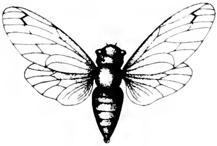

THE

PROCEEDINGS

OF THE

LINNEAN SOCIETY

OF

NEW SOUTH WALES.

VOL. IX.

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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."

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. Maxillary 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 ?/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 sublobed.

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 $\frac{1}{3}$ 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 $\frac{2}{1}$. 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. $1\frac{1}{2}$/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 suboperclc, 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, $6\frac{1}{2}$ inches. Locality, Barrier Reef (Cardwell).

Pseudoscarus flavipinnis.

D. 9/10. A. 3/9. Lat. 25. Tr. $1\frac{1}{2}/6$.

The height of the body is $3\frac{1}{2}$ 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° 00′	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 —	or about	14,6
From tip of nose to occiput	124 —		4,9
Fore limb ,, ,, ,, about....	170 —		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 uupurified 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 Anuabada (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.		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 —	or about	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.

I. 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 cilated 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

Moıe 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 wich 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 equal 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. EUCOPINÆ.

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 Spermamothe1 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 für 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.

(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 Zooxanthellæ 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.

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* The following species has been omitted :—
Cancellaria ampullacera, 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.

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* 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" (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 verv 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

(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 soil, 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 Koli, 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 aminci sur ses deux faces en coin, obcordé au pôle supériéux, et largement ouvert au pôle natateur. L'axe cavitaire est allongé, étroit, bordé sur ses deux faces de cils unis en haut et libres en bas, et de deux rougeés sur tous les boids, soit des pôles soit des côtes.

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 cordigera, 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 histological 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 described 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 Poléjaeffs 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 Polejaefts 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 Lencones 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 Lencones 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 Lencones. 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 Lencetta 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 he 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 cutline, 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. I.—*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 1½ 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 seccnd, 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 trom 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 importance 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 *Paranænia.* 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.

(1). Possibly *P. typica,* Chilton, is the same as *Mæra 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 tennicornis.* 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 *Cæsyra*, 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 ⅔ 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 ⅔ 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. *agelaea.*

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 hind-marginal 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 often 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 4. 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; pcst. 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, hind-margin 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 spct.

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 transversely 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 ¾ of second. Antennæ whitish, ciliations 4. Thorax daik 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 ⅔ 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 ¾ 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 CILIATFD 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

(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 accrate 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.* Grundzüge 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, Sycotrobus.

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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

(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 für 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

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(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.

Locolity : 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

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(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 für 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 100° 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 3, 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

(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 from 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[111].

(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 ones 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,

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(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 quadri-radiates 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. B and 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 tho 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. II., 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 the 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. Lenckart. 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

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(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 sacca. 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 Müller." (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 overzeesche 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

(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

(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.	Mm.		F.	in.	Mm.		F.	in.
♂ from the Murrumbidgee R. (Mcl. Mus.)	2515	or about	8	3	992	or about	3	3	457	or about	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*.

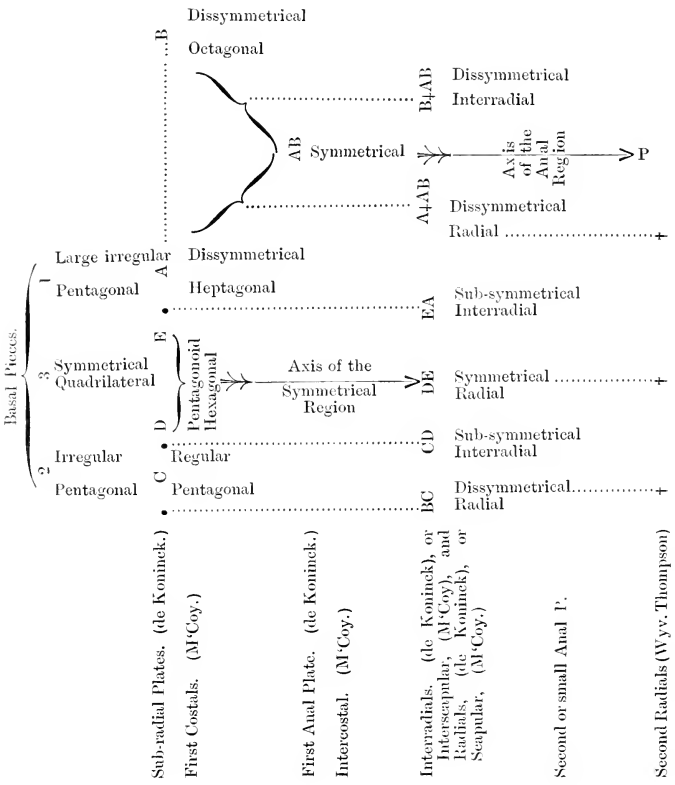
The inner casts of these two genera are often found in the same beds, but in *Cyathocrinus* the basal plate is formed of five articles, whilst in *Tribrachyocrinus* it is formed of three articles only as in *Platycrinus*.

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 sub-radial 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 arises 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 thepaleozoic 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.

"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, F.L.S.

"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 $48\frac{1}{2}$ 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 Southern 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 :—

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PROFESSOR W. J. STEPHENS, M.A., F.G.S.

VICE-PRESIDENTS :

REV. J. E. TENISON-WOODS, F.L.S., F.G.S.
DR. JAMES C. COX, F.L.S., &c.
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HONORARY SECRETARIES :

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P. R. Pedley, Esq.
H. R. Whittell, Esq.

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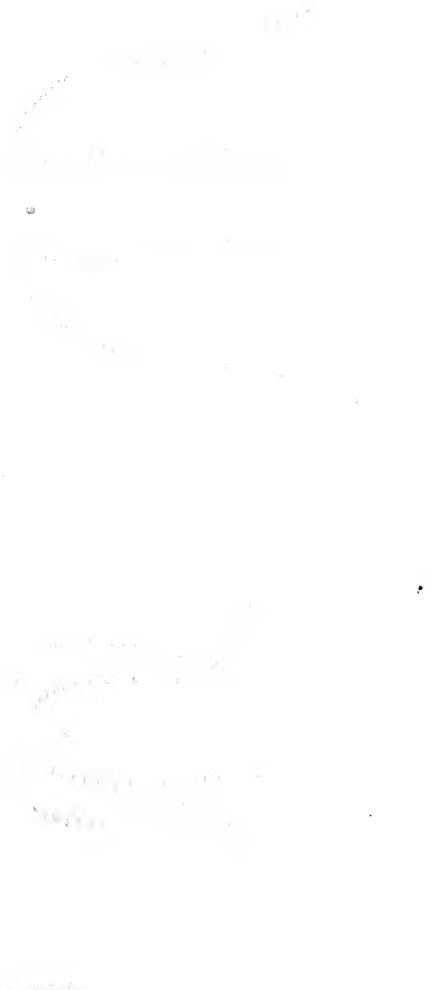

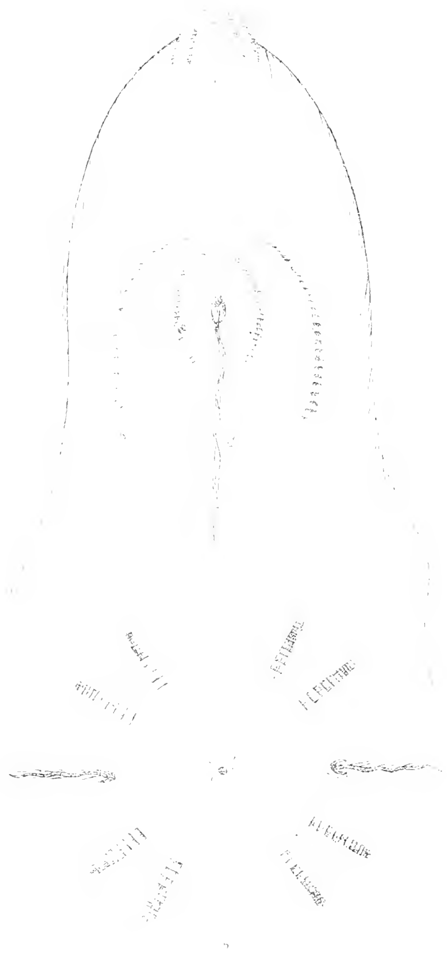

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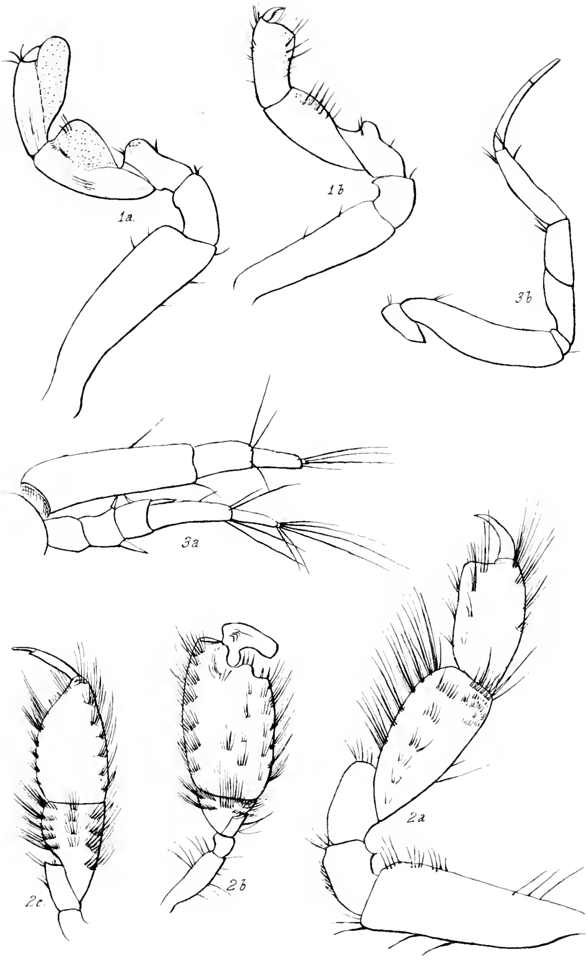

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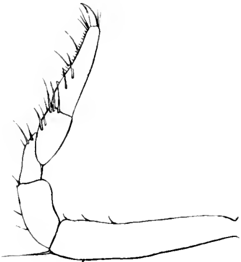

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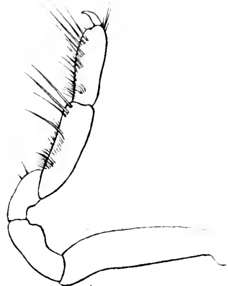

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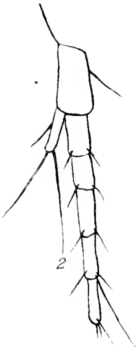

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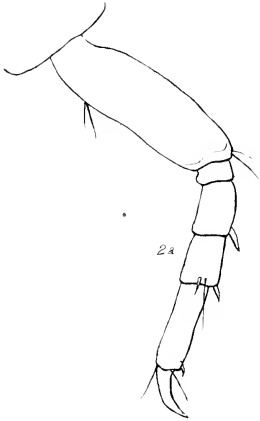

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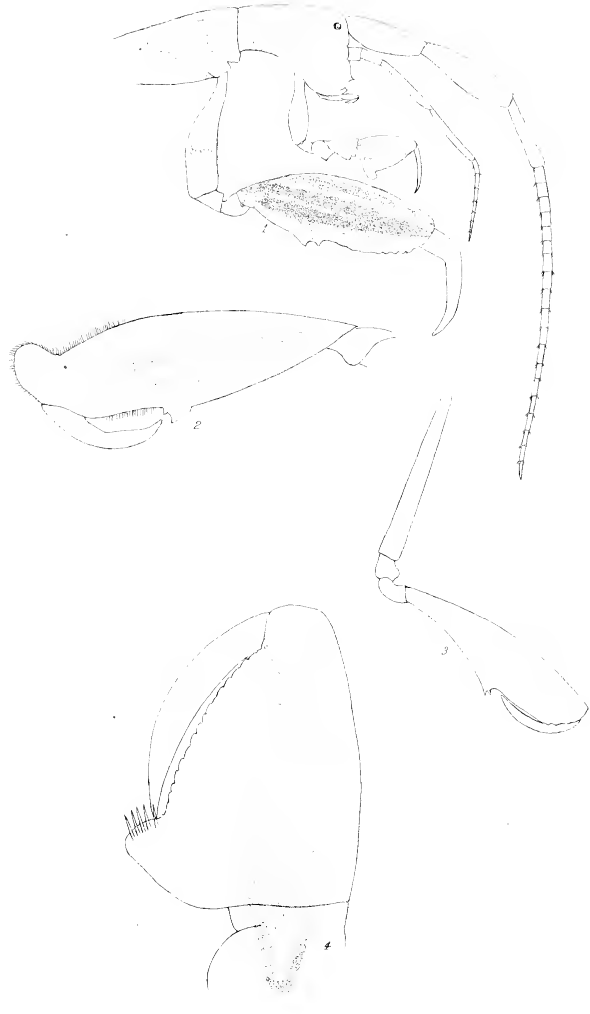

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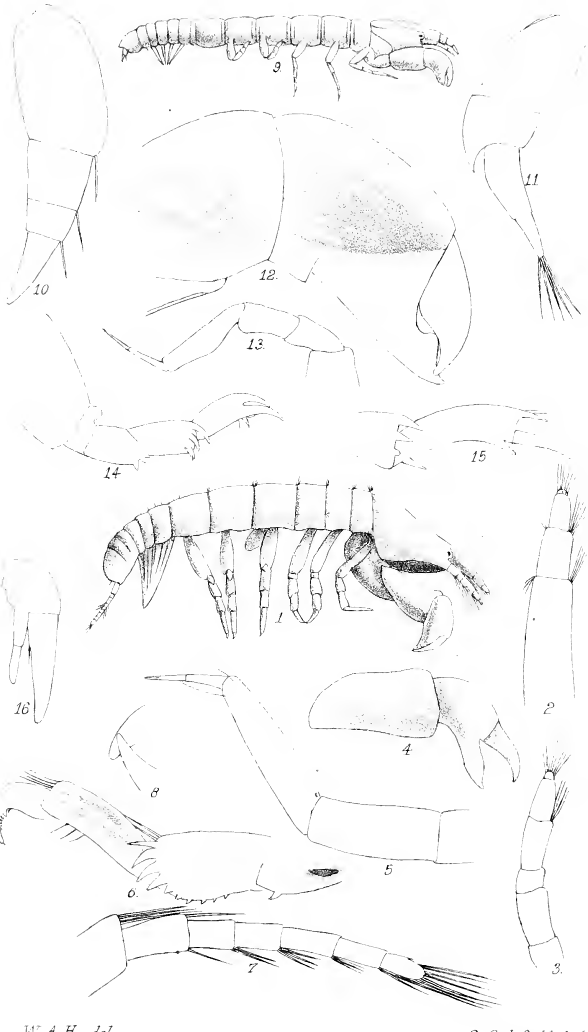

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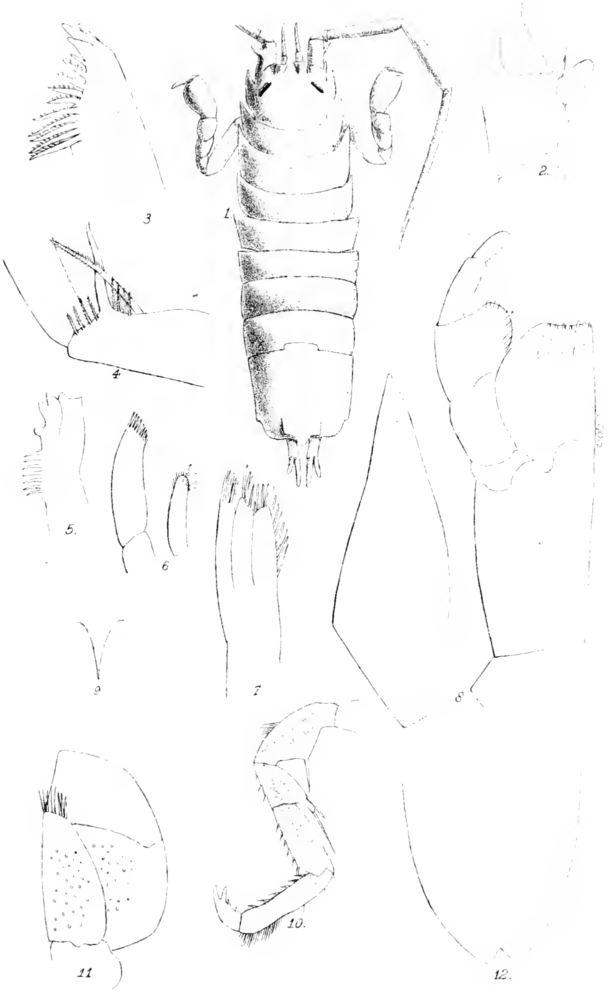

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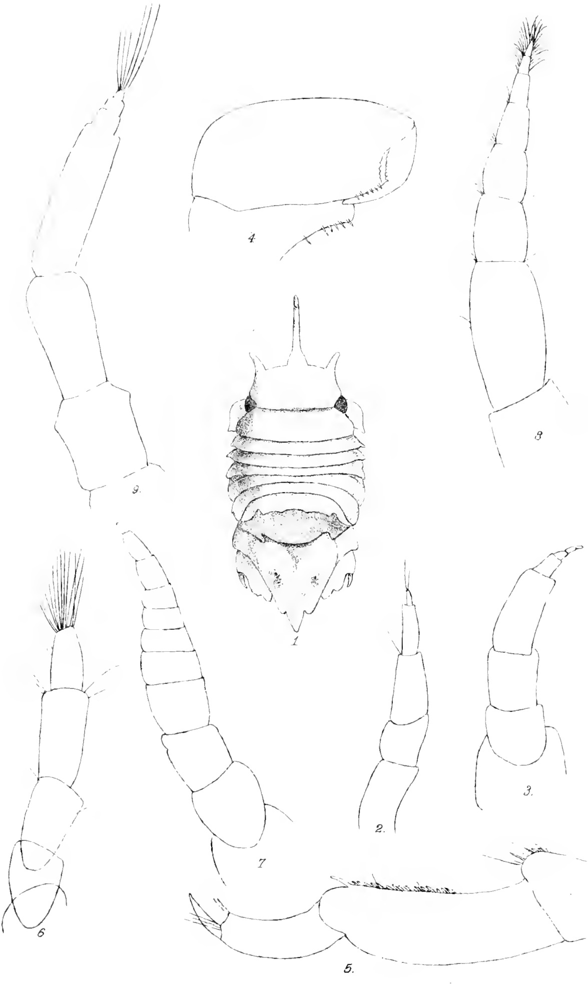

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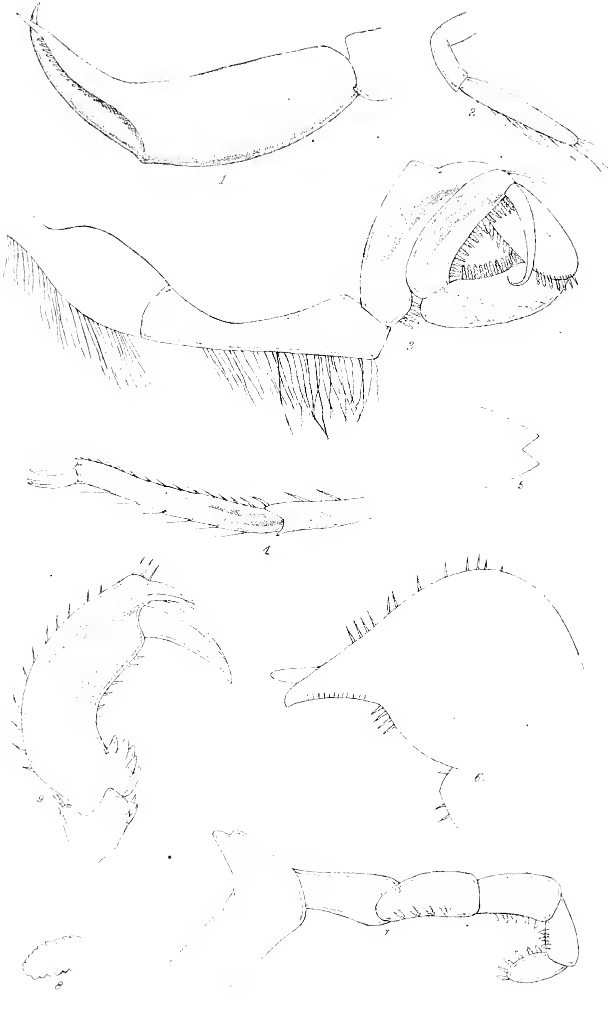

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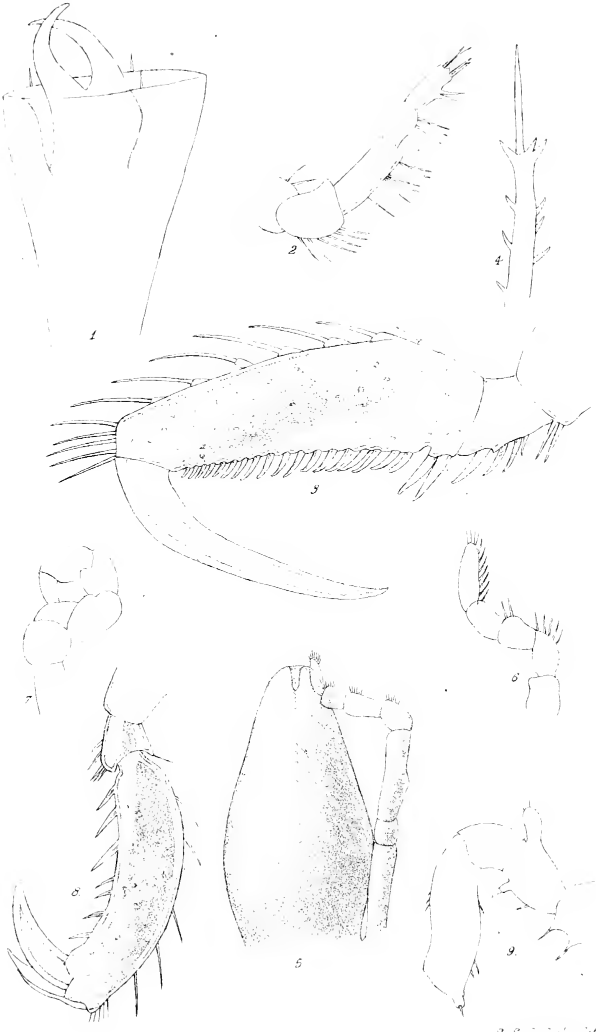

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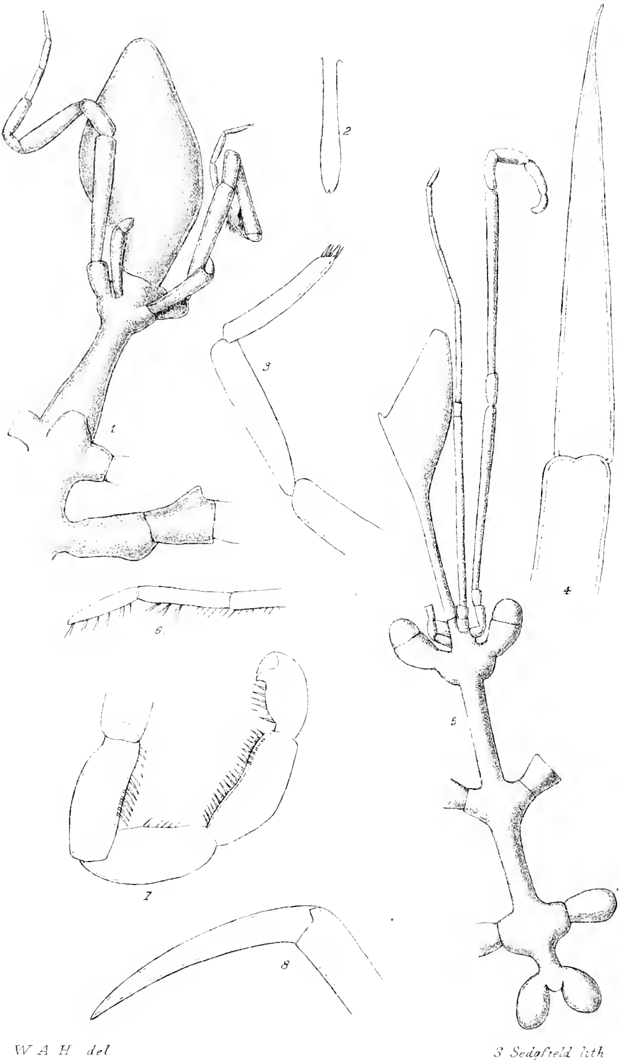

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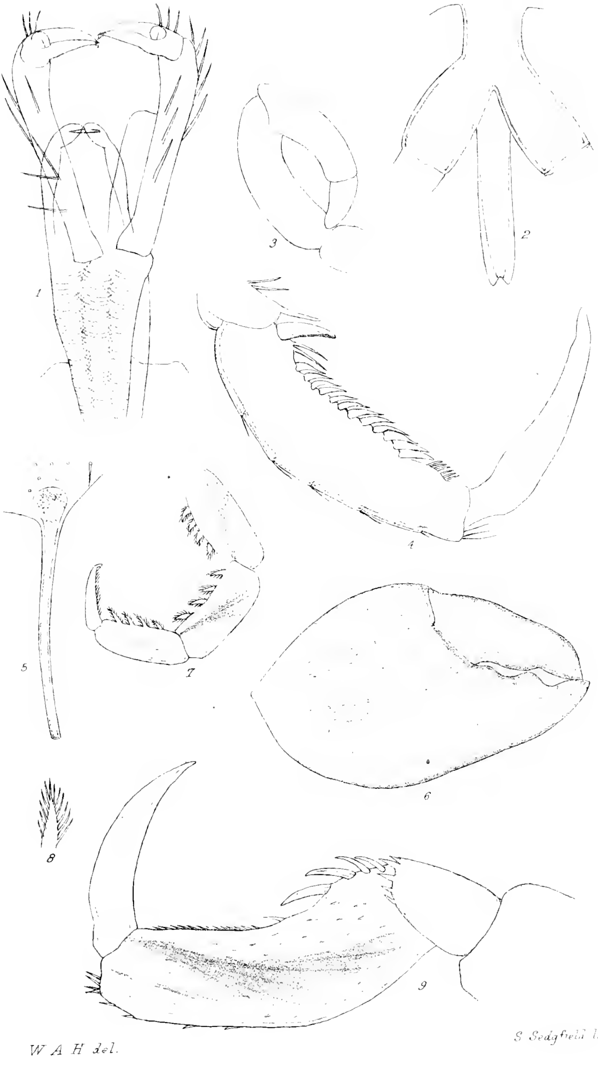

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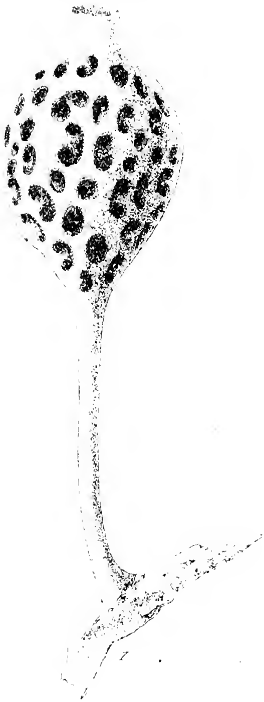

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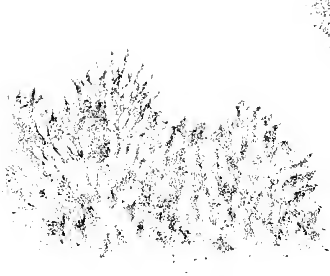

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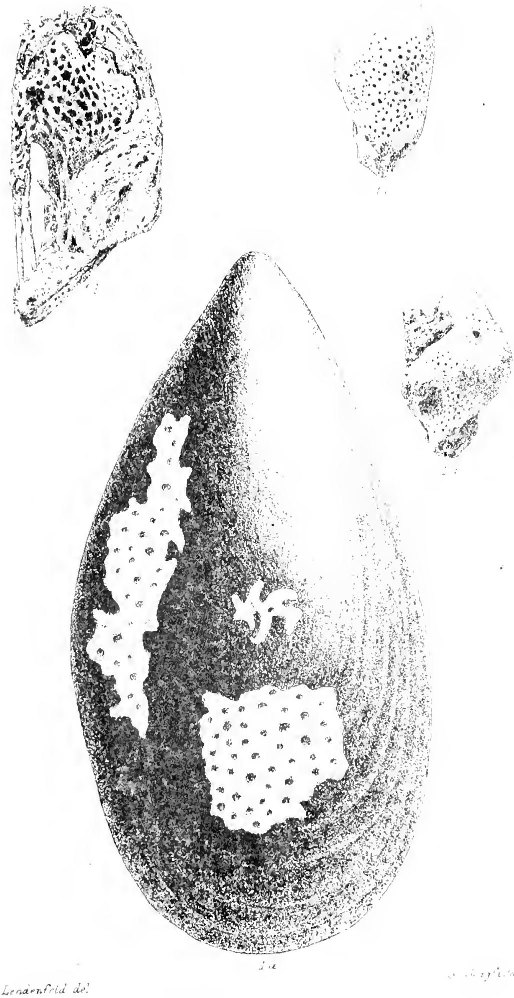

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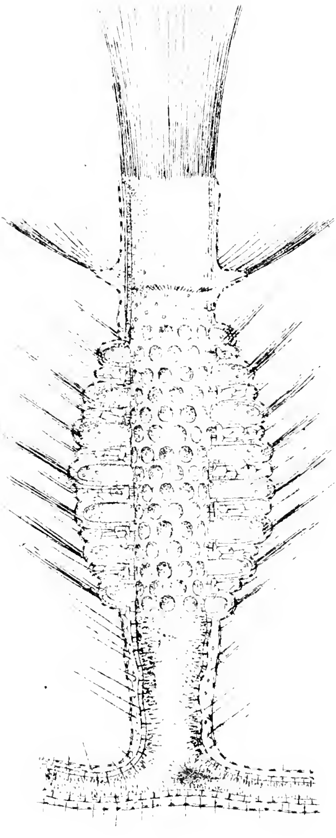

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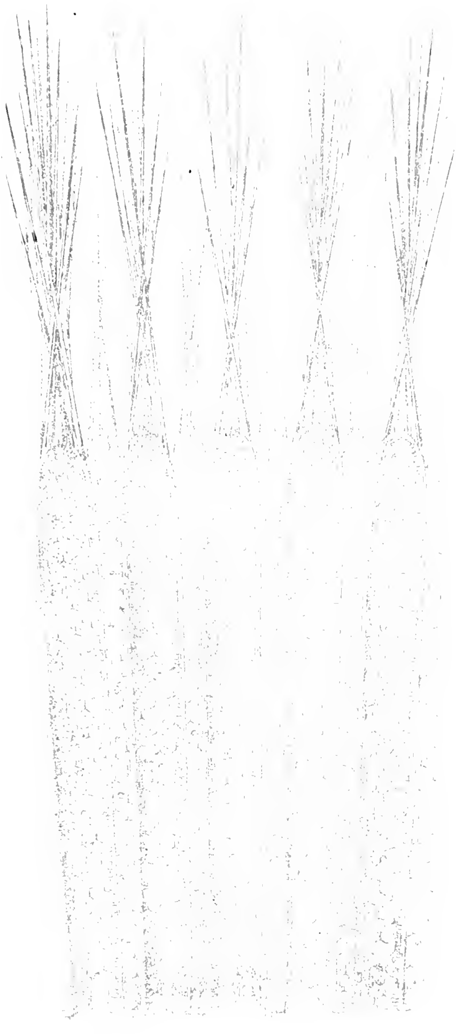

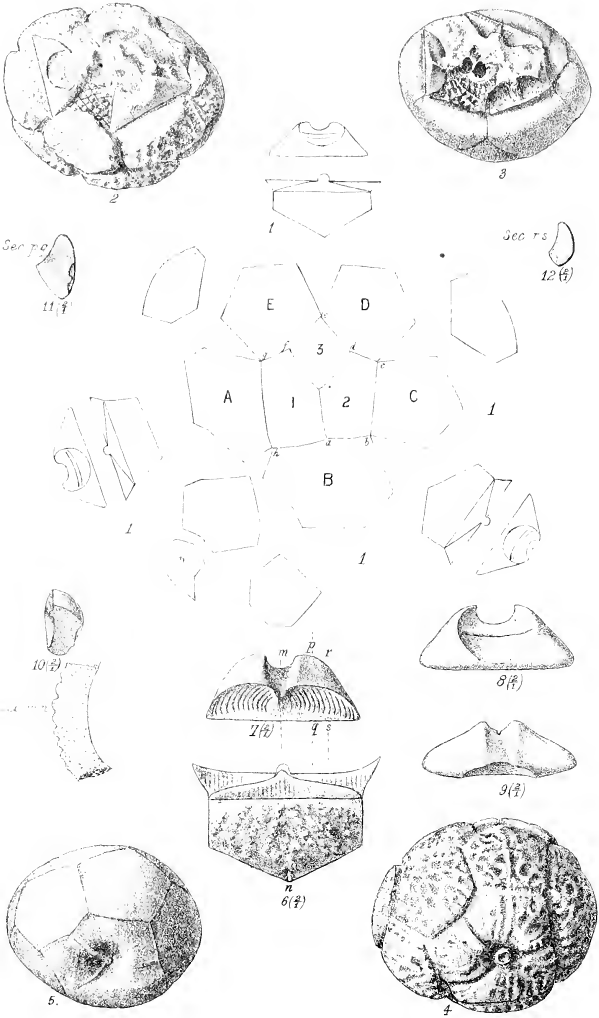

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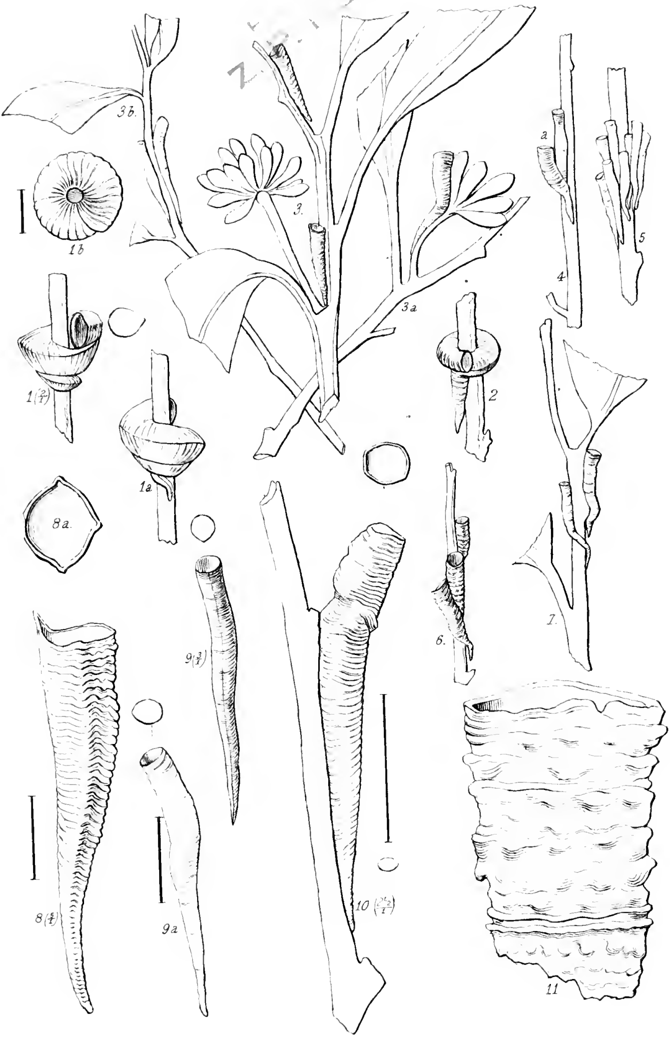

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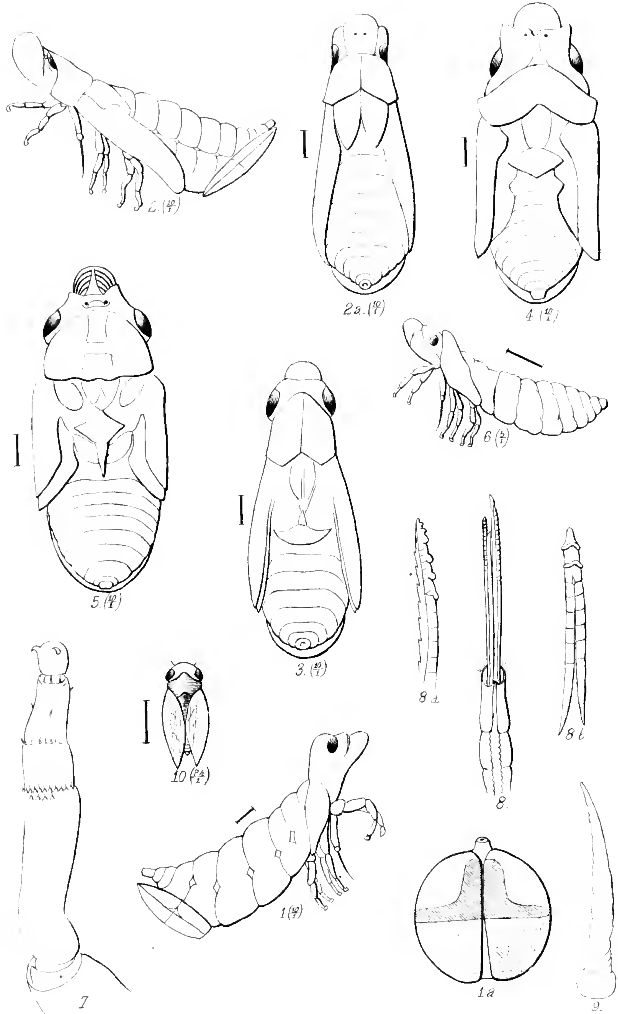

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