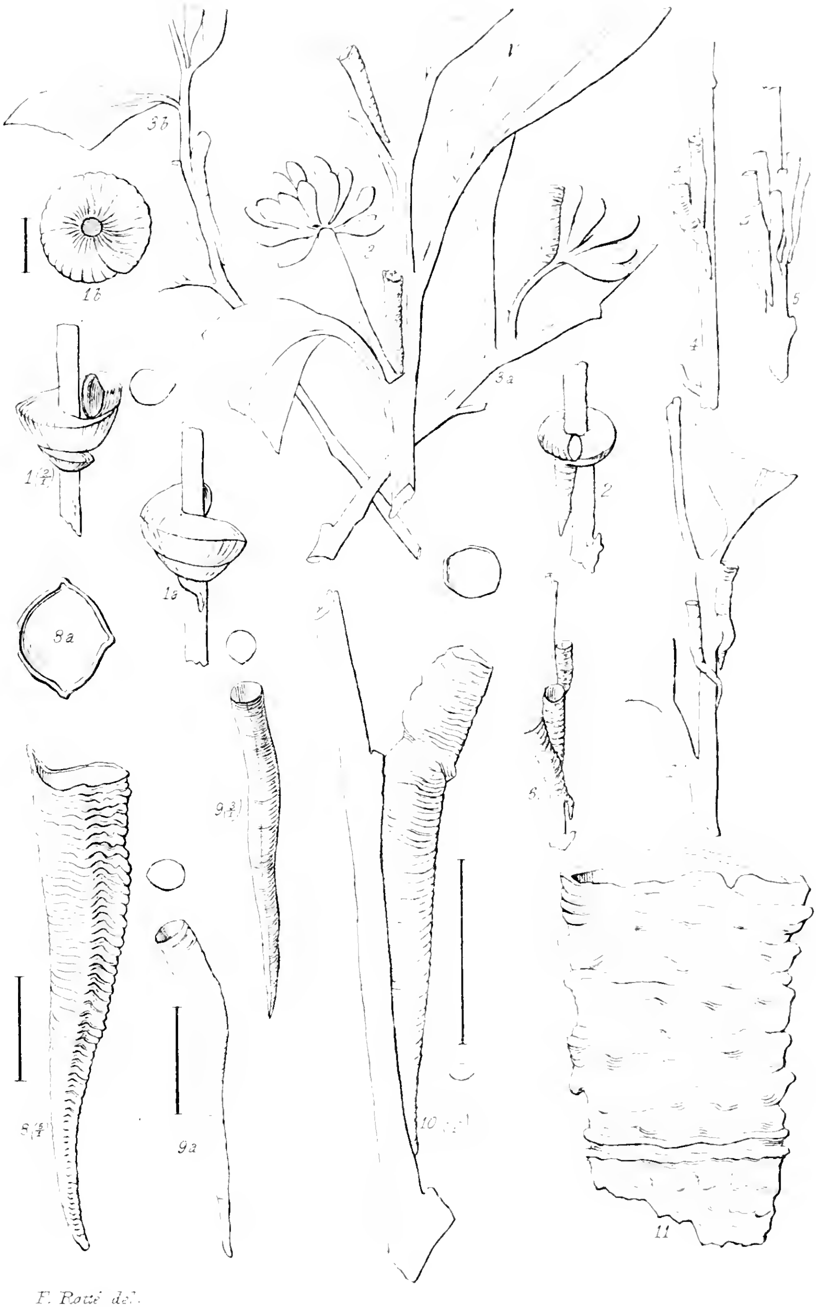

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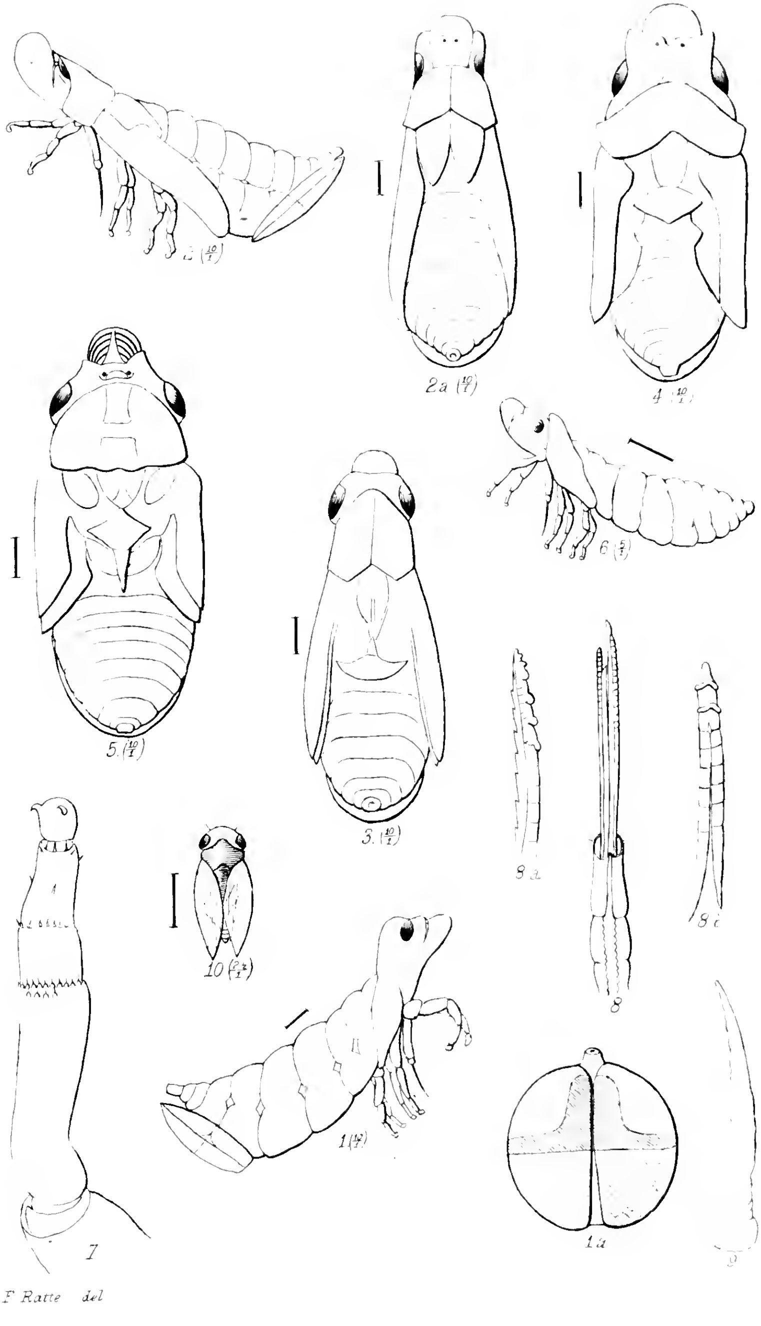

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THE

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OF THE

LINNEAN SOCIETY

OF

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VOL. IX.

PART THE FIRST.

Containing the Papers read at the Meetings held in January and February, 1884.

WITH TWO PLATES.

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