Commonwealth of Australia.

DEPARTMENT OF TRADE AND CUSTOMS.

FISHERIES.

Zoological Results of the Fishing Experiments carried out by F.I.S. "Endeavour" 1909-10 under H. C. DANNEVIG, Commonwealth Director of Fisheries.

VOLUME I.

PUBLISHED BY DIRECTION OF THE MINISTERS FOR TRADE AND CUSTOMS, HON. FRANK GWYNNE TUDOR AND HON. LITTLETON E. GROOM.

SYDNEY, 1911-1914.

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LIST OF THE CONTRIBUTORS.

With References and Catalogue Numbers.

Chapman, F.— **59.312 (26.5 : 94.6).**

Report on a Sample of *Globigerina* Ooze from 1122 fathoms, East of Tasmania.

Zool. Res. End., i., 3, 1912.

Hallmann, E. F.— **59.34 (26.5 : 94.2-5).**

Report on the Sponges obtained by the F. I. S. "Endeavour" on the Coasts of New South Wales, South Australia, Queensland, and Tasmania. Part 1.

Zool. Res. End. i., 2, 1912,

Hedley, Charles— **59.4 (26.5 : 94.2).**

Report on the Mollusca obtained by the F. I. S. "Endeavour" chiefly off Cape Wiles, South Australia. Part 1.

Zool. Res. End. i., 1, 1911.

McCulloch, Allan R.— **59.7 (26.5 : 94.2-6).**

Report on the Fishes obtained by the F. I. S. "Endeavour" on the Coasts of New South Wales, Victoria, South Australia, and Tasmania. Part 1.

Zool. Res. End., i., 1, 1911,

Raff, Janet W.— **59.71 (26.5 : 94.2).**

A New Species of *Asymmetron* from the Great Australian Bight.

Zool. Res. End., i., 3, 1912.

1911.

Commonwealth of Australia.

Department of Trade and Customs.

FISHERIES.

Zoological Results of the Fishing Experiments carried out by the F.I.S. "Endeavour," 1909-10 (H. C. Dannevig, Commonwealth Director of Fisheries).

PART I.

PUBLISHED BY DIRECTION OF THE HONORABLE FRANK GWYNNE TUDOR,

MINISTER FOR TRADE AND CUSTOMS.

Sydney, December 22nd, 1911.

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CONTENTS TO PART I.

INTRODUCTORY NOTE.

The Reports comprised in the "Zoological Results of the Fishing Experiments carried out by the F.I.S. 'Endeavour'" have been prepared at the Australian Museum, Sydney, under the authority of the Trustees, and at the request of the Hon. The Minister for Trade and Customs.

The material for investigation is sent direct from the "Endeavour" by the Director of Fisheries (Mr. H. C. Dannevig) to the Australian Museum, and, after elaboration, is distributed as follows:—All "types" are held in reserve for the Fisheries Branch of the Department of Trade and Customs; a set of "co-types" are retained by the Trustees; the remainder of the specimens are distributed to the other Australasian State Museums in the name of the Minister for Trade and Customs.

The Reports deal with the Fishes collected on the coasts of New South Wales, Victoria, South Australia and Tasmania. The Asteroidea and Sponges are from the same waters with the addition of those of the Queensland coast. The Mollusca are a more specialised series, chiefly obtained off Cape Wiles, South Australia. The new Asymmetron comes from the Great Australian Bight, and a sample of Globigerina Ooze was obtained to the east of Tasmania.

I. Report on the Fishes obtained by the F.I.S. "Endeavour," on the Coasts of New South Wales, Victoria, South Australia and Tasmania.

PART I.

BY

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Australian Museum
Sydney.

Plates I-XVI.; Text figs. 1-20.

I.—REPORT ON THE FISHES.

PART I.

I.—INTRODUCTION.

The collections dealt with in this Report were obtained by the Federal Fisheries Investigation Ship "Endeavour," under the direction of Mr. H. C. Dannevig. They were obtained at many localities along the New South Wales, Victorian, Tasmanian and South Australian coasts at various depths down to ninety fathoms. The present part deals with the greater number of the fishes forwarded for examination to the Australian Museum from this area, but the Scleroparei and Jugulares of the Acanthopterygii and the Pediculati and Plectognathi are reserved for a second part.

In all about 1070 specimens, representing 94 species, have been critically examined, which, in conjunction with the large collections in the Australian Museum, have afforded excellent material for a detailed study of variation in many hitherto little known species. With a series of forty or fifty specimens from wide-spread localities before one, it is often a simple matter to recognise the identity of fishes which have been regarded as distinct when isolated examples afford no clue. In the following pages I have endeavoured to clear up the synonymy of species of *Cœlorhynchus*, *Physiculus*, *Seriolella*, *Callanthias*, *Cæsioperca*, etc., while figures are given showing the remarkable variation of *Zanclistius*, *Macrorhamphosus*, *Centriscops*, *Beryx* and others. Many of the more striking variations were specially selected by Mr. Dannevig on board the ship, and it is largely due to his discrimination in this direction that so many extreme forms are here dealt with. When individuals were lacking to complete a series he has gone to considerable trouble to obtain them, and in the case of fishes in which the colours were of importance, he has sent me fresh material packed in ice. For this and other valuable help I owe him my best thanks.

I have also to acknowledge the kindness of the Committee of the Macleay Museum who have allowed me to borrow some of Sir William Macleay's type specimens for examination and comparison with the "Endeavour" collections.

Ten species are described as new, and four others and two genera are recorded from Australia for the first time. Thirty-three are figured, and I have to acknowledge the very willing assistance of Mr. Dene Fry, of the Australian Museum, in the preparation of the plates.

II.—DESCRIPTION OF THE GENERA AND SPECIES.

Family HEXANCHIDÆ.

Genus Heptranchias, *Rafinesque*.

Heptranchias perlo, *Bonnaterre*.

Seven-gilled Shark.

(Plate i., fig. 1.)

Squalus perlo, Bonnaterre, Encycl. Meth., Ichth., 1788, p. 10.
Squalus cinereus, Gmelin, Linn. Syst. Nat., 1789, p. 1497.
Heptanchus cinereus, Müller & Henle, Plagiost., 1839, p. 81, pl. xxxv.
Notidanus cinereus, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 398.

The collection includes seven examples which I am unable to separate from the European *H. perlo*, Bonnaterre. Their teeth agree exactly with Müller and Henle's figure, and they also fit the description fairly well. I forwarded a photograph of one of the specimens, together with some notes, to Mr. C. Tate Regan for his opinion, and he has favoured me with the following reply:—"So far as I can judge from your photograph the shark is *H. cinereus*."

These specimens are readily distinguished from *H. indicus*, Agassiz, the only other Australian species, by the following characters:—

Head broad, snout broadly rounded; a single median tooth in the upper jaw; colour greyish with darker spots:—*indicus*.

Head narrow, snout pointed; no single median tooth in the upper jaw; colour uniform grey:— *perlo*.

All the specimens were taken in the one haul in 60-70 fathoms, sixty miles south of Cape Everard, Victoria.

Family HETERODONTIDÆ.

Genus Heterodontus, *Blainville*.

Heterodontus philippi, *Bloch and Schneider*.

Port Jackson Shark, Bullhead Shark, Oyster Crusher.

Squalus philippi, Bloch and Schneider, Syst. Ichth., 1801, p. 134.
Cestracion phillipi, Regan, Ann. Mag. Nat. Hist. (8), i., 1908, p. 495.

Specimens of this common species were preserved from the following localities:—

Between Newcastle and Port Stephens, New South Wales, 22-60 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Off the mouth of the Murray River, South Australia, 20 fathoms.

Fifty miles south of Cape Wiles, South Australia, 75 fathoms.

Spencer Gulf, South Australia, 70 fathoms.

GENUS GYROPLEURODUS, *Gill.*

GYROPLEURODUS GALEATUS, *Günther.*

Crested Port Jackson Shark.

Cestracion galeatus, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 416.

Gyropleurodus galeatus, Regan, Ann. Mag. Nat. Hist. (8), i., 1908, p. 495.

Two specimens from 43 fathoms, six miles off Port Stephens, New South Wales.

FAMILY SCYLIORHINIDÆ.

GENUS SCYLIORHINUS, *Blainville.*

SCYLIORHINUS ANALIS, *Ogilby.*

Spotted Dog-fish, Spotted Cat-shark.

Scyllium anale, Ogilby, Proc. Linn. Soc. N.S. Wales, x., 1885, p. 445.

Scyliorhinus analis, Regan, Ann. Mag. Nat. Hist. (8), i., 1908, pp. 455 and 460.

Scyllium maculatum, Ramsay, Proc. Linn. Soc. N.S. Wales, v., 1880, p. 97; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 138 (*nec. S. maculatum*, Bl. Schn.).

The collection includes two males, one from Shoalhaven Bight, New South Wales, 15-45 fathoms, and the other from off Babel Island, Bass Strait. Ogilby[1] has suggested that the specimen doubtfully recorded from Tasmania by R. M. Johnston as *Scyllium maculatum* is really this species, and this view is confirmed by the second "Endeavour" specimen.

The size of the anal fin is variable in different specimens of this species and therefore cannot be relied upon as has been done by Regan in his key to the species of *Scyliorhinus*.

1 Ogilby—Proc. Linn. Soc. N.S. Wales (2), iv., 1889, p. 180.

Scyliorhinus vincenti, *Zietz.*

(Plate ii., fig. 3, and fig. 1.)

Scyllium vincenti, Zietz, Trans. Roy. Soc. South Australia, xxxii., 1908, p. 287.

Through the kindness of Professor E. C. Stirling, Director of the South Australian Museum, I have been able to compare one of Mr. Zietz's specimens with another taken by the "Endeavour" in 20 fathoms off the mouth of the Murray River, South Australia. They differ slightly in the relative positions of the fins which, however, I find to be equally variable in allied species.

According to Zietz, the origin of the first dorsal is behind the middle of the total length. In both I have examined it is a little nearer the tip of the snout than the extremity of the tail. In the "Endeavour" specimen the base of the anal is shorter than that of the co-type and terminates below the anterior portion of the second dorsal instead of nearer the middle of that fin. The end of the bases of the ventrals is in advance of the origin of the dorsal, not below it, as described by Zietz, though in his specimen the flesh is shrunken around the base of the dorsal, making it appear farther forward than it really is. Finally, the colour in the better preserved example is a dark chocolate brown above, with numerous creamy-white spots all over the body and fins, except on the front half of the head. The dark cross-bands are ill-defined, and there appears to be a series of darker blotches on the sides. The belly is creamy-white in colour.

The following is a description of the "Endeavour" specimen:—Head to last gill-opening 5.3 in the length, its width 1.5 in its length; eye 6.5 in the head and about equal to half the length of the snout which is 3.1 in the head. The interorbital space is greater than the length of the snout. Preoral portion of the head 1.5 in the width of the mouth which is 2.4 in the head and greater than the snout.

Body elongate, slightly compressed. Head depressed, flat above; snout rounded, blunt in profile, its width before the eyes one-third greater than its length. Eyes lateral, with the inferior fold well marked. Spiracle large, oval, and placed just behind the eye. Gill-slits decreasing in size backwards, the last being about half as wide as the first and placed over the base of the pectoral. Nasal valves produced as lobes directed outwards and backwards, with emarginate posterior borders; they are separated from each other and from the mouth, the space between them being rather more than the width of one lobe. No cirrus. A well-marked labial fold extends round the angle of the mouth, its anterior limb rather shorter than its posterior which extends less than half way towards the middle of the lower jaw. Teeth similar in both jaws, arranged in several rows, tricuspid, with the median point longer than the lateral ones.

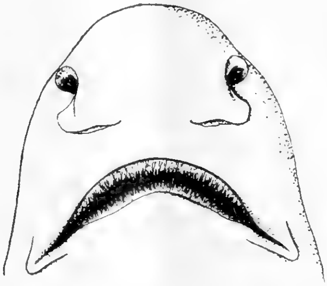

FIG. 1.

First dorsal originating a little behind the posterior base of the ventrals and slightly in advance of the middle of the total length. The length of its base is much greater than its height; its anterior margin is very oblique, and the posterior nearly vertical, and the lower angle is pointed. The second dorsal is a trifle higher than the first, and is of similar form, though the posterior angle is slightly produced; its origin is over the posterior portion of the anal, and the hinder angle is midway between the posterior insertion of the first dorsal and the tip of the caudal. The anal is considerably larger than either of the dorsals, and its base is longer than its distance from the caudal; the posterior angle acute. Greatest breadth of the caudal a little less than one-third of its length. Posterior angles of the ventrals acute and the margins united in the male.

Scales quadrilateral and keeled on the head, becoming triangular and acutely pointed dorsally and tricuspid on the sides.

Colour.—Chocolate brown above, with ill-defined darker cross-bars. There are indications of some dark blotches on the sides, and the hinder half of the head, body, tail and fins bear many creamy-white spots which tend to form rings.

Total length of adult male 414 mm.

The following key will serve to distinguish the four species of *Scyliorhinus* hitherto recorded from Australia:—

a. Nasal valves separated from each other and from the mouth.

b. Labial fold extending along the lower jaw half or less than half the distance to the symphysis.

c. Body lighter with brown spots and sometimes cross-bands. Ventral fins of males not directly in contact behind the claspers but with an intermediate integument:— *analis*.

cc. Body darker, with white spots and obscure cross-bands. Ventral fins of males in contact behind the claspers:— *vincenti*.

bb. Labial fold extending along the lower jaw nearly to the symphysis.

d. Body with scattered darker spots:— *maculatum*.

aa. Nasal valves overlapping the edge of the upper lip.

e. Body with darker spots, sometimes confluent into cross bands or ocelli:— *marmoratus*.

Genus Cephaloscyllium, *Gill*.

Cephaloscyllium isabella, *Bonnaterre*.

Swell Shark, Carpet Shark.

L'Isabelle, Broussonet, Mem. Acad. Sci. Paris, 1780, p. 648 (non binomial).

Squalus isabella, Bonnaterre, Encycl. Meth., Ichth., 1788, p. 6.

Squalus (i)sabella, Gmelin, Linn. Syst. Nat., 1789, p. 1489,

Scyllium laticeps, Dumeril, Rev. et Mag. Zool., 1853, p. 84, pl. iii., fig. 2.

Cephaloscyllium laticeps, Waite, Rec. Cantb. Mus., i., No. 2, 1909, p. 6., pl. xiv., fig. 1, and pl. xxi., fig. 1.

Cephaloscyllium sabella, Waite, Trans. N. Zeal. Inst., xlii., 1910, p. 384.

A small example is in the collection which was trawled off the east coast of Flinders Island, Bass Strait.

FAMILY ORECTOLOBIDÆ.

GENUS PARASCYLLIUM, *Gill.*

PARASCYLLIUM VARIOLATUM, *Dumeril.*

(Plate ii., fig. 1.)

Hemiscyllium variolatum, Dumeril, Rev. et. Mag. Zool., 1853, p. 121, pl. iii., fig. 1.

Parascyllium variolatum, Ogilby and McCulloch, Proc. Roy. Soc. N.S.Wales, xlii., 1908, p. 269.

Two fine female examples were taken off Port Phillip Heads in November, 1909.

PARASCYLLIUM COLLARE, *Ramsay and Ogilby.*

Collared Cat Shark.

Parascyllium collare, Ramsay and Ogilby, Proc. Linn. Soc. N.S. Wales (2), iii., 1889, p. 1310; *id.*, Ogilby and McCulloch, Proc. Roy. Soc. N.S. Wales, xlii., 1908, p. 267.

Three males from Shoalhaven Bight, New South Wales, 15-45 fathoms.

PARASCYLLIUM FERRUGINEUM, *sp. nov.*

(Plate ii., fig. 2, and fig. 2.)

Head to last gill-opening, 5.8 in the length, its width $1\frac{5}{8}$ in its length. Eye 9 in the head, 2.8 in the snout which is 3.2 in the head. Interorbital space almost equal to the snout. Preoral portion of head equal to half the width of the mouth which is 1.3 in the snout.

Body elongate, somewhat depressed anteriorly, cylindrical posteriorly. Head much depressed with its upper surface flat; snout broadly rounded, obtusely conical in profile and increasing in width backwards. Eyes lateral with a prominent fold below. Spiracle minute and situated half an eye-diameter from the infero-posterior angle of the eye. Gill-openings increasing regularly in size from the first to the fourth, the last very large, $3\frac{2}{3}$ the width of the first and more than half as long as the snout; the last two are placed over the base of the pectoral. Nasal cirrus short and thick, just reaching to the lips; exterior nasal fold with two or three small lobes posteriorly, the outer the longest and pointed. Lower labial fold extending about half way towards the middle of the jaw and continued round the angle of the mouth. Teeth similar in both jaws, small, flattened, triangular and acute, with rounded projections on each side basally but not tricuspid.

First dorsal fin originating well behind the ventrals, but a little nearer the tip of the snout than the end of the tail; its posterior margin nearly vertical and forming a right angle

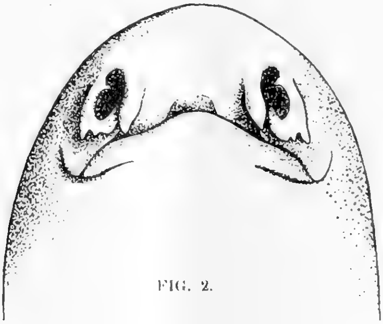

FIG. 2.

with the lower margin. Second dorsal subequal to the first and of similar form, its hinder angle about midway between the posterior insertion of the first and the tip of the caudal. Anal fin low with its outer border oblique and terminating below the anterior part of the second dorsal; the length of its base about $1\frac{1}{3}$ in its distance from the caudal. Greatest breadth of the caudal a little less than one-fourth its length. Pectorals longer than broad, with the angles rounded. Ventrals quadrilateral, $1\frac{2}{3}$ as long as broad.

Colour.—Greyish brown above with indistinct darker cross-bands; the first narrow and extending between the eyes, the next broader and covering the space between the gill-openings. There are two more before the first dorsal and one in front of the second dorsal. Entire body with evenly spaced large brown spots which are darkest on the cross-bars and become elongate on the caudal. Three similar spots on each side of the nuchal band. Fins also with spots which are most numerous on the dorsal.

Type.—A female, 730 mm. long, taken outside Port Phillip Heads, Victoria, in November, 1909.

Of the two described species of *Parascyllium* this is nearest allied to *P. collare*, Rams. and Ogil., but it may be at once distinguished by its much broader head, more rounded snout, larger fins and different colouration.

Family CARCHARIIDÆ.

Genus Galeus, *Rafinesque.*

Galeus australis, *Macleay.*

School Shark.

Galeus australis, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 354.

Six small examples, each about 110 mm. long, were obtained in Oyster Bay, Tasmania.

Genus Prionace, *Cantor.*

Prionace glauca, *Linnæus.*

Blue Shark.

Squalus glaucus, Linnæus, Syst. Nat., 10th ed., 1758, p. 235.

A number of specimens of this widely distributed species were caught with hand-lines off the South Australian coast.

Family SPHYRNIDÆ.

Genus Sphyrna, *Rafinesque.*

Sphyrna lewini, *Lord.*

Hammer-headed Shark.

Zygæna lewini, Lord in Griffith, Anim. Kingd., x., 1834, p. 640.

One small male from the east coast of Flinders Island, Bass Strait.

Family SQUALIDÆ.

Genus Squalus, *Linnæus.*

Squalus megalops, *Macleay.*

Dog-fish.

Acanthias megalops, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 367.

Numerous examples of this species were preserved from off Babel and Flinders Islands, Bass Strait.

Family PRISTIOPHORIDÆ.

Genus Pristiophorus, *Müller and Henle.*

Pristiophorus cirratus, *Latham.*

Saw Shark.

Pristis cirratus, Latham, Trans. Linn. Soc., ii., 1794, p. 281, pl. xxvi., fig. 5, and pl. xxvii.

Numerous fœtal specimens and several young of this species are in the collection from Shoalhaven Bight, New South Wales, 15-45 fathoms, and north of Goose Island, Bass Strait.

PRISTIOPHORUS NUDIPINNIS, *Günther.*

Saw Shark.

(Plate i., fig. 2.)

Pristiophorus nudipinnis, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 432; *id.*, McCoy, Prodr. Zool. Vict., 1881, pl. lvi., fig. 2; *id.*, Regan, Ann. Mag. Nat. Hist. (8), ii., 1908, p. 57.

The collection includes several fœtal and young specimens from off the mouth of the Murray River, South Australia, 20 fathoms, and from Flinders Island, Investigator Group, South Australia, 37 fathoms.

Plate i., fig. 2, represents a young example, 445 mm. long, from the latter locality.

FAMILY SQUATINIDÆ.

GENUS SQUATINA, *Dumeril.*

SQUATINA SQUATINA, *Linnæus.*

Angel Shark.

Squalus squatina, Linnæus, Syst. Nat., 10 ed., 1758, p. 233.

Rhina squatina, McCoy, Prodr. Zool. Vict., Dec. iv., 1879, pl. xxxiv.

Young and fœtal examples were preserved from the following localities:—

Shoalhaven Bight, New South Wales, 15-45 fathoms.

North-west of Greenly Island, South Australia, 44 fathoms.

Forty-two miles south of St. Francis Island, South Australia, 35 fathoms.

FAMILY RAJIDÆ.

GENUS RAJA, *Linnæus.*

RAJA AUSTRALIS, *Macleay.*

Skate.

Raia australis, Macleay, Proc. Linn. Soc. N.S. Wales, viii., 1884, p. 461.

Raja australis, Waite, Mem. Austr. Mus., iv., 1899, p. 40, pl. iv.

Two large males were preserved from the Shoalhaven Bight, N.S. Wales, 15-45 fathoms.

RAJA NITIDA, *Günther.*

(Fig. 3.)

Raja nitida, Günther, "Challenger" Rept., Zool. i., 1880, p. 27, pl. xiv., fig. a.

This species has hitherto been known only from a small male, five inches wide, from off Twofold Bay, New South Wales, 120 fathoms. The "Endeavour" collection includes three females and one male from seven and a half to eight inches wide, which present considerable differences from Günther's figure, but, in view of their larger size and the fact that they come from deep water, 90 fathoms, only one to two hundred miles from Twofold Bay, I have no hesitation in identifying them with this species.

The most striking difference lies in the teeth which are described as "with very small points, almost obtuse." This description fits those of my female specimens which are almost pavement-like with blunt points, but in the male they are long and acute. The development of spines on the head and body, pectorals and tail, is much greater in the larger specimens, though less in the female than the male. None of my specimens have quite the same outward form as the young one figured, but this is variable in the different specimens and does not afford a specific character. Finally, the dark blotches shown in the figure are wanting in my four, though the clusters of white spots are similarly distributed.

The following description is drawn up from the four "Endeavour" specimens:—

Snout to anterior nostrils 3.3 in the head to the last gill-slit. Interorbital space less than two-thirds of the eye, which is 4.7 in the head. Width of the mouth about 3.5 in the head.

Disk very broad, its width greater than the length from the tip of the snout to its hinder margin; its anterior margin more or less undulated, the border of the pectoral either forming an unbroken line or distinct angle with the sides of the head; hinder margin rounded and somewhat angular posteriorly. Snout with a small median papilla. The distance between the outer borders of the eyes is greater than that between the latter and the edge of the disk. Preoral length of the head equal to the width between the outer edges of the spiracles. Nasal lobes produced backwards and outwards, the space between them less than half the preoral length. Inner margin of the nostrils with two interior and one exterior lobe when folded, all of which form a broad-mouthed tube when expanded. Gill-slits decreasing in size backwards, much smaller than the spiracle which is about half the length of the eye. Teeth small, with expanded though not confluent bases in the male, and long median points directed backwards. In the female they are rounded, flattened and juxtaposed, the median point being reduced to a small prominence only.

Entire upper surface covered with minute prickles directed backwards. There are two large curved spines before each eye and three or four behind them. One to three are present on the mid-line behind the head, which may be surrounded by several smaller ones also. Behind these are several irregular rows of thorns which range themselves in one median row and two lateral ones on the tail and extend to the first dorsal fin.

FIG. 3.

Sides of the pectoral without larger thorns in the female, but these are well developed in the male, the innermost ones being the largest. Entire lower surface perfectly smooth.

Dorsal fins subequal, the space between them half or less than half the length of their bases. In some the interval between the second dorsal and the caudal is equal to that between the two dorsals, in others the two fins are almost united. A skinny flap, which is widest posteriorly, extends varying distances along the sides of the tail, sometimes reaching as far as the ventrals.

Colour.—Light brown above with very indistinct darker marblings. Clusters of white spots are scattered over the body, the most prominent of which is on the mid-line behind the head, two pairs on each side of it, and one near the middle of each pectoral fin.

Total length 350 mm.

Trawled in 90 fathoms, east of East Sister Island, Bass Strait, and elsewhere off the Victorian Coast.

RAJA WAITII, *sp. nov.*
(Plate iii., and fig. 4.)

Space between the nostrils equal to their distance from the tip of the snout. Greatest width of the mouth 2.5 in the head to the last gill-slit. Interorbital width 5 in the same, and a little greater than the length of the eye.

Disk broad and rounded, its length 1.1 in its breadth. Snout broadly rounded, with a median rounded papilla, and confluent with the anterior margins of the pectorals which are almost straight. The lateral margins of the pectorals are rounded, as is the angle between them and the posterior border. The distance between the outer margins of the eyes is greater than that of the latter from the edge of the disk. Preoral length much less than the distance between the outer margins of the spiracles and 2.7 in the head to the last gill-opening. Width of the spiracles one-third the preoral length.

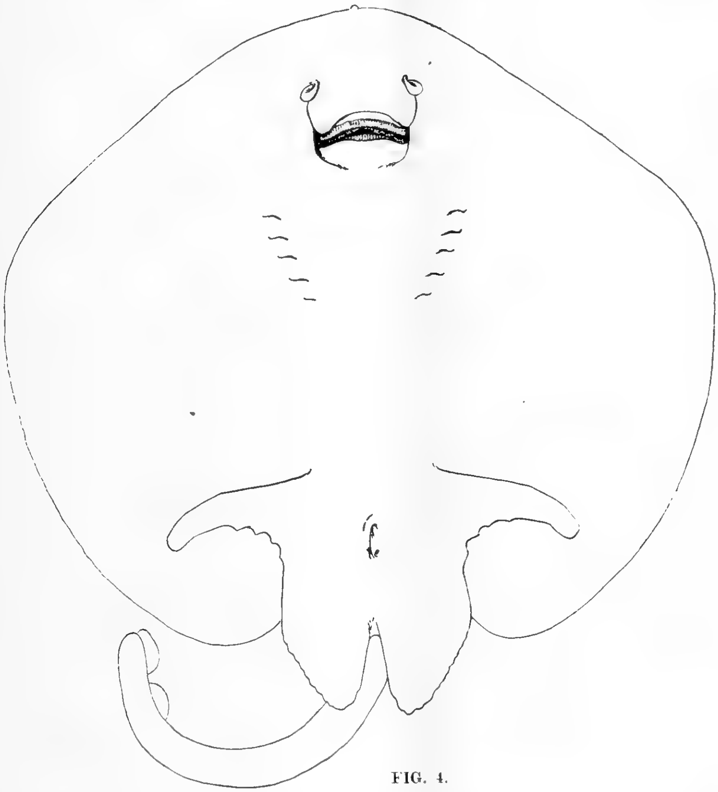

FIG. 4.

Nasal lobes produced backwards and outwards, the exterior margins truncate, the posterior sinuate; the distance between them near the mouth about two-thirds of that between the nostrils. Nostrils with a raised tubular margin which forms a lobe posteriorly. Gill-slits decreasing in size backwards, the first rather more than half the width of the spiracle. Teeth small and rounded, scarcely juxtaposed, each with a small median point.

Upper surface of disk quite smooth except for two pairs of spines above the anterior part of the eyes and four over the posterior portions. Several minute spines are also present on the upper eye-lid. Tail with several rows of spines which are largest anteriorly but most numerous posteriorly. Both dorsal fins are also covered with minute spines.

Dorsal fins subequal, the space between them equal to half the length of their bases. Caudal absent. A broad skinny flap extends along each side of the tail as far as the end of the ventrals. Anterior lobes of the ventrals greatly produced, the gaps between them and the posterior lobes each with four small triangular lobes. On the upper surface, where the fins are covered by the disk, there is a pair of large fatty glands.

Colour.—Pale brown above with lighter patches which are covered with small brown dots. Body, fins and tail with numerous small bluish spots which are absent only on the lighter patches on the disk; in places they are confluent and form reticulate patterns. Lower surfaces slate-coloured.

Length of specimen 454 mm.

A single female specimen was trawled in 44 fathoms, north-west of Greenly Island, South Australia.

This species is at once distinguished from all other Australian species of *Raja* by its rounded and perfectly smooth body.

Family NARCOBATIDÆ.

Genus Narcine, *Henle.*

Narcine tasmaniensis, *Richardson.*

Tasmanian Numb-fish.

Narcine tasmaniensis, Richardson, Proc. Zool. Soc., 1841, p. 22, and Trans. Zool. Soc., iii., 1849, p. 178, pl. xi., fig. 2.

Specimens were preserved from the east coast of Flinders Island, Bass Strait.

Family DASYBATIDÆ.

Genus Urolophus, *Müller and Henle.*

Urolophus cruciatus, *Lacépède.*

Banded Stingaree.

Raja cruciatus, Lacépède, Ann. Mus., iv., 1804, pp. 201 and 210, pl. lv., fig. 2.

Urolophus cruciatus, Richardson, Zool. Erebus and Terror, Fishes, 1844, p. 35, pl. xxiv.

Two specimens from 40 fathoms off the east coast of Flinders Island, Bass Strait.

Family AETOBATIDÆ.

Genus Aetobatus, *Blainville.*

Aetobatus australis, *Macleay.*

Eagle Ray.

Myliobatis aquila, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 489; *id.*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 225 (*nec Raja aquila*, Linn.).

Myliobatis nieuhofii, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 226, and ii., 1873, p. 58 (*nec Raja nieuhofi*, Bl. Schn.).

Myliobatis australis, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 380; *id.*, McCoy, Prodr. Zool. Vict., pl. lxiii., 1882.

A young specimen is preserved from the Shoalhaven Bight, New South Wales, 15-45 fathoms.

Günther identified some very young *Myliobatis* from Sydney with *M. aquila*, Linnæus, though he noted certain characters in their teeth which did not agree with those of that species. Castelnau (1873) suggested that this identification was incorrect and considered that they were probably the young of *M. nieuhofi*, Bl. Schn. Waite regarded them as *M. australis*, Macleay, as is evident from the fact that he omitted *aquila* from his list of the fishes of New South Wales.[1] In another paper[2] he expressed the opinion that *M. nieuhofi* and *M. australis* were identical, but it would seem that they differ in the forms of their snouts, it being somewhat produced in the former, and blunt and short in the latter.

McCoy showed that *M. australis* occurred in Port Phillip, and under the circumstances I have little doubt that Castelnau's specimens were really that species and not *M. nieuhofi*. I therefore arrange the synonymy as above.

Family CHIMÆRIDÆ.

Genus Chimæra, *Linnæus.*

Chimæra ogilbyi, *Waite.*

Ghost Shark.

Chimæra ogilbyi, Waite, Mem. Austr. Mus., iv., pt. i., 1899, p. 48, pl. vi.; *id.*, Shigeho Tanaka, Journ. Coll. Sci. Imp. Univ. Tokio, xxiii., Art. 7, p. 10.

1 Waite—Mem. N.S. Wales Nat. Club., ii., 1904.

2 Waite—Mem. Austr. Mus., iv., 1899, p. 47.

Two males are in the collection which were trawled in 40 fathoms off the East Coast of Flinders Island, Bass Strait. Waite's specimens were all females, but the males have been well described by Shigeho Tanaka from Japan.

Family CALLORHYNCHIDÆ.

Genus Callorhynchus, *Cuvier*.

Callorhynchus callorynchus, *Linnæus*.

Elephant-fish.

Callorhynchus callorynchus, Waite, Rec. Cantb. Mus., i., No. 2, 1909, p. 23, pl. xvi., fig. 2.

A small specimen is preserved taken off the east coast of Flinders Island, Bass Strait, and six others from the Victorian coast.

Family CLUPEIDÆ.

Genus Clupea, *Linnæus*.

Clupea (Pomolobus) bassensis, *sp. nov.*

Australian Sprat.

(Plate iv., fig. 2.)

Clupea sprattus, Günther, Proc. Zool. Soc., 1871, p. 672 (*nec C. sprattus*, Linnæus).

D. 18; A. 18-20; P. 17; V. 8; C. 19; Scales 44, 12.

Body elongate, its greatest breadth less than half its height, which is 4.4 to 4.8 in the length from the snout to the hypural. Belly somewhat rounded, the scutes small, twenty-one between the head and the ventrals, and eleven more to the vent. Scales large, cycloid, commencing above the preopercle and extending onto the base of the tail.

Head 3.5 to 4 in the length, and either very little or considerably longer than the body is deep. Eye 3.1 to 3.6 in the head, with a narrow adipose lid before and behind. Interorbital space flat, equal to about two-thirds of the eye. Maxillary very large, its greatest width one-third its length, reaching to below the anterior third or almost to the middle of the eye; supplemental bone very large. Upper posterior border of the operculum emarginate; hindermost portion formed of a skinny flap. Cheeks and upper portion of operculum covered with translucent flesh, the rest of the head naked. Lower margin of the maxillary microscopically denticulate. A few microscopic teeth are placed at widely-spaced intervals on the anterior part of the jaws.[1]

Origin of the dorsal well in advance of the middle of the total length and just behind the vertical of the ventral fins;

---

1 Günther stated that he found palatine teeth in his specimens "as well developed as in *Cl. sprattus*." I have failed to find any in either species, but this character is generally admitted to be inconstant.

the length of its base is just about equal to the distance from the tip of the snout to the hinder margin of the eye and longer than the anterior rays. Anal low, its length much greater than that of the dorsal. Ventrals as long as half their distance from the vent.

Colour.—Silvery, the upper third of the body dark blue. Scattered darker specks are found on the jaws and preorbitals and on the caudal peduncle. Rays of the dorsal, caudal and pectoral fins also dark spotted.

Length of largest specimen 117 mm. Described from two specimens from off the east coast of Flinders Island, Bass Strait. Others are from the entrance to Storm Bay, Tasmania.

It is only after a detailed comparison of these specimens with many others of *C. sprattus* from the London markets that I venture to regard them as distinct. They appear to differ by their more elongate form, my deepest specimen, the one figured, having the depth of the body less than the length of the head, whereas in *C. sprattus* it is considerably deeper. That species further seems invariably to have but seven rays in the ventral fin without counting the imperfect short one in front. All of *C. bassensis* have eight. *C. antipodum*, Hector, is a very distinct species with a much shorter body, well developed abdominal scutes, and with the ventral placed below instead of just in advance of the anterior portion of the dorsal. From *C. sajax*, Jenyns, the new species is at once distinguished by the position of its ventral fin.

In 1867 a note from Mr. J. E. Calder was published[1] in which he recorded an immense shoal of these Herrings being driven ashore in Simmons' Cove, Bruni Island, Tasmania, by Barracouta, Kingfish and others. He considered there were about one hundred tons of them on the shore and fully two hundred more at the bottom of the water, all dead. Carts and boats were used to take them away for manure, yet they were scarcely lessened in quantity. Mr. Allport also noted that a similar shoal had been observed in 1844, and numbers of the fish had passed far up into the Derwent River.

CLUPEA (CLUPANODON) NEOPILCHARDUS, *Steindachner.*
Pilchard.

Clupanodon neopilchardus, Steindachner, Denk. K. Akad. Wiss. Wien., xli., 1879, p. 12.

Three specimens from 26-30 fathoms, eight miles off Wooded Bluff, Clarence River, New South Wales, are of

1 Calder—Proc. Roy. Soc. Tasm., 1867, p. 5.

interest as showing how far north this species extends on our coast. It extends around southern Australia and up to Houtman's Abrolhos on the west coast, and is also known from Tasmania and New Zealand.

Family ARGENTINIDÆ.

Genus Argentina, *Linnæus.*

Argentina elongata, *Hutton.*

Argentina elongata, Hutton, Ann. Mag. Nat. Hist. (5), iii., 1879, p. 53; *id.*, Waite, Rec. Cantb. Mus., i., 1911, p. 161, pl. xxiv.

Thirteen examples of this species, 65-125 mm. long, differ from a larger one from New Zealand only in the colour-markings. All have a dark band above the silvery lateral line on which are arranged six to nine blackish spots. Near the tail there is a second series on the lateral line and more or less alternate to those above them. There is also a dark mark on the side of the snout. Though they can be traced, these markings are very indistinct in the larger specimen.

They were taken at the following localities:—

Entrance to Oyster Bay, Tasmania.

Off the east coast of Flinders Island, Bass Strait, 30 fathoms.

Fifteen miles off Norah Head, New South Wales, 45-58 fathoms.

No species of this genus has been previously recorded from Australian waters.

Family SYMBRANCHIDÆ.

Genus Cheilobranchus, *Richardson.*

Cheilobranchus rufus, *Macleay.*

Red-banded Shore Eel.

Chilobranchus rufus, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 266.

Cheilobranchus rufus, Waite, Rec. Austr. Mus., vi., 1906, p. 195, pl. xxxvi., fig. 1.

Numerous specimens were obtained in Oyster Bay, Tasmania.

Family LEPTOCEPHALIDÆ.

Genus Congermuræna, *Kaup.*

Congermuræna habenata, *Richardson.*

Little Conger Eel.

Congrus habenatus, Richardson, Zool. Ereb. & Terr., Fishes, 1848, p. 109, pl. l., fig. 1-5.

Congromurœna longicauda, Ramsay & Ogilby, Proc. Linn. Soc. N.S. Wales (2), ii., 1888, p. 1022.

A single specimen from Port Arthur, Tasmania, belongs to the long-tailed form of this species. Comparison with five other Australian specimens and one from New Zealand shows that the lengths of the body and tail are variable and have no specific value. As this is the only character which can be relied upon to distinguish *C. longicauda* from *C. habenata*, the former name can no longer stand.

Family MYRIDÆ.

Genus Muræxichthys, *Bleeker*.

Muræxichthys tasmaniensis, *sp. nov.*

(Fig. 5.)

Body worm-like, the depth 3.3 in the head. Head 12.8 in the total length, and 4.3 in the space between the gill opening and the vent. Eye 3.2 in the snout, which is long and obtusely pointed, and 4.8 in the head. Cleft of mouth extending far behind the eye, and 2.7 in the head; a longitudinal fold below the end of the mouth. Tube of anterior nostril with a minute exterior lobe; flap covering the posterior nostril overhanging the lip and placed below the anterior portion of the eye. Teeth in single rows on the jaws and palate; three or four larger ones on either side of the vomer. Rows of widely-spaced pores extend along each jaw, on the upper surface of the snout and behind the eyes. Gill-opening narrow, about as wide as the eye. The lateral line appears to be almost straight anteriorly, but the sides of the head between the gill-opening and the preoperculum are considerably damaged and render this character uncertain. Vent well in advance of the middle of the length, its distance from the tip of the snout 1.4 in the tail. Dorsal and anal fins very low, almost rudimentary. Origin of the dorsal a trifle nearer the tip of the snout than the tail, its distance from the vent equal to the length of the head.

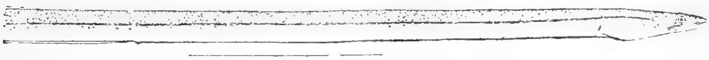

FIG. 5.

Colour.—Pale green in formalin, the upper portion speckled with minute brown dots which are of uniform size. Anteriorly they are confined to the upper half of the body, but posteriorly they approach the lower surface. On the head they extend onto the sides and the lower jaw.

Length 170 mm. One specimen from the entrance to Oyster Bay, Tasmania.

This species differs from the specimen I have identified as *M. breviceps*, Günther, in the position of the origin of the dorsal which is behind instead of far in advance of the vent. It has also a much longer and sharper snout, smaller eye, and more rudimentary fins; the colour-marking is different, the spots on the back being similar to those on the sides, and they extend onto the sides of the head and the lower jaw.

It is very closely allied to, and possibly identical with *M. australis*, Macleay, but differs from the five specimens I have examined of that species in having the origin of the dorsal far instead of only slightly behind that of the anal. The snout is also somewhat longer, being 4.8 in the head instead of 5.3.

MURÆNICHTHYS AUSTRALIS, *Macleay*.

(Fig. 6.)

?*Murænichthys gymnotus*?, Günther, Chall. Rept., Zool., i., 1880, p. 30 (*nec* Bleeker).

Murænichthys australis, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 272.

Body terete and vermiform, its depth behind the gill opening 3.3, behind the vent 3.9 in the head. Head 13 in the total length, and 4.5 in the trunk. Eye very small, nearly 3 in the snout, which is obtusely pointed and 5.3 in the head. Cleft of mouth extending far behind the eye, its length from the tip of the snout 2.7 in the head; a longitudinal fold below the end of the mouth. Tube of anterior nostril with a minute exterior lobe; flap covering the posterior nostril overhanging the lip and placed below the anterior margin of the eye. Teeth in single rows on the jaws and palate; three or four larger ones on either side of the vomer. Rows of widely-spaced pores extend along each jaw, on the upper surface of the snout, behind the eye and up towards the origin of the lateral line. Gill opening as wide as the eye. Lateral line a little arched over the branchial sac. Vent well in advance of the middle of the length, its distance from the end of the snout 1.35 in the tail. Dorsal and anal fins very low except near the end of the tail where they are a little broadened out and extend around the point. The origin of the dorsal is a little behind that of the anal, not over the vent as stated by Macleay.

FIG. 6.

Colour.—After long preservation, uniform brown, with minute darker specks above the lateral line and on the head, where they extend onto the sides and lower jaw.

Described from the type, 248 mm. long, from Lane Cove, Port Jackson. Two other specimens are in the Macleay Museum without data, and two in the Australian Museum from Port Jackson.

I am indebted to Professors W. A. Haswell and T. W. E. David for the opportunity of redescribing and figuring Macleay's original specimen.

It is very probable that the specimen from Port Jackson which Günther doubtfully identified as *M. gymnotus*, Bleeker, is not that species but is *M. australis*. The two may be easily distinguished, the latter having but a single row of maxillary teeth instead of several, and its mouth extending not slightly but far behind the eye.

Ogilby has proposed the genus *Scolecenchelys*[1] for this species, and in a letter he informs me that it "differs from *Murænichthys* in the much more slender and elongate body and the origin and development of the dorsal fin (as comparing *australis* with *breviceps*)." I regard these as specific rather than generic characters.

MURÆNICHTHYS BREVICEPS, *Günther*.

(Fig. 7.)

?*Murænichthys macropterus*, Klunzinger, Arch. Nat., xxxviii., i., 1872, p. 43 (*nec* Bleeker).

Murænichthys breviceps, Günther, Ann. Mag. Nat. Hist. (4), xvii., 1876, p. 401.

A small specimen, 195 mm. long, from South Australia, is possibly the young of this species. As will be seen by the figure, its proportions do not quite agree with those of the type, which is twenty inches long, but the differences may perhaps be accounted for by its small size. The following is a description of the "Endeavour" specimen:—

Body worm-like, the depth 4 in the head. Head 10.8 in the total length and 2.7 in the trunk. Eye 2.6 in the snout, which is $4\frac{1}{2}$ in the head. Cleft of the mouth extending far behind the eye and 2.7 in the head; a longitudinal fold below the end of the mouth. Tube of the anterior nostril very large, with a minute external lobe; flap covering the posterior nostril overhanging the lip and placed just before the eye. Rows of large widely-spaced pores extend along each jaw, on the upper surface of the head and behind the eye. Lateral line arched above the branchial sac. Dorsal and anal fins very low, extending

1 Ogilby—Proc. Linn. Soc. N.S. Wales, xxii., 1897, p. 246.

around the end of the tail. Origin of the dorsal a trifle nearer the tip of the snout than the vent, its distance from the gill opening 2.3 in that from the vent.

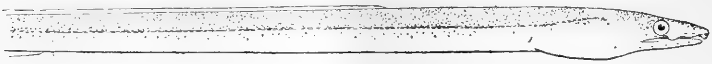

FIG. 7.

Colour.—Pale green in formalin, speckled with minute brown dots which are very small and crowded on the upper surface, and larger near the lateral line; anteriorly they scarcely extend below the middle of the body, but posteriorly they approach the ventral surface. Extreme end of the dorsal and caudal darker, the fins otherwise colourless.

Trawled in 35 fathoms, south of St. Francis Island, South Australia.

The specimens identified as *Murænichthys macropterus*, Bleeker, from Port Phillip and the Murray River, are probably not that species, but are *M. breviceps*, which is said by its author to differ from the former by its comparatively shorter head and longer snout.

Family AULOPIDÆ.

Genus Aulopus, *Cuvier.*

Aulopus purpurissatus, *Richardson.*

Sergeant Baker.

Aulopus purpurissatus, Richardson, Icones Piscium, 1843, p. vi., pl. ii., fig. 3.

Already known from western and eastern Australia, this species is now recorded from South Australia, a specimen having been trawled in 75 fathoms, fifty miles south of Cape Wiles.

Family SUDIDÆ.

Genus Chlorophthalmus, *Bonaparte.*

Chlorophthalmus nigripinnis, *Günther.*

Cucumber Fish.

Chlorophthalmus nigripinnis, Günther, Ann. Mag. Nat. Hist. (5), ii., 1878, p. 182, and Chall. Rept., Zool., xxii., p. 193, pl. li., fig. a; *id.*, Waite, Proc. N.Z. Inst., 1910, p. 25, and Rec. Cantb. Mus., i., 1911, p. 164, pl. xxv.

This species exhibits considerable variation in its markings according to age, young specimens of about five inches long having the sides blotched and spotted with bluish-grey, whereas others of eleven inches are immaculate. The markings on the fins also differ in intensity in a large series of specimens.

C. nigripinnis was, until recently, known only from the deeper waters of New South Wales. Waite has recorded it from New Zealand, however, and it must now be added to the Victorian and Tasmanian lists, about one hundred and fifty specimens having been preserved from the following localities:—

Oyster Bay, Tasmania, 40-60 fathoms.

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Family MACRORHAMPHOSIDÆ.

Genus Macrorhamphosus, *Lacépède.*

Macrorhamphosus elevatus, *Waite.*

Bellows Fish.

(Fig. 8.)

Macrorhamphosus scolopax, var. *elevatus*, Waite, Mem. Austr. Mus., iv., 1899, p. 59, pl. vii., fig. 1.

Macrorhamphosus gallinago, Ogilby, Proc. Roy. Soc. Qld., xxi., 1908, p. 6.

In the Report of the "Thetis" Expedition, Waite noted certain characters in which his specimens differed from the published descriptions of *M. scolopax*, but in consideration of the variations to which members of this genus are subject, he regarded the Australian representative as but a variety of that species. Having compared specimens of each, I am able to point out that there are well marked specific differences between them. Examples of *M. elevatus* of the same size as others of *M. scolopax* are much deeper and have shorter and thicker snouts. The variations in the lengths of the spines in different specimens of *M. scolopax* have been tabulated by Günther,[1] and I find similar though less striking variations in the Australian species, but it is always longer and usually much longer than the snout in *M. elevatus*, whereas it appears to be usually if not always shorter in *M. scolopax*.

The large series of specimens available to me shows that the relative depth of the body increases considerably with age, but it is also clear that the exact form of the body differs even in specimens of the same length. Under these circumstances I have no hesitation in regarding *M. gallinago*, Ogilby, as identical with *M. elevatus*, especially as there are "Thetis" specimens which only differ from Ogilby's descrip-

1 Günther—Brit. Mus. Cat. Fish., iii., 1861, p. 519.

tion in having eighteen instead of sixteen anal rays.[1] The last dorsal spine is minute and often rudimentary, while the position of the base of the second spine is altered by the development or otherwise of the hump on the back.

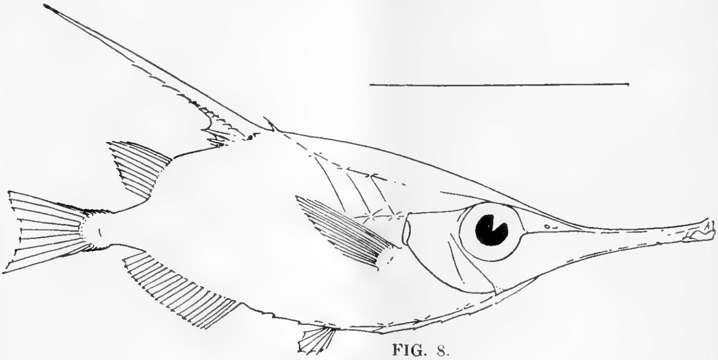

FIG. 8.

In order to show the change with growth more clearly I give a figure of the smallest specimen of the series for comparison with Waite's figure of the adult. It is 66 mm. long and was trawled off Cape Three Points, New South Wales, in 32-40 fathoms.

As *Centriscus scolopax*, this species has been recorded from Tasmania by Johnston,[2] and there is a specimen in the Australian Museum collection from Ulverstone. The "Endeavour" trawled it at the following stations:—

Twenty miles off Babel Island, Bass Strait, 68 fathoms.

Off the east coast of Flinders Island, Bass Strait, 60 fathoms.

Disaster Bay, New South Wales, 45 fathoms.

Between Port Stephens and Sydney, New South Wales, 22-65 fathoms.

Ogilby's specimen of *M. gallinago* came from the Tweed River Heads at the northern boundary of New South Wales.

GENUS CENTRISCOPS, *Gill.*

CENTRISCOPS HUMEROSUS, *Richardson.*

(Plate v., and fig. 9.)

Centriscus humerosus, Richardson, Voy. "Erebus" and "Terror," Fishes, 1846, p. 56, pl. xxxiv., figs. 5-6; *id.*, Günther, Brit. Mus. Cat. Fish., iii., 1861, p. 522.

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1 Mr. J. D. Ogilby has very kindly compared "Thetis" specimens with his type and he informs me that he considers them to be identical. He further notes that the latter has eighteen and not sixteen anal rays as described, a mistake due to a printer's error.

2 Johnston—Proc. Roy. Soc. Tasm., 1882 (1883), p. 123.

As Richardson's description and figure of this species were prepared from a dried specimen which had apparently shrunk considerably, they are very inaccurate. Certain errors were corrected by Günther in his later description of the same specimen, so that it only remains to give reliable figures to place the species on a sound basis.

My specimens differ from the original description in the following details. None show the mesial row of small scutes before the dorsal spine, while those on the sides and around the vent are so differently arranged that they must have been considerably distorted in the type. The "acute curved teeth at the base in front" of the dorsal spine really represent a small detached spine anteriorly, and a pair of lateral ones, the latter being only occasionally developed. Finally, the skin is not nearly so rough as figured, but is covered with closely-set microscopic spines which give a velvety feel to the touch.

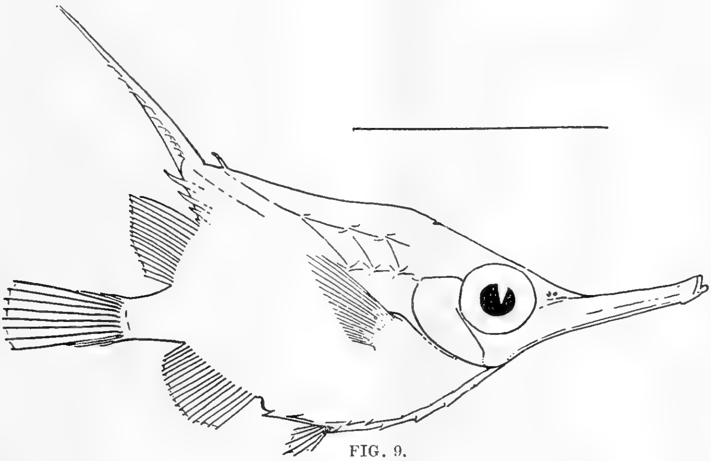

FIG. 9.

The form of the body changes greatly with growth, the body becoming much deeper and the snout longer, while the dorsal spines are greatly reduced. The eye is comparatively larger in young specimens. Full grown specimens develop a peculiar patch of bristles on the dorsal line just before the hump of the back. They are also very beautifully coloured in life, though the only tints remaining in my specimens are delicate rose-pink areas on the breast and upper portion of the sides which bear numerous large silvery spots and bars. A silvery pink bar is present on the snout below and before the eye. A broad oblique dark bar extends from behind the pectorals to the origin of the anal, behind which is a similar lighter band, and both are bordered with silvery streaks.

The smallest and largest specimens in the collection are the two selected for illustration, and measure 70 mm. and 265 mm. respectively. Mr. Dannevig says this species is exceedingly abundant in the deeper waters of southern Australia, and one hundred and seventy-eight specimens were preserved from the following localities:—

Oyster Bay, Tasmania, 40-60 fathoms.

Off Storm Bay, Tasmania.

Babel Island, near Flinders Island, Bass Strait, 68 fathoms.

East from E. Sister Island, Bass Strait, 90 fathoms.

Sixty miles south of Cape Everard, Victoria, 60-70 fathoms.

Family SYNGNATHIDÆ.

Genus Corythroichthys, *Kaup*.

Corythroichthys phillipi, *Lucas*.

(Fig. 10.)

Syngnathus phillipi, Lucas, Proc. Roy. Soc. Vict. (n. ser.), iii., 1891, p. 12.

Four specimens of this species were obtained in Oyster Bay, Tasmania. They differ from Lucas' excellent description only in having the osseus rings and fin rays rather more numerous which brings the formula up to the following:— D. 25-28, osseus rings 18-19 + 44-48.

This species is very closely allied to the more northern *C. margaritifer*, Peters, but is distinguished by having a larger number of tail rings, the dorsal fin placed a little farther back in relation to the vent, and by the greater development of the ridges of the head and body, particularly the ventral keel.

FIG. 10.

[*Corythroichthys intestinalis*, Ramsay.

Having had occasion to compare the above-mentioned specimens with *Syngnathus intestinalis*, Ramsay,[1] I discovered that the types of that species were not Australian, as has been generally supposed, but came from Bougainville Island in the Solomon Group. Ramsay gave no locality, but merely stated that they were taken from the intestinal cavity

1 Ramsay—Proc. Linn. Soc. N.S. Wales, v., 1881, p. 494.

of *Holothuriæ.* Duncker[1] considers this species to be synonymous with *C. conspicillatus*, Jenyns,[2] together with several other species described by Jordan and his colleagues. Having examined all the material available to me, I am sure that *C. intestinalis* and *C. waitei,* Jord. & Seale,[3] are identical, and, as I have recorded[4] the latter from Cooktown, Queensland, Ramsay's species is rightly included in Australian literature.]

Genus Solegnathus, *Swainson.*

Solegnathus spinosissimus, *Günther.*

Spiny Sea-Horse.

Solenognathus spinosissimus, Günther, Brit. Mus. Cat. Fish. viii., 1870, p. 195; *id.*, Waite, Proc. Linn. Soc. N.S. Wales, ix. (2), 1894, p. 222, pl. xvii., figs. 5 and 8.

Sixteen specimens of this species were preserved. They were obtained in 15-45 fathoms in Shoalhaven Bight, New South Wales.

Solegnathus fasciatus, *Günther.*

Solenognathus fasciatus, Günther, Chall. Rep., Zool., i., 1880, p. 30, pl. xiv., fig. B.; *id.*, Waite, Proc. Linn. Soc. N.S. Wales, ix. (2), 1894, pp. 220 and 227.

Duncker[5] considers this species to be identical with the preceding. I have carefully compared the thirteen specimens obtained with those of *S. spinosissimus* and have endeavoured to find some more definite character than the form of the scutes to distinguish the two. They are, however, identical in every other respect, and though this one difference holds good in a large number of specimens, yet the species cannot but be considered to be based on a very uncertain footing. The scutes are well shown by Waite in the figures quoted.

Though several specimens have the pseudo-marsupium in such a condition that it is evident that they were carrying eggs when obtained, only two have them still attached. The most perfect of these bears forty-five eggs, and it would seem that only a very few are missing. They are very similar to those of *S. spinosissimus* as described by Waite, but are in a less advanced stage of development, and are arranged in about five very irregular rows commencing directly behind the vent

1 Duncker—Faun. Südwest-Austr., ii., 1909, p. 237.
2 Jenyns—Zool. Beagle, iii., 1842, p. 147, pl. xxvii., fig. 4.
3 Jordan and Seale—Bull. U.S. Bur. Fish., xxv., 1905 (1906), p. 212, fig. 17.
4 McCulloch—Proc. Linn. Soc. N.S. Wales, xxxv., 1910, p. 432.
5 Duncker—Faun. Südwest-Austr., ii., 1909, p. 235.

and occupying thirteen tail-rings. They were collected in the latter part of November, 1909.

The specimens are from the following localities:—

South-east from Babel Island, off Flinders Island, Bass Strait.

Disaster Bay, southern New South Wales.

SOLEGNATHUS ROBUSTUS, *sp. nov.*

(Plate ix., fig. 2.)

D. 34, P. 24-25. Body rings, 26 + 50.

Head 6·4 in the length and 3·7 in the trunk. Length of tail a little less than the distance between the vent and the pectorals, its depth behind the dorsal 3·2 in the base of that fin. Snout 1·7 in the head, its depth nearly 5 in its length, and less than the diameter of the eye which is 4·1 in the snout. Narrowest interorbital width a little less than half the diameter of the eye. Dorsal fin occupying ten body rings, the length of its base almost equal to the distance between the tip of the snout and the posterior border of the eye. The lateral row of scutes is not continued along the side of the tail as in *S. hardwickii*, but passes upwards and merges into the supero-lateral row, though, owing to the upper surface being very convex, this is less conspicuous than in *S. spinosissimus* and *S. fasciatus*. Scutes of the body with radiating lines of well-developed spines, and each with a stronger flattened one in the centre. On the anterior portion of the body and sides these central spines are higher than broad and widely separated, but before the dorsal on the mid-line they become broader; on the tail, especially along the median superior and inferior lines, they are much broader than high, and are arranged so closely together as to form an almost continuous keel. The whole head and space before the pectorals is covered with uniform upstanding spines which are arranged in radiating lines on the opercles. The last thirty tail rings are prehensile and are provided with fleshy excrescences on their inferior surfaces.

Total length, 300 mm. One specimen from 37 fathoms off Flinders Island, South Australia, August 30th, 1909.

This species is easily distinguished from the others by its broad snout and very thick tail, and also by the form of the scutes. The following is a key to the Australian species:—

a. Lateral row of scutes extending along the sides of the tail, not merging into the upper row.

b. Scutes rugose but with scarcely any spines:— *hardwickii*.

aa. Lateral row of scutes merging into those on the upper edge of the tail behind the dorsal fin.

c. Depth of the tail behind the dorsal 4 or more in the base of that fin. Depth of snout 6 or more in its length.

d. Scutes intensely spiny and convex :—*spinosissimus.*

dd. Scutes rugose with one spine and flatter :— *fasciatus.*

cc. Depth of the tail behind the dorsal about 3 in the base of that fin. Depth of snout 5 in its length.

e. Scutes with rows of spines and little convex :— *robustus.*

Genus Hippocampus, *Rafinesque.*

Hippocampus abdominalis, *Lesson.*

(Plate vi., fig. 1.)

Hippocampus abdominalis, Lesson in Ferussac, Bull. Sci. Nat., xi., 1827, p. 127; *id.*, Günther, Brit. Mus. Cat. Fish., viii., 1870, p. 199; *id.*, Klunzinger, Sitzb. Akad. Wiss. Wien., lxxx., i., p. 420; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 135; *id.*, Waite, Rec. Cantb. Mus., i., No. 1, 1907, p. 15; *id.*, *loc. cit.*, 1911, p. 175, pl. xxviii.; *id.*, Duncker, Faun. Südwest-Austr. ii., 1909, p. 247.

The specimen figured is a very large one from Merimbula, near Twofold Bay, New South Wales, where this species is said to be common. It is recorded from New Zealand, Tasmania and Victoria, while Günther records a specimen in the British Museum from Sydney which was presented by Sir John Richardson. If this specimen really came from Port Jackson the species must be very rare here, as it has not been included in any of the catalogues of New South Wales fishes, nor have any local specimens come under my notice.

Hippocampus graciliformis, *sp. nov.*

(Plate vi., fig. 2.)

D. 27? P. 16. Rings 12 + 45.

Body slender, its greatest depth being only 1·5 the width behind the pectorals. Tail nearly twice as long as the distance between the tip of the coronet and the vent. Snout very short and thick, as long as the postorbital portion of the head. Eye $1\frac{2}{3}$ in the snout. Supra-orbital spines low and triangular, converging before the eyes where they form a prominent keel on the proximal portion of the snout. Behind the eyes the profile extends obliquely upwards to just before the coronet where it is notched. The coronet is quadrangular with very indistinct tubercles and ridges. Tubercles of the body almost uniformly obtuse, the lateral row a little more developed than the others; below the dorsal fin those of the back are somewhat enlarged. On the tail the fifth, ninth and twelfth are prominent. None of the tubercles bear filaments. The dorsal fin stands on four body and three tail rings; its anterior portion is damaged but it appears to have had twenty-seven rays.

Colour.—Light brown, the tail with nine darker cross-bands. The head has large scattered dark spots arranged around the eye and on the snout, and there are others on the sides and under surfaces of the anterior portion of the body.

Total length 87 mm.

One specimen taken somewhere near Bass Strait, but the exact locality is unknown.

The large number of rays in the dorsal fin distinguishes this from all other Australian species except *H. abdominalis*, Lesson. From that species it is easily separated by its slender body, the form of the supraocular spines and coronet, and the poor development of the tubercles.

Family SCOMBRESOCIDÆ.

Genus Scombresox, *Lacépède.*

Scombresox forsteri, *Cuvier and Valenciennes.*

Scombresox forsteri, Cuvier and Valenciennes, Hist. Nat. Poiss., xviii., 1846, p. 481.

A single specimen was taken in a landing net at night, one hundred and twenty miles south-south-west of St. Francis Island, South Australia.

Family EXOCŒTIDÆ.

Genus Exonautes, *Jordan and Evermann.*

Exonautes speculiger, *Cuvier and Valenciennes.*

Flying Fish.

Exocœtus speculiger, Cuvier and Valenciennes, Hist. Nat. Poiss., xix., 1846, p. 94.

Cypsilurus speculiger, Jordan and Seale, Bull. U.S. Bur. Fish., xxv., 1905 (1906), p. 209, fig. 13.

A single specimen agreeing perfectly with the descriptions and figure quoted was obtained between Port Stephens and Newcastle, New South Wales.

Family ATHERINIDÆ.

Genus Atherina, *Linnæus.*

Atherina dannevigi, *sp. nov.*

(Plate xvi., fig. 2.)

D. viii.-ix., i. 11. A. i., 12-13. P. 13-14. V. i. 5. C. 17. Scales 73-75.

Body very elongate, the depth 6·5 to 7·3 in the length to the hypural. Head 4 to 4·3. Eye 3 to 3½ in the head, equal to or longer than the snout.

Mouth oblique, not very large, the gape reaching almost to the anterior orbital rim; maxillary continued backwards to below the anterior third of the eye. The teeth are exceedingly minute and appear to be present on the jaws, vomer and palatines. Gill-rakers slender, equal to about half the length of the eye, sixteen on the lower limb of the first arch. Upper surface of the head flat, the interorbital width equal to the diameter of the eye. Muciferous system well developed, with large open pores. A row of about nine commences on the snout and extends over the eye, then downwards and along the upper margin of the opercles. Nine more are arranged from behind the eye, around the angle of the preoperculum to the mouth, where they join another row running along the margin of the preorbital. Five more pores are found along each ramus of the lower jaw.

Scales extending forwards on the back as far as the hinder portion of the eye, and there are about thirty-nine along the mid-line of the back to the first dorsal, and twenty-four between the two dorsals. Those on the sides of the body are rounded but for a small median lobe which gives them an angular appearance. There are three rows on the cheeks and about seven on the operculum. They also extend well onto the base of the caudal fin.

Origin of the first dorsal behind the ventrals but well before the middle of the distance between the tip of the snout and the base of the tail; second spine longest, equal to two-thirds or more of the space between the tip of the snout and the hinder orbital margin. Soft dorsal commencing over the first third of the anal, its third ray a trifle shorter than the longest spines. Anal similar to the soft dorsal but with a longer base. Origin of ventrals almost midway between the snout and the end of the anal, or a little nearer the latter. Pectorals reaching to above the base of the ventrals. Vent between the ventrals and rather nearer their tips than their bases.

Colour.—Sandy yellow (in formalin), each scale of the back margined with a row of minute brown dots. A silver band, which is rather wider than the row of scales it covers, is uniformly dotted with minute brown specks, and may or may not be defined by a black line above. Occiput darker.

Described from three specimens 75 to 85 mm. long from two stations—Spencer's Gulf, South Australia, 20 fathoms, and the entrance to Oyster Bay, Tasmania. Selected type 75 mm. long from the latter locality.

This is distinguished from all other Australian species by its very small scales. It is apparently nearest to *A. hepsetoides*, Richardson,[1] but the description of that species is so imperfect I am unable to compare it satisfactorily. Richardson, however, compared his species with *A. hepsetus*, Linn., to which, as his name denotes, he considered it very similar. The "Endeavour" specimens are so very different in appearance from the latter that I have little doubt they are distinct from Richardson's species also, and this, together with the fact that they come from somewhat deep water induces me to describe them as new.

Genus Tæniomembras, *Ogilby.*

Tæniomembras, Ogilby, Proc. Linn. Soc. N.S. Wales, xxiii., 1898, p. 41.

Ogilby has erected this genus for *Atherina microstoma*, Günther, considering that it differs from *Atherina* by (1) its more elongate body, (2) pointed snout, (3) small mouth, (4) stronger dentition, (5) shorter, stouter and fewer gill-rakers. I regard 1, 2 and 4 as being of specific value only, but 3 and 5 may perhaps be conveniently used to split up the large number of Australian species of *Atherina*. Notwithstanding Günther's statement, "teeth conspicuous in the jaws and on the vomer," Ogilby describes the latter as smooth, while he finds a single row on the palatines. These are lacking in the specimens described below, but the vomerine teeth are well developed.

Tæniomembras microstoma, *Günther.*

(Plate x., fig. 2.)

Atherina microstoma, Günther, Brit. Mus. Cat. Fish., ii., 1861, p. 401; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 39; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 122, and 1890 (1891), p. 34.

Br. 6-7; D. vi.-vii. 10-11; A. 11-12; P. 13-14; V. i. 5; C. 17; Sc. lat. 38-40; Sc. tr. 8.

1 Richardson—Ann. Mag. Nat. Hist., xi. (1), 1843, p. 178.

Height of the body $5\frac{3}{4}$-7, length of the head 4-$4\frac{1}{3}$ in the length to the hypural. Eye 3, a little wider than the interorbital space, snout $4\frac{1}{2}$ in the head. Depth of the caudal peduncle a little less than the width of the eye.

Body moderately elongate, somewhat compressed, its breadth equal to about two-thirds of its height. Head flat above with a series of very large pores extending from the snout, over the eye, to a canal above the operculum. A second series crosses the snout in front of the eye and follows the preorbital, joining another which extends around the margins of the preoperculum. There is a series on each ramus of the lower jaw, and a single pore behind the eye. A few large scales on the upper surface of the head extending forward to the eyes, snout and preorbital region bare. A single row of large scales on the cheek, and three rows on the operculum; a single row on the sub- and interoperculum. Mouth small, the maxillary not reaching the anterior margin of the eye; jaws subequal. Teeth minute but distinct, in several rows on the anterior parts of both jaws, none on the sides; a well-developed patch on the vomer, palatines toothless. Gill-rakers short and stout, the longest less than a third the length of the eye; about fifteen on the first arch.

Scales of the body large, cycloid and concentrically striated. There are thirty-eight to forty on the silvery lateral band from behind the base of the pectoral to the hypural, and eight in a transverse series not counting the median ones on the back and belly. There are fourteen to fifteen between the nape and the first dorsal fin.

Origin of the dorsal a little behind that of the ventrals, and a little nearer the end of the snout than the hypural. The spines are very weak and flexible, the second and third the longest, subequal, and about half as long again as the eye. The distance between the first spines of the two dorsals equals that between the end of the second and the hypural. Anal originating well in advance of the second dorsal, the length of its base once and a half in its distance from the hypural. Margins of the pectorals rounded, the second and third upper rays the longest, not quite reaching the vertical of the ventrals. Ventrals reaching back a little more than half their distance from the anal, the vent placed between their tips.

Colour.—Whitish in formalin with a broad dark silvery lateral band along the fourth row of scales. The upper parts of the head and back are densely spotted with minute olive green dots, which also border the scales of the body above the lateral band and sometimes those below it as well. All the fins with more or less numerous scattered dots on the rays.

Described from five specimens, about 63 mm. long, taken in the estuary of the Derwent River, Tasmania, by Mr. E. F. Lovett, who presented them to the Australian Museum. Two other very battered specimens are in the "Endeavour" collection from Storm Bay, Tasmania. They differ from Günther's description only in being rather more slender, in having one ray less in the anal fin, and in the position of the silvery lateral band, but I do not regard any of these as being of much importance.

FAMILY STROMATEIDÆ.

GENUS SERIOLELLA, *Guichenot.*

SERIOLELLA BRAMA, *Günther.*

Snotgall Trevally, Trevalla.

(Plate ix., fig. 1.)

Neptonemus brama, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 390; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 85 and 120.

Neptonemus? travale, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 119.

Seriolella brama, Regan, Ann. Mag. Nat. Hist. (7), x., 1902, p. 129; *id.*, Waite, Rec. Cantb. Mus., i., 1911, p. 229, pl. l.

Notwithstanding the numerous differences appearing in the two descriptions of *S. brama* and *S. trevale*, I agree with Regan that they represent but one species. I think there can be no doubt that my specimens are correctly identified with *S. brama*, while the fact that they were recognised as the common trevalla or trevally of the Melbourne markets by Mr. Dannevig bears out their association with *S. trevale* which was originally obtained from that source.

I have examined over a dozen specimens from various localities extending from Tasmania to Port Jackson and find the variation in the number of fin-rays and spines to be considerable, as the following selected examples will show:—(1) D. vii., i., 30; A. iii., 22; P. 21. (2) D. vii. ii., 33; A. iii. 23; P. 21. (3) D. vii. ii. 26; A. iii. 21; P. 20. (4) D. vi. ii. 32; A. iii. 23; P. 20. The lengths of the spines before the second dorsal are very variable, and the second may be replaced by a jointed ray. The disagreement in the proportions of the head and body, as given by the two authors, is doubtless accounted for by a different system of measuring adopted by each. The depth in my specimens is about 2·6 in the length to the hypural and 3·4 in that to the tip of the tail. The only other important difference is in the armature of the preoperculum, as described by Castelnau, but I find this to be a very unreliable character, some specimens having the ridges and denticulations distinctly, though feebly, developed, while in others there is no trace of them.

The following description is drawn up from all the material available to me:—

D. vi.-vii. i.-ii. 26-33; A. iii. 21-23; P. 20-21; V. i. 5; C. 17; l. lat. about 90. Depth 2·6, head $3\frac{1}{3}$ to $3\frac{1}{2}$, pectoral 3 to 3·4, base of dorsal 1·7, base of anal 3 to 3·2 in length to the hypural. Caudal peduncle 3·5. Eye-opening 4 to 4·5. Vertical diameter of orbit 3·4 to 4 in the head.

Body compressed, rather deep, its dorsal and ventral profiles almost equally arched, covered with moderate cycloid scales, those of the lateral line somewhat smaller than the others. Caudal peduncle narrow. Whole upper surface and sides of the head covered with a thick fleshy skin which largely hides the scales and other characters beneath it. Snout tumid, the nostrils placed close together and nearer the end of the snout than the eye, the anterior the largest and rounded, the posterior slit-like. Mouth oblique, maxillary small and weak, and reaching to or a little beyond the vertical of the anterior margin of the eye. Preorbital narrow, its margin smooth or crenulated. Eye large, placed in the middle line of the head. Bones of the head very weak, their margins either feebly denticulated or smooth; posterior margin of the preoperculum emarginate, the angle produced and broadly rounded. Operculum terminating in a very thin flat point margined with skin. Teeth extremely fine and small, arranged in a single row on each jaw; vomer, palatines and tongue toothless.

Dorsal fin commencing a little before, over, or behind the base of the pectoral; the spinous portion is low and the middle spines the longest. If present, the second spine of the second dorsal is generally higher than any of those of the first; the second and third rays are the longest and about as long as the distance between the tip of the snout and the hinder margin of the eye. The two first spines of the anal are short and thick and somewhat detached from the rest of the fin; third spine longer and weaker and adpressed to the first ray. Soft portion of the fin similar to, but lower than, the second dorsal. Pectoral falcate reaching to or beyond the vertical of the first anal ray. Ventrals rather small, placed below the posterior base of the pectorals, and reaching about two-thirds of the distance between their insertion and the vent. Caudal deeply forked.

Colour.—Body with large somewhat irregular blotches distributed over its upper half, of which the most conspicuous is a dark rounded one at the origin of the lateral line. Two large and less distinct marks descend from the origin and middle of the second dorsal to below the lateral line, and besides these there are numerous smaller markings scattered over the body. These markings have not been noted by Castelnau, whose description was prepared from fresh specimens, and as all mine have lost most of their scales it may be that they are not shown or are indistinct in perfect examples. A dark bar extends vertically across the eye which is otherwise golden. Dorsal, anal, pectorals and ventrals dusky, especially towards their margins.

Fifteen specimens were preserved from the following localities:—

Spencer Gulf, South Australia, 20 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Oyster Bay, Tasmania.

SERIOLELLA PUNCTATA, *Forster*.

(Plate x., fig. 1.)

Gasterosteus punctatus, Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 36.

Neptonemus bilineatus, Hutton, Trans. N. Zeal. Inst., v., 1872, p. 261, pl. viii.

Seriolella bilineata, Regan, Ann. Mag. Nat. Hist. (7), x., 1902, p. 128.

Seriolella punctata, Waite, Rec. Cantb. Mus., i., 1911, p. 231, pl. li.

D. vi.-vii. 34-39; A. iii. 22-24; P. 20-22; V. i. 5; C. 17.

Depth 3·3 to 4, head 3·4 to 3·6, pectoral about 4, base of dorsal 1·7, and base of anal 3·8 in the length to the hypural. Caudal peduncle 4 to 4·5, eye-opening 4·8 to 5·5, vertical diameter of the orbit 3·4 to 3·8 in the head.

Body compressed, elongate, the dorsal and ventral profiles evenly arched, upper parts covered with large pores. Caudal peduncle narrow. Upper surface and sides of the head covered with a thick fleshy porous skin which hides the scales and other characters beneath it. Snout somewhat fleshy and rounded. Nostrils close together, nearer the tip of the snout than the eye; the posterior longer than the anterior which is round. Mouth oblique; maxillary rather narrow and weak, extending to or beyond the vertical of the anterior margin of the eye. Preorbital narrow. Eye moderate, placed a little above the mid-line of the head. Opercular bones very weak, and with smooth margins in all my specimens, but they are doubtless subject to the same variation as in *S. brama.* Posterior margin of the preoperculum oblique and usually a little emarginate, the angle produced and broadly rounded; operculum terminating in a very thin flat point margined with skin.

Dorsal fin commencing a little behind the vertical of the base of the pectoral; the spinous portion is low and the middle spines are the longest. The third or fourth rays are the longest, but are shorter than the distance between the tip of the snout and the hinder margin of the eye. The two first spines of the anal are very small and more or less hidden in the skin; the third is longer and adpressed to the first ray. Soft portion of the fin similar to, but lower than that of the dorsal. Pectoral falcate not nearly reaching the vertical of the vent. Ventrals small, inserted just behind the pectorals and reaching one-third or more of the distance between them and the anal. Caudal forked.

Colour.—Body with numerous small round spots along the middle line, and a large dark mark behind the head, near the base of the lateral line, which is deeper than broad. A dark vertical bar across the eye. Pectorals, dorsal and anal fins dusky, especially towards their margins. Ventrals and caudal lighter.

Longest specimen 280 mm.

Seriolella porosa, Guichenot,[1] is said to differ from *S. punctata* in being more slender, the depth being 4 to $4\frac{1}{2}$ in the length as against $3\frac{2}{3}$ to $3\frac{3}{4}$. The original figure of that species, however, agrees very well in this respect with my specimens of *S. punctata*. Regan[2] considers the Tasmanian *S. dobula*, Günther, to be synonymous with *S. porosa*, and I think it possible that both will prove to be merely variations of Forster's species, though I have seen no specimens in which the depth is $4\frac{1}{2}$ in the length as described by Günther.

Two specimens were preserved which were taken between Port Stephens and Newcastle, New South Wales, 22-60 fathoms, and seven others from the Victorian coast and from Oyster Bay, Tasmania.

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1 Guichenot in Gay—Fauna Chilena, Pisces, 1847, p. 238; Atlas ii., Ichth. pl. vii., fig. 2.

2 Regan—Ann. Mag. Nat Hist. (7), x., 1902, p. 128.

Family GADIDÆ.

Genus Physiculus, *Kaup.*

Physiculus barbatus, *Günther.*

Rock Cod, Cape Cod, Red Cod.

Pseudophycis barbatus, Günther, Ann. Mag. Nat. Hist. (3), xi., 1863, p. 116; *id.*, Castelnau, Proc. Zool. Acclim. Soc. Vict., i., 1872, p. 162; *id.*, McCoy, Prodr. Zool. Vict., pl. xx., 1878; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 88 and 126.

Physiculus palmatus, Klunzinger, Arch. fur. Naturg., xxxviii., i., 1872, p. 38.

Lotella grandis, Ramsay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 462.

Physiculus barbatus, Waite, Mem. N.S. Wales Nat. Club, 1904, p. 24.

Only one specimen of this common southern species was preserved. It is fifteen inches long and was obtained off Cape Everard, Victoria, in 70 fathoms.

There seems to be little doubt that *P. palmatus*, Klunzinger, from Hobson's Bay, Port Phillip, is identical with the common Victorian Rock Cod since the description agrees perfectly with that given by McCoy of the latter species. The fact that Klunzinger compared his fish with *P. breviusculus*, Richardson, only, indicates that he was unaware of Günther's species.

Family MACROURIDÆ.

Genus Cœlorhynchus, *Giorna.*

Cœlorhynchus australis, *Richardson.*

Lepidoleprus australis, Richardson, Proc. Zool. Soc., 1839, p. 100, and Trans. Zool. Soc., iii., 1849, p. 151, pl. viii., fig. 1.

Macrurus australis, Günther, Brit. Mus. Cat. Fish., iv., 1862, p. 391; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 127; *id.*, Günther, Chall. Rept., Zool., xxii., 1887, p. 127.

Cœlorhynchus mortoni, Ogilby, Proc. Roy. Soc. Tasm., 1896 (1897), p. 83.

Cœlorhynchus australis, Waite, Rec. Cantb. Mus., i., 1911, p. 177, fig. 1, pl. xxix., fig. 1.

When recording *Optonurus denticulatus* from New South Wales I noted[1] that several specimens lacked the ends of their

1 McCulloch—Rec. Austr. Mus., vi., 1907, p. 346.

tails, and that in one the dorsal and anal fins had grown together around the injured portion, thereby giving it the appearance of being perfect. Many examples of *C. australis* in the "Endeavour" collection exhibit this same peculiarity, some having the tail so truncated and the anal rays so complete around it that they almost seem to have heterocercal instead of leptocercal tails. Dissection shows that the injured vertebra spreads out into a cartilaginous fan somewhat resembling a true hypural bone, to which the rays are movably articulated.

A large series of specimens, seventy-five in number, conclusively proves that *C. mortoni*, Ogilby (the type specimen of which is lost), is identical with Richardson's species, and that the differences noted between the two are nearly all due to the one having a more perfect and therefore longer tail than the other. The only character that cannot be so explained lies in the armature of the scales, Ogilby counting 18 to 23 ridges in *C. mortoni*, while *C. australis* is said to have 12 to 18 only. I find that the number varies according to the size of the specimens, my smallest having only six ridges, whereas a large scale in a big example has twenty-two.

When fresh, the specimens were greyish with darker bands extending along the body and occupying the overlapping portions of each row of scales. There is a more or less distinct dark band between the eyes, and the operculum is blackish. Upper half of the first dorsal black with a lighter margin. Anal dark with a white border. Pectorals and ventrals dusky with lighter edges.

Specimens were preserved from off Storm Bay, Tasmania, 60 fathoms, and from Oyster Bay, Tasmania.

Family BERYCIDÆ.

Genus Austroberyx, *gen. nov.*

Body rather deep, compressed, covered with moderately large, ctenoid scales which are regularly arranged. Abdomen trenchant, with a row of slightly enlarged, keeled scales. Head large, with thin bones and high ridges which have deep muciferous cavities between them; the exposed bones rough with raised striæ. Snout short, mouth oblique, the chin prominent. Eye large. Jaws, vomer and palatines with villiform teeth. Opercles serrated; operculm with two spines, preoperculum with more or less strongly developed spines on its inner border. Dorsal with six or seven spines which increase regularly in height, and eleven to fourteen soft rays. Anal with four spines and twelve to fourteen rays, its base shorter than that of the dorsal. Ventrals with one spine and seven rays.

Type *Beryx affinis*, Günther. *B. gerrardi*, Günther, and *B. lineatus*, Cuvier and Valenciennes, also belong to this genus. They are distinguished from *Beryx*, Cuvier (type *B. decadactylus*, Cuv. and Val.), by having the anal shorter than the dorsal and composed of only 12-14 rays instead of 26-30. The bones of the head also appear to be more strongly armed, and the suborbitals are broader.

Regan[1] has placed *Beryx affinis*, Günther, and its allies in the genus *Hoplopteryx*, Agassiz[2], of which most of the species are Cretaceous fossils. Judging from Woodward's restoration of *H. lewesiensis*,[3] Mantell, however, the recent forms seem to differ in having the opercular bones more strongly armed and in having much smaller scales.

Note on the genera *Trachichthys*, Shaw and Nodder, and *Hoplostethus*, Cuvier and Valenciennes.—It would seem that *Trachichthys* (type *T. australis*, Shaw & Nodder) is a monotypic genus characterised by having three dorsal and two anal spines which are placed close together, and, like the rays, are entirely covered with minute asperities. Minute tuberculiform teeth are crowded on the jaws, vomer and palatines.

Günther[4] counted three spines and twelve rays in the dorsal, and two spines and ten rays in the anal of the type specimen of *T. australis*. McCoy[5] describes iv./11 and iii./9 (10) respectively, but has mistaken the anterior rays for spines, while Waite[6] expressly states that there are three and not two anal spines in *Trachichthys*. I have counted nine specimens of *T. australis*, and find the number of spines and rays to be as stated by Günther.

Boulenger[7] has united *Hoplostethus* with *Trachichthys*, regarding some Australian and New Zealand species (*T. intermedius*, Hector, and *T. elongatus*, Günther) as intermediate between the two. Both these fishes, however, bear little resemblance to *T. australis*, having four and six dorsal spines and three anal spines which are well separated, and which, together with the rays, are not covered with minute asperities. They are much nearer to *Hoplostethus* (type *H. mediterraneus*, Cuv. & Val.), but both differ from that genus, as defined by Jordan and Fowler,[8] in possessing microscopic

1 Regan—Ann. Mag. Nat. Hist. (8), vii., 1911, p. 5.
2 Agassiz—Poiss. Foss., iv., 1838, p. 4.
3 Woodward—Brit. Mus. Cat. Foss. Fish., iv., 1901, p. 398, fig. 31.
4 Günther—Cat. Fish. Brit. Mus., i., 1859, p. 10.
5 McCoy—Prodr. Zool. Vict., 1886, pl. cxiv.
6 Waite—Mem. Austr. Mus., iv., 1899, p. 66.
7 Boulenger—Ann. Mag. Nat. Hist. (7), ix., 1902, p. 202.
8 Jordan & Fowler—Proc. U.S. Nat. Mus., xxvi., 1902, p. 7.

vomerine teeth, while *T. elongatus* also has only four instead of six dorsal spines. In all other respects, however, they agree with *Hoplostethus*, *T. intermedius* indeed being very closely allied to *H. mediterraneus*, so that I think it better to expand the limits of that genus to include them rather than form an unnatural group by uniting *Hoplostethus* and *Trachichthys*.

AUSTROBERYX GERRARDI. *Günther*.

(Plate viii.).

Beryx Gerrardi, Günther, Ann. Mag. Nat. Hist. (5), xx., 1887, p. 238, fig.

Br. 8; D. vi., 13; A. iv., 12-13; P. 13; V. i., 7; C. 19; l. lat. 36-39; l. tr. 6 + 11. Height $1\frac{7}{8}$-2, head $2\frac{1}{2}$-$2\frac{2}{3}$ in the length to the hypural. Eye $2\frac{1}{3}$ in the head. Interorbital width slightly less than $\frac{2}{3}$ of the eye, and equal to the length of the snout. Base of the anal $\frac{2}{3}$ that of the dorsal which equals the length of the head. Caudal peduncle $\frac{4}{5}$ of the eye and almost equal to the post-orbital portion of the head.

Body short and deep. Upper profile very convex from the snout to the first dorsal spine which marks its highest point. The curve from the snout to the ventral fin is much less than that of the back; the line between the ventrals and the anal is straight and bears 9-11 keeled scales which decrease in size backwards.

Maxillary reaching to below the posterior third of the eye, stiliform anteriorly but very broad behind; there is a small rough patch of spines on the narrow portion which is in contact with the supplemental bone, but the rest is smooth. Supplemental bone with numerous ridges each ending in spines. Turbinal bones bilobed and margined with sharp spines. Preorbital denticulated, without a curved spine but with a slight notch at its upper end to receive a blunt spine projecting from the maxillary. Bones of the infraorbital arch spine-like and roughened. Interorbital space narrowest above the middle of the eye, becoming a little wider forwards, then narrowing again towards the nostrils. Supraciliary edges finely denticulated, terminating anteriorly above the nostrils; between these are two curved, slightly roughened ridges which approach each other at either end and enclose a somewhat elliptical area, with truncate ends, which is $3\frac{1}{3}$-4 times as long as broad. Above the first third of the eye these ridges each give off a branch which again divides and passes backwards ending in some rather strong spines some distance before the suprascapular.

Preoperculum with two parallel margins, the hinder borders of which are serrated; the angle of the inner margin is formed of two flattened, denticulated spines, while that of the outer is armed with smaller simple spines. Both lower borders finely denticulated. Operculum narrow, its anterior half covered with scales, the posterior portion with coarse striæ ending in marginal points; two strong spines on the upper portion of the bone. Subopercle with one or two small spines at its lowest point. Interoperculum with a broad notch near its junction with the subopercle, its angle and lower border striated and finely denticulated. Margin of the suprascapular denticulated, its lower portion with an oblique ridge terminating in some enlarged spines.

Nostrils more widely separated than in *A. affinis*, the hinder ones being very close to the orbital margins. First branchiostegals very slender, second to fifth broad and denticulated below, the others smooth. Gill-rakers very long and slender posteriorly, about half as long as the eye; twenty-two on the lower limb of the first arch. Exceedingly fine villiform teeth on the jaws without larger ones near the middle. A small triangular patch on the vomer and a long cuneiform band on each palatine bone.

With the exception of the form of the ridges on top of the head, the position of the nostrils and the absence of enlarged teeth, all the characters of the head are almost exactly similar to those of young *A. affinis*.

Dorsal spines gradually increasing in length, the last $1\frac{1}{4}$-$1\frac{1}{2}$ as long as the eye and $\frac{2}{3}$ the length of the second ray; all are more or less angular and striated. Second ray the longest, about $2\frac{1}{3}$ as long as the last. The first anal spine is placed below the third dorsal ray, the fourth equals the fifth dorsal spine in length and is about $\frac{2}{3}$ as long as the second ray; the last ray is placed far behind that of the dorsal. Pectoral not quite $\frac{3}{4}$ in the head and reaching to above the base of the anterior anal rays. Ventrals with strong, flattened, striated spines, $\frac{2}{3}$ as long as the rays which extend to the base of the fourth anal spine. Caudal deeply forked, the lobes somewhat pointed and about equal to the head in length.

All the scales rather coarsely denticulated, the external half of their exposed surfaces with smooth ridges ending in marginal teeth. Bases of the dorsal and anal fins protected by sheaths formed of several rows of scales, the outermost of which is the largest. A small patch of scales on the cheeks. A large angular scale at the axil of the ventral fin. Lateral line straight, each scale with a median excavation.

Colourless in formalin.

Described from twelve specimens, 150-200 mm. in length.

This species is distinguished from *A. affinis* and *A. lineatus* by its small number of scales on the lateral line, different fin formulæ and by its short and deep form.

Trawled in 37 fathoms off Flinders Island, Investigator Group, South Australia.

AUSTROBERYX AFFINIS, *Günther.*

Nannygai.

(Fig. 11.)

Beryx affinis, Günther, Brit. Mus. Cat. Fish., i., 1859, p. 13, and Ann. Mag. Nat. Hist. (5), xx., 1887, p. 238, fig.; *id.*, Ogilby, Ed. Fish. N.S. Wales, 1893, p. 69, pl. xxi.; *id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 48, pl. xvii.

Hoplopteryx affinis, Regan, Ann. Mag. Nat. Hist. (8), vii., p. 5, pl. i.

This species is extremely variable with age, the young being short bodied and round, and the depth only $2\frac{2}{3}$ in the total length, while large specimens are much more elongate with the depth $3\frac{1}{3}$. The form and armature of the bones of the head is essentially the same in both, but those of the young have much more spinate edges, and their surfaces are smooth and with but few ridges. The same remarks apply to the

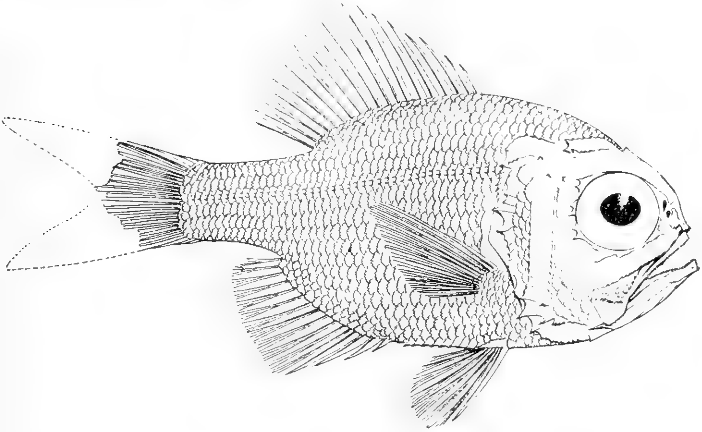

FIG. 11.

scales which have very coarsely denticulated edges and almost smooth surfaces; in the adult the denticulations are much finer and they are continued back as ridges almost half way across the exposed portions of the scales. The accompanying figure represents my smallest specimen (70 mm. long).

Constant characters appear to be afforded by the number of spines and rays in the dorsal and anal fins, and the number of perforated scales along the lateral line. In nine examples $2\frac{3}{4}$-16 inches long, I find them to be as follows:—D. vii./11-12, A. iv./12, lateral line 42-44.

Günther has stated that the length of the head equals the height of the body. As this character has been used in comparison with other species, it is worth noting that it is considerably shorter in all the specimens I have seen, and is shown to be so in all the figures published.

Only three specimens were preserved in the "Endeavour" collection which came from the east coast of Flinders Island, Bass Strait, and sixty miles south of Cape Everard, Victoria, 60-70 fathoms.

Genus Paratrachichthys, *Waite.*

Paratrachichthys trailli, *Hutton.*

Paratrachichthys trailli, Hutton—Waite, Mem. Austr. Mus., iv., 1899, p. 65.

Waite noted that the number and form of the abdominal scutes of his single specimen differed slightly from the descriptions and figure of *Trachichthys macleayi*, Johnston, and *T. trailli*, Hutton. In the "Endeavour" specimens I find from twelve to sixteen scutes, and the first either divided or single, and with one median or two lateral spines. This, therefore, proves the identity of *T. macleayi* with Hutton's species.

Referring to the vomerine teeth, Waite states that the patch could be covered by a pin's head. This agrees well with most of my specimens, but in others they are entirely wanting.

The collection includes seventeen specimens from off the east coast of Flinders Island, Bass Strait, 40 fathoms, and Oyster Bay, Tasmania, 40-60 fathoms.

Family MONOCENTRIDÆ.

Genus Monocentris, *Bloch and Schneider.*

Monocentris gloria-maris, *de Vis.*

Knight Fish.

Monocentris gloria-maris (de Vis.)—Waite, Mem. Austr. Mus., iv., 1899, p. 67, pl. viii., figs. 1-2, and Rec. Austr. Mus., vi., 1905, p. 60.

Two specimens were obtained fifteen miles off Saddle Hill, New South Wales, in 35 fathoms.

Family PEMPHERIDÆ.

Genus Pempheris, *Cuvier*.

Pempheris multiradiata, *Klunzinger*.

Pempheris multiradiatus, Klunzinger, Sitzb. Akad. Wiss. Wien., lxxx., i., 1879, p. 381.

Pempheris macrolepis, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 516; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 73, pl. x.

Pempheris lineatus, Ogilby, Proc. Linn. Soc. N.S. Wales, x., 1886, p. 447.

Having carefully examined all the material at my disposal, I have no doubt that *P. multiradiata* is identical with *P. macrolepis*, as has been suggested by Macleay.[1] Klunzinger's description agrees exactly with my specimens which come from various localities between the Bellinger River, New South Wales, and Kingston, South Australia. In twelve examples I find the following number of fin-rays and scales:— D. v./11-13, A. iii./32-38, lateral line to the hypural 46-50.

Waite (*loc. cit.*) has suggested that *P. multiradiata* is identical with *P. compressa*, Shaw, but I can see no reason for this conclusion. The former has most of its scales cycloid, only those on the anterior and lower portion of the head, breast, and on the back before the dorsal fin being ctenoid. In *P. compressa* all are very distinctly ctenoid, and they are much smaller, there being 62-64 along the lateral line instead of only 46-50.

The "Endeavour" specimens were taken at the following stations:—

Off Bellengen, New South Wales, 40-52 fathoms.

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Off the east coast of Flinders Island and north of Goose Island, Bass Strait.

Forty miles off Kingston, South Australia, 30 fathoms.

Pempheris affinis, *sp. nov.*

(Plate vii., Fig. 1.)

D. v., 10-11; A. iii. 38-41; P. 16-17; V. i. 5; C. 17; l. lat. 60-62; l. tr. 7 + 19. Depth $2\frac{1}{3}$-$2\frac{1}{2}$, head $3\frac{1}{4}$-$3\frac{1}{2}$ in the length to the hypural. Eye 2-$2\frac{1}{4}$ in the head; interorbital width $1\frac{1}{2}$-$1\frac{3}{4}$ in the eye and about twice as wide as the snout is long. Depth of caudal peduncle $\frac{2}{3}$ of the eye.

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1 Macleay—Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 21

Body rather deep; the profile arched to the first dorsal, thence straight to the tail. Lower profile forming an even curve to the origin of the anal, the base of which is very oblique. Interorbital space convex. Maxilla reaching to slightly behind the middle of the eye, and covered with large, rough ctenoid scales. Preoperculum with a very strong spine at the angle and one or two weaker ones on each border. Operculum with two very small flat points separated by a broad excavation; above and close to the upper one are several small points which may be indistinct. Whole head, with the exception of the tip of the snout and the lips, covered with moderately large scales which are mostly cycloid, only those of the preorbital and lower portion of the head being ctenoid. Upper jaw with an outer row of large canines which increase in size as they approach the median toothless excavation; anteriorly there is an inner row of smaller teeth behind them. Lower jaw with a few large teeth directed outwards anteriorly, and two rows of smaller teeth along the sides which become united into one about half way back. A row of small conical teeth is present on each side of the vomer, and still smaller ones form bands on the palatines. Posterior gill-rakers long and slender, more than one-third the length of the eye; there are twenty-three on the lower limb of the first arch.

On the back, in front of the dorsal fin, and also on the ventral surface, except on the bases of and between the ventrals, the scales are extremely rough and ctenoid; their edges are turned obliquely outwards from the body, and they are firm and adherent. The rest of the body is covered with large, flat, cycloid scales which are only marked with very fine concentric striæ, and are very deciduous. The lateral line is continued to the end of the middle caudal rays, and has 60-62 scales as far as the hypural and fifteen more to the end. The exposed portion of each scale is smooth and smaller than those on either side of it, and the edges are broken both above and below the canal by small rounded indentations.

Origin of the dorsal well behind the vertical of the ventral spine; the distance between it and the end of the snout is slightly less than half that between the same point and the end of the middle caudal rays. The fifth spine is more than two-thirds the length of the second ray, which is equal to three-fourths or more of the length of the head. The base of the anal is $2\frac{1}{2}$ that of the dorsal, and its anterior rays are as long as the last dorsal spine; the first spine is placed below the last dorsal ray. Third pectoral ray the longest, reaching to above the fourth anal ray. Ventrals placed beneath the pectorals and reaching backwards to the vent.

Colour.—Body everywhere closely speckled with minute reddish-brown dots which are more crowded on the back and head. Dorsal, caudal and ventrals tipped with black, while the anal also has a narrow black border. With the exception of these markings and some crowded dots on the anterior portion of the dorsal and on the caudal lobes, the fins are colourless.

Described from four specimens 96-135 mm. long.

Length of type (B. 7332) 135 mm.

This species is very closely allied to *P. multiradiata*, but may be at once distinguished by its much smaller scales. It has also a somewhat different number of rays in the dorsal and anal fins, and the tail portion of the body is longer, while a good recognition character lies in the black tips to the fins.

Three small specimens were taken by the "Endeavour" in thirteen fathoms off Nobby's Head, Newcastle, New South Wales. A larger and somewhat better preserved example is in the Australian Museum collection from Port Jackson, and has been selected as the type.

PEMPHERIS KLUNZINGERI, *nom. nov.*

Pempheris mülleri, Klunzinger, Sitzb. Akad. Wiss. Wien., lxxx., i., 1879, p. 380, pl. vi. (nec *P. mülleri*, Poey, 1860).

Both Macleay[1] and Waite[2] have suggested that this species is identical with *P. compressa*,[3] Shaw, but it appears to be distinguished by its much more elongate form, somewhat larger number of anal rays and smaller scales. I have counted eight specimens of *P. compressa* and find the number of fin-rays and scales to be as follows:—D. vi./9-10, A. iii./35-38, lateral line to the hypural, 62-64. Klunzinger gives for the same in his species:—D. v./10, A. iii./39-40, lateral line 75. The different forms of the two species may be seen by comparing Klunzinger's figure with that of Stead of *P. compressa*.[4]

The type came from King George's Sound. It was not obtained by the "Endeavour," nor have I seen any specimens.

PEMPHERIS ELONGATA, *sp. nov.*

(Plate iv., Fig. 1.)

D. iv.-v., 10-12; A. iii., 24-27; P. 17-18; V. i., 5; C. 17; l. lat. 68-71; l. tr. 8-9 + 18-20. Height 3·1 to 2·7 in the length to the hypural. Profile slightly arched to the dorsal fin, thence straight to the tail; lower profile considerably more curved than the upper one. Caudal peduncle narrow, 1·3 in the eye.

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1 Macleay—Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 21.
2 Waite—Mem. Austr. Mus., iv., 1899, p. 74.
3 Shaw in White—Voy. N.S. Wales, 1790, p. 267, fig. 2.
4 Stead—Ed. Fish. N.S. Wales, 1908, p. 49, pl. xviii.

Head 2·8 to 3·1 in the length. Orbit 2·4 in the head, much greater than the interorbital width which is rather more than one-fourth of the head, convex, and one-third longer than the snout. Operculum with two very weak spines which are almost hidden by scales. With the exception of the snout and lips the whole head is covered with small scales set in a fleshy skin, beneath which are numerous muciferous canals with small pores opening onto the surface. Teeth minute, in a single row on the jaws and in very narrow bands or almost single rows on the vomer and palatines.

Median portion of the scales of the body more or less produced and usually with several microscopic points which are variable both in number and degree of development. There are from sixty-eight to seventy-one scales along the lateral line to the hypural and about ten more extend onto the base of the caudal; they are enlarged, those of the anterior portion being almost twice as broad as long, and have either truncate or excavate spiny margins. Below the lateral line the scales are arranged in oblique rows which descend backwards towards the lower surface of the body.

The distance between the origin of the dorsal and the end of the snout is usually somewhat less, sometimes rather more than half that between it and the tip of the caudal. The first spine may be either well developed, small or absent; the others increase regularly in height, the last being about two-thirds the length of the first ray. The latter is simple and a little longer than the space between the end of the snout to the hinder orbital margin. The length of the base of the anal is 1·5 to 1·7 that of the dorsal; its anterior rays are much higher than the posterior ones, but are only two-thirds, or less, the length of the first dorsal ray. The first spine is placed either below the hindermost portion of the dorsal or entirely behind that fin and is often minute and hidden in the scales. Third upper ray of the pectoral the longest, reaching almost to or a little beyond the vertical of the anal. Ventrals placed below the pectorals and not reaching so far back as the vent.

Colour.—Upper surface of the head, back and upper portion of the sides closely speckled with microscopic brown dots which give them a greyish colour. Breast, lower jaw and lips more or less similarly dotted, and the specks also extend onto the dorsal and caudal rays. Otherwise colourless in preserved examples.

Described from sixteen specimens 90 to 132 mm. long, the longest of which is selected as the type.

This species is allied to *P. unwini*, Ogilby, but is at once distinguished by its much less spiny and more numerous scales. The dorsal and anal fins also have several more rays each, but otherwise the two are very similar.

The specimens were trawled off Flinders Island, Bass Strait, in 40 fathoms, and off Wilson's Promontory, Victoria.

The following key will serve to distinguish the Australian species of *Pempheris*:—

a. Anal fin with more than 30 rays; body rather deep.
  b. Scales mostly cycloid, ctenoid anteriorly, deciduous.
    c. Scales large, 46-50 on lateral line (to the hypural):— *multiradiata*.
    cc. Scales smaller, 60-62 on the lateral line:— *affinis*.
  bb. Scales ctenoid, adherent.
    d. 62-64 scales on the lateral line:— *compressa*.
    dd. 75 scales on the lateral line:— *klunzingeri*.
aa. Anal fin with less than 30 rays, body rather elongate.
    e. Edges of the scales with minute, irregular points, though scarcely ctenoid:— *elongata*.

Family SERRANIDÆ.

Genus Epinephelus, *Bloch*.

Epinephelus septemfasciatus, *Thunberg*.

Grey-banded Rock Cod.

Plectropoma susuki, Günther, Proc. Zool. Soc., 1867, p. 100.

Epinephelus septemfasciatus, Boulenger, Brit. Mus. Cat. Fish., i., 1895, p. 226; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 75; *id.*, Jordan & Richardson, Proc. U.S. Nat. Mus., xxxvii., 1910, p. 458.

Jordan and Richardson have recently expressed the opinion that the Australian records of this species are probably incorrect. I have compared the specimen taken by the "Thetis," another of unknown origin, and two in the "Endeavour" collection with the description given by these authors of Japanese specimens, and find that they differ in two small details only. None show the small patch of very fine scales near the tip of the maxillary, nor in any is the sixth band divided as described. Günther stated, however, that the colouration of his Port Jackson specimens was as in that figured by Schlegel, so that, though I think it possible that the Australian fish represents a distinct subspecies, it is best to leave the matter open until examples from both localities can be compared.

Two specimens trawled off the Clarence River, New South Wales, in 26-30 fathoms.

GENUS HYPOPLECTRODES, *Gill.*

HYPOPLECTRODES SEMICINCTA, *Cuvier and Valenciennes.*

Half-banded Sea Perch.

Gilbertia semicincta, Boulenger, Brit. Mus. Cat. Fish., 2nd. ed., i., 1895, p. 307.

A single specimen was preserved from six miles off Port Stephens, New South Wales, 43 fathoms.

GENUS ANTHIAS, *Bloch.*

Anthias, Boulenger, Brit. Mus. Cat. Fish., 2nd ed., i., 1895, p. 320.

A careful examination of fourteen specimens of *A. pulchellus*, Waite, shows that the differences between this genus and *Cæsioperca* are very slight. Comparing the definitions of the two, as given by Boulenger (*loc. cit.*, pp. 311 and 320), it appears that the only reliable differences between them are as follows:—

Scales rough on the border, denticulated; tubes of the lateral line bifurcate, short. Dorsal with 19-23 rays. Anal with 9-10 rays:— *Cæsioperca.*

Scales ciliated, smooth. Tubes straight or with an ascending tubule and extending along nearly the entire scales. Dorsal with 14-18 rays. Anal with 6-8 rays:— *Anthias.*

In *A. pulchellus* I find the number of fin rays agrees with *Anthias*, while the characters of the scales are distinctly those of *Cæsioperca*. In the fourteen specimens the number of fin-rays and scales is as follows:—D. x./16-17; A. iii./8; P. 15-16; l. lat. 41-45.

My colleague, Mr. E. F. Hallmann, very kindly prepared microscopical mounts for me of the scales of *Anthias pleurotænia*, Bleeker, *A. pulchellus*, Waite, *Cæsioperca rasor*, Rich., and *C. lepidoptera*, Forster. In the first-named only are they smooth with ciliated edges. Those of the other three have their borders roughened for varying distances

FIG. 12.

within the ciliated edges. In none do I find the tubes of the lateral line bifurcate, as stated by Boulenger, though they extend further across the scales in *A. pleurotænia* than in the others.

It follows, therefore, that if *A. pulchellus* be admitted as a true *Anthias*, the differences in the number of fin-rays alone can be used to distinguish *Cæsioperca* from that genus.

ANTHIAS PULCHELLUS, *Waite.*

(Fig. 12.)

Anthias pulchellus, Waite, Mem. Austr. Mus., iv., 1899, p. 77, pl. xii.

Of eleven specimens preserved only three bear the black spot on the dorsal fin. They were obtained off Norah Head, New South Wales, in 65 fathoms, and 60 miles south of Cape Everard, Victoria, 60-70 fathoms.

GENUS CALLANTHIAS, *Lowe.*

CALLANTHIAS ALLPORTI, *Günther.*

Allport's Perch.

Callanthias allporti, Günther, Ann. Mag. Nat. Hist. (4), xvii., 1876, p. 390; *id.*, Boulenger, Brit. Mus. Cat. Fish., 2nd ed., i., 1895, p. 335, pl. xv.; *id.*, Waite, Prelim. Rept. "Thetis" Exped., 1898, p. 31, pl. ii.

Callanthias platei, Boulenger, Ann. Mag. Nat. Hist. (7), iii., 1899, p. 346; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 80; *id.*, *ibid.*, Rec. Austr. Mus., v., 1903, p. 56 (*nec C. platei*, Steindachner).

Callanthias platei australis, Ogilby, Proc. Linn. Soc. N.S. Wales, xxiv., 1899, p. 173.

In 1898 Waite (Prelim. Rept. "Thetis") recorded six specimens from the New South Wales coast as *C. allporti*, Günther, but noted that they did not wholly agree with the published descriptions of that species. Boulenger (Ann. Mag. Nat. Hist.), with Günther's type before him, considered that Waite's figure represented a distinct species and identified it with *C. platei*, Steindachner,[1] which had just been described from Juan Fernandez. Later, Ogilby (Proc. Linn. Soc. N.S.W.), noting certain differences between Steindachner's figure and the Australian fish, proposed to separate the latter under the varietal name *australis*, but this name was not adopted by Waite, who referred to it simply as *C. platei* (Mem. Austr. Mus., iv., and Rec. Austr. Mus., v.).

With twenty-three specimens taken by the "Endeavour" and four others in the museum collection before me, I find that the "Thetis" specimens were correctly identified as *C. allporti*, and that *C. platei australis* is merely the young form

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1 Steindachner—Faun. Chilensis, Zool. Jahrb., Suppl., iv., 2, 1898, p. 284, pl. xv.

of that species. *C. allporti* varies greatly with age both in the depth of the body and height of the vertical fins, so that Waite's figure represents the half-grown fish about 200 mm. long, while that in the British Museum Catalogue is the figure of an adult specimen.

Though closely approaching the figure of *C. platei* in its younger stages, *C. allporti* nevertheless appears to be distinguished by its larger eye and higher vertical fins. The other characters used by Ogilby to differentiate the variety *australis* are dealt with below.

My series includes specimens from less than five inches to others over eleven inches long, and they show that the body is much more slender in young individuals than in adults. The greatest depth in the smallest specimen is 3·21 in the length from the snout to the hypural, and it regularly increases with age until in the largest it is 2·66 in the same.

The height of the vertical fins also varies with age, as well as individually. In the smallest specimen the longest anal rays are 7·3 in the above length, while a large example has them 5·04 in the same. In none are they so short as in the figure of *C. platei* which shows them to be about 8·3 in that length.

The length of the head varies from 3·88 (young) to 4·61 (adult) in the length from the snout to the hypural. In his comparison of *C. platei* with *C. p. australis*, Ogilby's figures show the head to be much smaller in the first-named. My specimens, however, and a comparison of Steindachner's and Waite's illustrations show that this difference is not so great as is indicated.

The eye of the young is larger than that of the adult, being 2·7 as against 3 in the length of the head. The eye of *C. platei* is proportionately smaller. The maxillary generally extends to below the anterior margin of the pupil, but in one specimen reaches almost to the middle of the eye. Ogilby's counting of the fins and scales agrees with mine.

Ogilby has erected the genus *Anogramma* for *C. allporti* regarding the strength of the vomerine teeth to be of generic importance. I have large specimens agreeing in every other way with the figure of *C. allporti* in which these are either small or absent, while others of the *australis* form have them well developed. *Anogramma* is therefore unnecessary.

The "Endeavour" collection includes forty-three specimens, most of which come from off Flinders Island, Bass Strait. Six were preserved from eleven miles east of Barrenjoey Head, New South Wales, 40 fathoms.

GENUS CÆSIOPERCA, *Castelnau.*
CÆSIOPERCA RASOR, *Richardson.*
Red Perch.

Serranus rasor, Richardson, Proc. Zool. Soc., 1839, p. 95, and Trans. Zool. Soc., iii., 1849, p. 73, pl. iv., fig. 1.

Anthias rasor, Günther, Brit. Mus. Cat. Fish., i., 1859, p. 93; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 311; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 109; *id.*, Lucas, Proc. Roy Soc. Vict., 2 ser., ii., 1890, p. 17.

Cæsioperca rasor, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 49; *id.*, Boulenger, Brit. Mus. Cat. Fish., 2nd ed., i., 1895, p. 313.

Anthias rasor var. *extensus*, Klunzinger, Arch. fur. Nat., xxxviii., i., 1872, p. 17.

Anthias extensus, Klunzinger, Sitzb. Ak. Wiss. Wien, lxxx., i., p. 339, pl. ii.

Cæsioperca extensa, Boulenger, Brit. Mus. Cat. Fish., 2nd ed., i., 1895, p. 313.

The "Endeavour" specimens show that the colour markings of this species are subject to great variation. The black mark on the side may be large or only moderately developed, or altogether absent. One specimen shows a large black spot on one side and none on the other, while in a second example it covers fifteen scales on the left side and two on the right. The blue bands around the eye and on the body are well developed in some and wanting in others. Having counted fifteen specimens I find the number of scales and fin-rays to be as follows:—D. x.-xi./19-22; A. iii./9-10; P. 14-15; V. i./5; C. 15; l. lat. 49-55.

In separating his *Anthias extensus* from *A. rasor*, Klunzinger considered that it had a more slender body, longer pectorals, smooth preorbital, and lacked the characteristic markings of Richardson's species. The above notes prove that the latter character has no specific value, while Boulenger shows that the length of the pectorals does not differ in the two. Castelnau described the preorbital as strongly ciliated, but in all my specimens it is either entire or somewhat crenulate, and therefore agrees with both Klunzinger's and Richardson's figures. I find that the depth of the body varies from 2·75 to 3·0 in the length to the hypural, so that but one character, the smaller scales, is left to distinguish *extensus*. Klunzinger counted 62-63 scales on the lateral line, but it seems that he included some unperforated ones on the base of the tail, as his figure, which is by that most accurate artist, Konopicky, shows only 58.

Having disposed of these apparent differences I have no hesitation in following Macleay[1] in uniting the two species.

The "Endeavour" collection includes fifteen specimens from the following stations:—

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Oyster Bay, Tasmania.

Forty miles west of Kingston, South Australia, 30 fathoms.

Flinders Island, Investigator Group, South Australia, 37 fathoms.

Five others are in the Australian Museum from Tasmania and South Australia.

Cæsioperca lepidoptera, *Forster*.

Bastard Longfin.

Cæsioperca lepidoptera (Forster), Boulenger, Brit. Mus. Cat. Fish., 2nd ed., i., 1895, p. 312; *id.*, Waite, Prelim. Rept. "Thetis" Exped., 1898, p. 31, pl. i.

Though a large black spot on each side below the lateral line is characteristic of this species, yet some specimens in the collection show that it may occasionally be absent. Others also are marked with many small greenish spots which sometimes form short, irregular lines, and may be so crowded on the upper parts as to darken them considerably, while still others show three yellow longitudinal bands along the sides below the lateral line.

Twenty-two specimens were examined from the following localities:—

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Oyster Bay, Tasmania, 40-60 fathoms.

Flinders Island, Investigator Group, South Australia, 37 fathoms.

Genus Exoplosus, *Lacépède*

Exoplosus armatus, *Shaw*.

Old Wife, Bastard Dorey, Zebra Fish.

Chætodon armatus, Shaw in White, Voy. N.S. Wales, 1790, p. 254, fig. 1.

Specimens of this widely distributed species were preserved from off the Clarence River, New South Wales, 26-30 fathoms, Shoalhaven Bight, New South Wales, 15-45 fathoms, and off the east coast of Flinders Island, Bass Strait, 40 fathoms.

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1 Macleay—Proc. Linn. Soc. N.S. Wales, ix., 1884, p. 4.

Family APOGONICHTHYIDÆ.

Genus Apogonops, *Ogilby*.

Apogonops, Ogilby, Proc. Linn. Soc. N.S. Wales, xxi., 1896, p. 23 (*anomalus*).

Ogilby's definition of this genus requires amendment and correction. Studying his type specimen I find that whereas he saw no supplemental bone to the maxillary there is really a very distinct bone lying along the upper and inner margin of the maxillary. He writes, also, "vomer, palatines and tongue edentulous;" both the first-named bear very minute teeth, and there are also some larger ones intermingled with the others on the vomer. The teeth on the jaws are as described in the type, but in large examples they are as described below. Instead of "a single dorsal fin, deeply notched," there are two dorsals separated by a short interspace.

No scales remain on any part of the body but the lateral line in the type, but in one of the specimens taken by the "Thetis" Expedition there are some on the upper portion of the head, body and base of the tail. Ogilby has stated that they are cycloid and concentrically striated. This applies to the head scales only, they being distinctly ctenoid everywhere else.

All these characters are much more easily detected in my largest specimens, 122 mm. long, than in the type which is only 54 mm. long, and, considering the care which Mr. Ogilby usually lavished on his descriptions, the differences detected are doubtless due to the want of sufficient microscopical appliances on his part.

Apogonops is apparently closely allied to *Synagrops*, Günther, but is distinguished by having three instead of only two anal spines.

Apogonops anomalus, *Ogilby*.

(Fig. 13.)

Apogonops anomalus, Ogilby, Proc. Linn. Soc. N.S. Wales, xxi., 1896, p. 24; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 74, pl. xi., fig. 1.

D. ix. i., 10; A. iii., 7; P. 13 + 1, V. i., 5; C. 17; l. lat. 46-50 to hypural. Head $2\frac{5}{6}$-$3\frac{1}{6}$, depth $4\frac{1}{10}$ in the length to the hypural. Eye 3-$3\frac{1}{6}$ in the head, longer than the snout which is $3\frac{3}{4}$. Interorbital space $4\frac{1}{6}$. Caudal peduncle $2\frac{1}{3}$-$2\frac{1}{2}$, as long as broad, its depth equal to the length of the eye.

Body elongate-oblong, tapering posteriorly, compressed. Head large, some of the bones covered with membrane enclosing canals beneath it. Mouth oblique, maxillary reaching to or not so far as the middle of the eye, its posterior border slightly emarginate; supplemental bone distinct, lying along the upper margin of the maxillary and turned in towards its inner side. Preorbital entire. Preoperculum with two borders, the inner entire, the outer serrated at and near the angle which is a little produced; short ridges extend from each tooth across the bone. Operculum with two spines, the lower a little longer than the upper. Suprascapular rounded, with a dentate margin, and a ridge on its lower portion extending forwards. Nostrils situated on the hinder half of the snout, almost equal in size, the anterior with a skinny margin.

Teeth in villiform bands on the jaws, vomer and palatines, with scarcely any larger ones in the young. In the adult the premaxillaries bear crowded villiform teeth along their whole length, and have a pair of large curved fangs near their symphyses which may be double. Between these bones there is a median excavation which is toothless. Mandible with a narrow band of villiform teeth which is widest anteriorly. A strong pair of canines, corresponding to but smaller than those of the upper jaw, in front; on either side large curved teeth occur among the others which increase in size as they extend backwards, and terminate about half way along the length of the jaw. These larger teeth are variable in size and number in different specimens. Vomer with two diverging bands of minute teeth, among which are some larger ones. Palatines each with a long, narrow band of minute villiform teeth. Gill-rakers of first arch long and slender, the hinder ones more than half as long as the eye and each with the inner margin minutely denticulated; 21-22 on the lower limb.

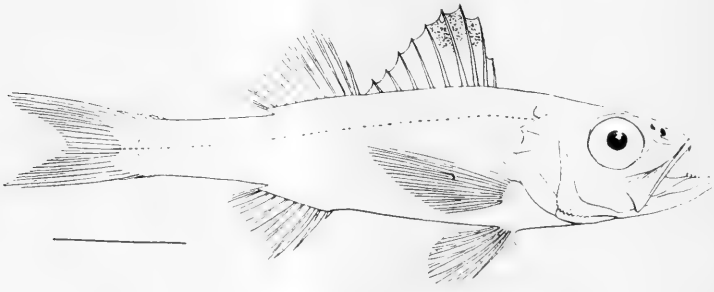

FIG. 13.

Scales very deciduous, those of the upper part of the head, preorbital and mandible rounded, concentrically striated and cycloid. They also appear to have been present on the cheeks and operculum. On the body they are similarly rounded and striated, but ctenoid; those of the lateral line have a deep notch in their posterior margins. The scales extend onto the fleshy bases of the dorsal and anal fins and onto the caudal. Lateral line almost straight and extending onto the scaly base of the caudal.

First dorsal fin originating over or a little behind the base of the pectorals; the third and fourth spines are subequal, $\frac{2}{5}$ or almost half as long as the head. The ninth spine is the shortest and is separated from the second dorsal by an interspace a little longer than its own length. Spine of the second dorsal slightly less than half as long as the rays, which are about equal to the length of the longest spines. Anal commencing below the third or fourth dorsal ray; the first spine is short and stout, the second shorter than but usually much stronger than the third which is but little shorter than the rays. Ventrals placed below the anterior part of the base of the pectoral and not nearly reaching to the vent; the spine is about two thirds the length of the second ray which is the longest. Pectorals very long, $\frac{2}{3}$-$\frac{3}{4}$ as long as the head, the upper ray rather longer than the others.

Colour.—Brownish or greyish above, lighter below; operculum, thorax and abdomen silvery. A series of about five dark blotches along the sides which are less distinct or absent in large specimens. Two darker patches on the scaly portion of the tail. Upper portion of the dorsal fin with a blackish patch between the second and fifth spines.

Described from two specimens, 54 and 122 mm. long, the smaller one being the type of the species. Fin formula and lateral line counted in nineteen specimens.

Forty-three specimens were preserved from the following localities:—

Between Port Setphens and Newcastle, New South Wales, 22-60 fathoms.

Twenty-five miles south-west of Cape Everard, Victoria, 83-98 fathoms.

Thirty-six miles off Cape Everard, Victoria, 75 fathoms.

Family AMBASSIDÆ.

Genus Priopis, *Kuhl and Van Hasselt.*

Priopis ramsayi, *Macleay,*

(Plate xvi., fig. 3.)

Pseudoambassis ramsayi, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 340.

Ambassis ramsayi, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 14.

Chanda ramsayi, Waite, Mem. N S. Wales Nat. Club, No. 2, 1904, p. 29.

Ambassis gymnocephalus, Ramsay and Ogilby, Proc. Linn. Soc. N.S. Wales, i. (2), 1887, p. 1102. (Perhaps not *A. gymnocephalus* (Lacépède) Bleeker.)

Abasassis, sp., Ogilby, Proc. Linn. Soc. N.S. Wales, iii. (2), 1889, p. 1559.

Chanda gymnocephalus, Waite, Mem. N.S. Wales Nat. Club, No. 2, 1904, p. 29.

D. vi.-vii., 10-11; A. iii., 10-11; P. 14; V. i.-5; C. 17; sc. lat. 25-26; sc. tr. 3 + 7. Depth nearly $2\frac{1}{2}$, head $3\frac{1}{4}$ in the length to the hypural. Eye $2\frac{3}{4}$-3, orbit $2\frac{1}{2}$ in the head, and twice as long as the snout. Interorbital width $1\frac{1}{2}$ in the orbit. Caudal peduncle 2 in the head.

Body rather deep, compressed. Upper anterior profile interrupted over the eye, the back between the nape and the dorsal more or less keeled. Supraorbital ridge smooth anteriorly, armed with three to five spines on its posterior portion which is bent downwards. Antero-inferior orbital ring crenulate or spinulate. Preorbital strongly denticulate. Lower limbs of preoperculum denticulated, all the other bones smooth. Maxillary reaching to below the anterior margin of the eye. Two rows of scales on the cheeks, one behind the eye; operculum with large irregular scales, a single row on the interoperculum. Minute teeth on the jaws, vomer, palatines and tongue. Gill-rakers flattened, spinulate on their inner edges, the longest about half as long as the eye.

Scales of the body extending forwards to above the middle of the eye and onto the bases of the dorsal, anal and caudal fins. Lateral line interrupted below the spine of the second dorsal or farther forward, each scale with its free margin notched. There are ten to thirteen scales on the first portion which is arched, and twelve to fourteen on the straight portion.

Origin of the first dorsal a little nearer the end of the second than the tip of the snout. The first spine short, the second strong and subequal to the third and $1\frac{1}{4}$ to $1\frac{1}{3}$ in the head; the last is joined to the second dorsal by membrane. Spine of the second dorsal two-thirds as long as those of the first, shorter than the anterior rays. Anal commencing and terminating behind the second dorsal, its base either slightly longer or shorter than that fin; the first spine short, the second and third long and stout, the last as long as the rays but shorter than the second dorsal spines. Pectorals almost reaching the vertical of the first anal spines. Ventrals reaching to or slightly beyond the vent which is placed well in advance of the anal fin. Caudal deeply forked.

Colour.—Whitish, the scales of the upper portion of the body margined with olive-green dots. A thin dark line on the median line of the tail, and a silvery lateral band in specimens in spirits. Upper portion of the head, lips and lower jaw densely spotted with olive-green. Membrane between the second and third dorsal spines blackish, and the tips of the soft dorsal and anal are darker. Caudal more or less spotted, its margin darker.

Described from two specimens, 80 and 88 mm. long, recently collected in a prawn net at San Souci, Botany Bay, by Mr. J. H. Wright, and presented by him to the Australian Museum. Two very imperfect specimens are in the "Endeavour" collection which were taken near Sydney.

I have examined the type of *Pseudoambassis ramsayi* in the Macleay Museum. It is very shrivelled and has lost many of its scales, but leaves no doubt that the specimens described above are correctly identified. I have also examined the specimens from the Parramatta River, identified by Ramsay and Ogilby as *A. gymnocephalus*, and find them to be identical with Macleay's species, though whether they are really *gymnocephalus* also I am unable to say. They appear, however, to have a much deeper body and less slender caudal peduncle than that species.

Family SILLAGINIDÆ.

References to the Australian species of this family are in an extremely confused state. I have endeavoured to sort some of them into the order I believe they should be, and furnish a key which is drawn up principally from an examination of a number of specimens of each species:—

a. Dorsal fins united, the first with 12-14 spines. Scales in about 130 rows:— ISOSILLAGO.

b. D. xii.-xiv., 25-27; A. 24-25. Body with small dark spots:— *punctata.*

aa. Dorsal fins separate, the first with 10-12 spines. Scales in 65-75 rows:— SILLAGO.

c. A conspicuous dark mark at the base of the pectoral.

d. Caudal peduncle as broad as the postorbital portion of the head.

e. D. xi., 18; A. 17-18; l. lat. 63-65:— *ciliata.*

dd. Caudal peduncle narrower than the postorbital portion of the head.

f. D. xi.-xii., 20-21; A. 21; l. lat. 70-71:— *maculata.*

cc. No black mark on the base of the pectoral.

g. Ventrals placed below the origin of the first dorsal.

h. D. xi., 18; A. 20; l. lat. 65:—*robusta.*

gg. Ventrals placed in advance of the origin of the dorsal.

i. D. x.-xi., 18-20; A. 20-22; l. lat 66-68:— *bassensis.*

ii. D. xi., 21-22; A. 19-21; l. lat. 69-74:— *bostockii.*

iii. D. xi., 22-23; A. 24-25; l. lat. 70:— *sihama.*

Neosillago marmorata, Castelnau,[1] having only five spines in the first dorsal, is evidently not a member of this family, but possibly belongs to the *Nototheniidæ.*

Having had the opportunity of examining the types of *Isosillago maculata*, Macleay,[2] I find that the number of spines and rays in the dorsal and anal fins are incorrectly stated in the original description. There are thirteen spines in the first dorsal and one spine and twenty-four or five rays in the second; the anal has twenty-four spines and rays in all. In these and all other characters they agree with *Sillago punctata*, Cuv. & Val., but may very well form the type of a distinct genus *Isosillago*, characterised by the union of the two dorsals, larger number of spines in the first, and by having very small scales.

I am unable to find any specimens marked as the types of *Sillago gracilis*, Alleyne and Macleay,[3] in the Macleay Museum, but there are two small specimens labelled "Sillago sp? Torres Straits," which I have no doubt are the types. Through the kindness of Professor Haswell and Professor David, I have been allowed to borrow them for examination. One is a little larger than the other, and from the snout to the end of its broken tail is almost 82 mm. long, which is exactly the length of the figure of *S. gracilis*. In other details also, such as the form of the damaged tail and the pronounced shrinkage marks on the head, it agrees perfectly with the figure, though it has lost all trace of the colour markings with the exception of the silvery lateral band. Both differ from the description in the number of fin-rays in the dorsal and anal, there being only one spine and twenty rays in each instead of one, twenty-

1 Castelnau—Res. Fish. Austr. (Vict. Rec. Philad. Exhib.), 1876, p. 16.

2 Macleay—Proc. Linn. Soc. N.S. Wales, iii., 1878, p. 34, pl. iv., fig. 3.

3 Alleyne and Macleay Proc. Linn. Soc. N.S. Wales, i., 1877, p. 279, pl. vi., fig. 2.

two as stated. I regard this of little importance, however, since Macleay also counted the same fins wrongly in his much larger specimens of *Isosillago maculata*, as noted above.

If these two specimens be regarded as the types of *S. gracilis*, that species must be sunk as a synonym of *S. maculata*, Q. & G., as both the specimens and the figure agree well with that species.

Genus Sillago, *Cuvier*.

Sillago bassensis, *Cuvier and Valenciennes.*

Bass Whiting, School Whiting.

Sillago bassensis, Cuvier & Valenciennes, Hist. Nat. Poiss., iii., 1829, p. 412; *id.*, Ogilby, Ed. Fish. N.S. Wales, 1893, pp. 99, 101, 102; *id.*, Waite, Rec. Austr. Mus., iv., 1902, p. 190; *id.*, Stead, Proc. Linn. Soc. N.S. Wales, xxx., 1906, p. 574, and Ed. Fish. N.S. Wales, 1908, p. 65, pl. xxxv.

Sillago maculata, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 94; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 116; *id.*, Lucas, Proc. Roy. Soc. Vict. (n. ser.), ii., 1890, p. 26 (after Castelnau); *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 109; (*nec. S. maculata*, Q. & G.).

Sillago ciliata, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), pp. 80, 116 (*nec S. ciliata*, Cuv. & Val.).

Many specimens of this common southern species were preserved. I have counted the fin-rays and scales of forty specimens from New South Wales, Victoria, Tasmania, South Australia and West Australia and find them to be as follows: —D. x.-xi./18-20; A. 20-22; l. lat. 66-68.

The "Endeavour" specimens were taken at the following stations:—

Off the east coast of Flinders Island, Bass Strait.

Off the mouth of the Murray River, South Australia, 20 fathoms.

South-east of Flinders Island, Investigator Group, South Australia, 37 fathoms.

Sillago maculata, *Quoy and Gaimard.*

Trumpeter Whiting.

Sillago maculata, Quoy & Gaimard, Voy. "Uranie," 1824, p. 261, pl. liii., fig. 2; *id.*, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 245 (part.); *id.*, Steindachner, Sitzb. Ak. Wiss. Wien., liii., p. 444; *id.*, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877, p. 279; *id.*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii., 1879, pp. 380-381; *id.*, Klunzinger, Sitzb., Ak. Wiss. Wien., lxxx. i., p. 370; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 566; *id.*, Woods, Fish. N.S. Wales, 1882, p. 65, pl. xxiii.; *id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 31; *id.*, Kent, Gt. Barrier Reef, 1893, pp. 292, 370; *id.*, Ogilby, Ed. Fish. N.S. Wales, 1893, p. 101 (part.); *id.*, Waite, Rec. Austr. Mus., iv., 1902, pp. 190, 191; *id.*, Waite, Mem. N.S. Wales Nat. Club, No. 2, 1904, p. 31; *id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 64, pl. xxxiv.

Sillago burrus, Richardson, Icones Piscium, 1843, p. 5, pl. ii., fig. 1; *id.*, Castelnau, Proc. Linn. Soc. N.S. Wales, ii., 1878, p. 232.

Sillago gracilis, Alleyne & Macleay, Proc. Linn. Soc. N.S. Wales, i., 1877, p. 279, pl. vi., fig. 2.

These are all the Australian references I know of which can be definitely associated with this species. I have examined specimens from the neighbourhood of Sydney, the Gulf of Carpentaria and Fremantle, West Australia.

SILLAGO CILIATA, *Cuvier and Valenciennes*.

Sand Whiting.

Sillago ciliata, Cuvier & Valenciennes, Hist. Nat. Poiss., iii., 1829, p. 415; *id.*, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 245; *id.*, Steindachner, Sitzb. Ak. Wiss. Wien., liii., 1866, p. 443; *id.*, Kner, Reise Novara, Fische, 1869, p. 127; *id.*, All. & Macl., Proc. Linn. Soc. N.S. Wales, i., 1877, p. 279; *id.*, Klunzinger, Sitzb. Ak. Wiss. Wien, lxxx. i., 1879, p. 369; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 567; *id.*, Woods, Fish. N.S. Wales, 1882, p. 65, pl. xxiv.; *id.*, Ogilby, Cat. Fish. N.S. Wales, 1886, p. 31; *id.*, McCoy, Prodr. Zool. Vict., 1889, pl. clxxxii.; *id.*, Kent, Gt. Barrier Reef, 1893, pp. 292 and 370, pl. xlv., fig. 2; *id.*, Ogilby, Ed. Fish. N.S. Wales, 1893, p. 102, pl. xxvii.; *id.*, Waite, Rec. Austr. Mus., iv., 1901, p. 47; *id.*, Waite, Mem. N.S. Wales Nat. Club, No. 2, 1904, p. 31; *id.*, Jordan & Seale, Bull. U.S. Bur. Fish., xxv., 1905 (1906), p. 277; *id.*, Stead, Ed. Fish. N.S. Wales, 1908, p. 63, pl. xxxiii.

Sillago terræ-reginæ, Castelnau, Proc. Linn. Soc. N.S. Wales, ii., 1878, p. 232.

Sillago bassensis, Castelnau, Proc. Linn. Soc. N.S. Wales, iii., 1879, p. 381; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, v., 1881, p. 567; *id.*, Kent, Gt. Barrier Reef, 1893, p. 291; *id.*, Tosh, Proc. Roy. Soc. Qld., xvii., 1903, p. 175, pls. viii-xiv. (*nec. S. bassensis*, C. & V.).

This species occurs all along the eastern coast of Australia, and has been recorded from Cape York to Port Phillip. A specimen in the British Museum is said to be from Tasmania.

The specimens recorded by Castelnau from Fremantle district, West Australia, as *S. ciliata*[1] are not that species. The Australian Museum has recently received some fine examples from the same locality, from Mr. A. Abjornssen, which differ from *S. ciliata* in having smaller scales, a much narrower caudal peduncle, more rays in the dorsal and anal fins, and in lacking the characteristic dark mark at the base of the pectorals. They are evidently identical with Castelnau's specimens and must, therefore, receive the alternative name, *bostockii*, which he proposed in case they should prove distinct from the eastern species.

Family SCIÆNIDÆ.

Genus Cynoscion, *Gill.*

Cynoscion atelodus, *Günther.*

Teraglin.

Otolithus atelodus, Ogilby, Ed. Fish. N.S. Wales, 1893, p. 75, pl. xxiii.

Cynoscion atelodus, Stead, Ed. Fish. N.S. Wales, 1908, p. 67, pl. xxxviii.

Three examples of this species, each about a foot long, were taken fifteen miles off Saddle Hill, New South Wales, in 35 fathoms.

Family GERRIDÆ.

Genus Chthamalopteryx, *Ogilby.*

Chthamalopteryx melbournensis, *Castelnau.*

Gerres melbournensis, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 158, and ii., 1873, p. 37.

Chthamalopteryx melbournensis, Ogilby, Proc. Zool. Soc. 1887, p. 616, fig.

The "Endeavour" collection includes many specimens of this species which were taken at the following stations:—

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Off the mouth of the Murray River, South Australia,, 20 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

Spencer Gulf, South Australia, 20 fathoms.

South-east of Flinders Island, Investigator Group, South Australia, 37 fathoms.

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1 Castelnau—Proc. Zool. Soc. Vict., ii., 1873, p. 133.

FAMILY CHEILODACTYLIDÆ.

GENUS GONIISTIUS, *Gill.*

GONIISTIUS VIZONARIUS, *Kent.*

Magpie Perch.

(Plate xi.)

Cheilodactylus gibbosus, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 75; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 112; *id.*, Lucas, Proc. Roy. Soc. Vict., (n. ser.), ii., 1890, p. 21 (after Castelnau) (*nec. C. gibbosus*, Richardson).

Chilodactylus vizonarius, Kent, Proc. Roy. Soc. Tasm., 1887, pp. xxx., xxxi. and 48; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1890 (1891), p. 31.

Chilodactylus bizonarius, Kent, Naturalist in Austr., 1897, pp. 165, 166, pl. xxviii., fig. 13.

D. xviii., 25-28; A. iii., 10; P. 8 + 6; V. i., 5; C. 15; l. lat. 65-68.

Height of the body 2·6 to 2·8, length of the head 3·50 to 3·66 in the length to the hypural. Snout much longer than the diameter of the eye which is 4·2 to 4·8 in the head. Nostrils large, close together, the anterior with two skinny lobes. Mouth rather small, the maxillary reaching to below the posterior nostril. A band of villiform teeth in each jaw; vomer, palatines and tongue toothless. There is a large conical projection in front of each eye, extending slightly outwards and upwards.

First dorsal originating a little behind the vertical of the preoperculum, the fifth spine generally the longest, and either equal to the distance from the snout to the preoperculum or considerably shorter. Anterior rays subequal in length, gradually decreasing backwards, the longest somewhat longer than the snout. Third anal spine longer than the second; the second ray the longest and equal to the length from the snout to the preoperculum. The simple rays of the pectoral are very variable in their relative lengths; the second is always the longest and reaches either to the origin or middle of the anal fin. Ventral spine slender, generally equal to the fourth dorsal spine in length; the first ray reaches to, or almost to the vent. Caudal deeply forked.

Scales large anteriorly, becoming smaller behind. They form a sheath to the bases of the dorsal and anal fins. On the head they are very small and extend forwards to the anterior margin of the eyes above and to the maxillary below, leaving the snout bare. They are very small on the breast also, and on a narrow band which extends backwards to the ventrals. Lateral line feebly arched, its course directed to the upper part of the caudal peduncle, whence it extends onto the base of the tail.

Colour.—Silvery, the scales with or without darker margins. A broad black band occupies the space between the fifth and thirteenth dorsal spines and extends to the ventrals, narrowing considerably as it approaches them. A second similar band extends from the soft dorsal to the anal, while there is another less distinct one enveloping the anterior portion of the head and defined posteriorly by a line descending from the nape, behind the eye to the throat. These two last bands are usually not so well defined as the first, and may be altogether absent. Pectorals, ventrals and anal blackish; dorsals and caudal light or dusky, the dark bands of the body sometimes continued onto the former.

Described from six specimens, the largest being 380 mm. long.

This species is so far recorded from Tasmania and Victoria only, but there is a specimen in the Australian Museum from Adelaide. Castelnau confused it with *Cheilodactylus gibbosus*, Richardson, and as such recorded it first from Hobson's Bay and later from Port Jackson.[1] The Victorian record undoubtedly refers to *G. vizonarius*, while the second is based on the true *G. gibbosus* which is occasionally seen around piles, etc., in Port Jackson in small numbers.

This species is undoubtedly a member of the same genus as the *Cheilodactylus vittatus*, Garrett, described and figured by Jordan and Evermann.[2] but whether this really belongs to Lacépède's genus is doubtful. I therefore place *vizonarius* in *Goniistius*, to which genus Waite referred *G. vittatus*.[3]

The specimens preserved in the "Endeavour" collections came from Anderson Bay, Tasmania, 14 fathoms, and off the east coast of Flinders Island, Bass Strait.

Genus Dactylosparus, *Gill.*

Dactylosparus, Gill, Proc. Acad. Nat. Sci. Philad., 1862 (*carponemus*, Cuv. & Val.).

This genus appears to be distinguished from *Cheilodactylus*, Lacépède, chiefly in having the anal fin oblong and nearly uniformly high instead of short and highest anteriorly.

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1 Castelnau—Proc. Linn. Soc. N.S. Wales, iii., 1879, pp. 351, 363.

2 Jordan & Evermann—Bull. U.S. Fish. Comm., xxiii., pt. 1, 1903 (1905), p. 447, pl. liv.

3 Waite—Rec. Austr. Mus., iv., 1902, p. 185.

DACTYLOSPARUS CARPONEMUS, *Cuvier and Valenciennes.*
Morwong.

Chilodactylus carponemus (Cuvier and Valenciennes), Ogilby, Ed. Fish. N.S. Wales, 1893, p. 55, pl. xviii.

The collection includes six young examples, 125-145 mm. long, which have much deeper bodies than adult specimens, and are marked with a round dark spot on the lateral line below the posterior part of the spinous dorsal. They were obtained off the east coast of Flinders Island, Bass Strait, and between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

DACTYLOSPARUS MACROPTERUS, *Forster.*

Jackass Fish, Silver Perch, Terakihi.

(Plate xii.)

Chilodactylus macropterus (Forster), Ogilby, Ed. Fish. N.S. Wales, 1893, p. 57.

This common species is represented from the following localities:—

Off the east coast of Flinders Island, Bass Strait.

Off the mouth of the Murray River, South Australia, 20 fathoms.

Forty miles west of Kingston, South Australia, 30 fathoms.

FAMILY TERAPONIDÆ.

GENUS HELOTES, *Cuvier.*

HELOTES SEXLINEATUS, *Quoy and Gaimard.*

Butter Fish.

Terapon sexlineatus, Quoy and Gaimard, Voy. "Uranie," 1824, p. 340, pl. lx., fig. 1.

Two specimens of this species were secured in the Melbourne market by Mr. Dannevig, which probably came from South Australia. They were called Butter-fish by the fishermen.

FAMILY MÆNIDÆ.

GENUS EMMELICHTHYS, *Richardson.*

EMMELICHTHYS NITIDUS, *Richardson.*

Emmelichthys nitidus, Richardson, Zool. Ereb. & Terr., Fishes, 1845, p. 47, pl. xxix., figs. 7-8.

Two small specimens were obtained thirty-six miles off Cape Everard, Victoria, in 75 fathoms. It is probable that they entered the net as it neared the surface, since the species has been taken in a surface net, swimming with pilchards and mackerels.[1] This fish has been recorded from West Australia, Tasmania, New South Wales and New Zealand.

Family HISTIOPTERIDÆ.

Genus Zanclistius, *Jordan.*

Zanclistius, Jordan, Proc. U.S. Nat. Mus., xxxii., 1907, p. 236 (*elevatus*).

Anal spines three; soft dorsal very high, usually falcate, with about twenty-six rays.

Zanclistius elevatus, *Ramsay and Ogilby.*

Short Boar Fish.

(Figs. 14-18.)

Histiopterus elevatus, Ramsay and Ogilby, Proc. Linn. Soc. N.S. Wales (2), iii., 1888, p. 1311; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 114, pl. xxvi.

Zanclistius elevatus, Waite, Proc. N. Zealand Inst., pt. 1, 1910, p. 25, and Rec. Cantb. Mus., i., 1911, p. 216; *id.*, Kershaw, Vict. Nat. xxviii., 1911, p. 93.

Fifty-two specimens, of all sizes between 75 and 300 mm. long, exhibit a remarkable range of variation in certain of the characters that are usually relied upon to differentiate the species of this family. That these are not due to either age or growth is adequately shown by this splendid series, while it is also clear that they cannot be entirely connected with sex.

Figures 14-18 illustrate five selected variations, their relative sizes being shown by the inch-line accompanying each.

The most striking variation is in the angle and form of the dorsal profile. In some specimens the line from the first dorsal spine to the base of the snout is almost straight, being broken only by a slight convexity over the eyes. In others it is an irregular arch interrupted by a large bony boss on the occipital region, and another smaller one over each eye. From these last the profile may extend obliquely forward so that the nostrils are placed nearly an eye-diameter in front of the anterior margin of the orbit, or it may follow the curvature of the eye so that they are only very little in front of the eye. The size of the eye is also subject to variation.

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1 Stead—Add. Fish Faun. N.S. Wales, No. 1 (Dept. Fish. N.S.W.), 1907, p. 16

FIG. 14.

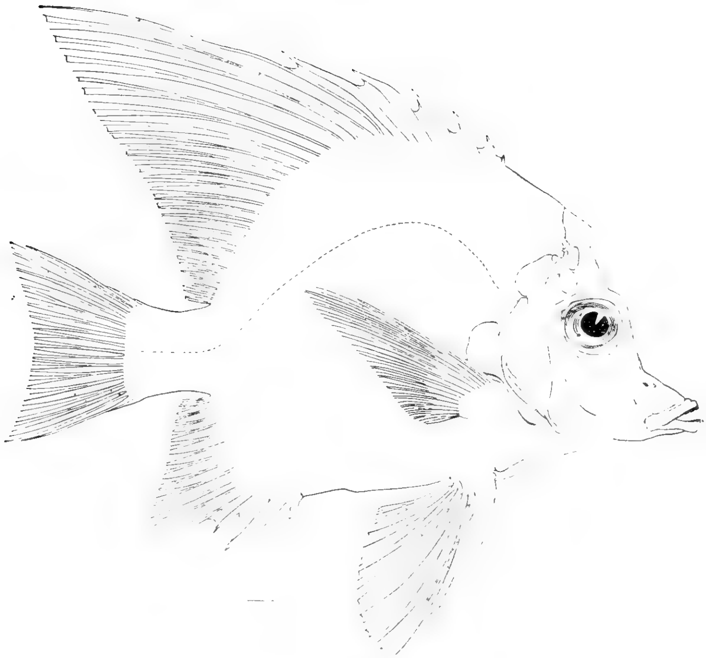

FIG. 15.

Two very young specimens have the bones of the head more strongly ribbed than in the larger examples, and they bear some prominent flattened spines on the occiput and above the eyes. Smaller spines are found on the lower end of the preorbital and on the suprascapular, and the angle and adjacent borders of the preoperculum are armed with strong teeth.

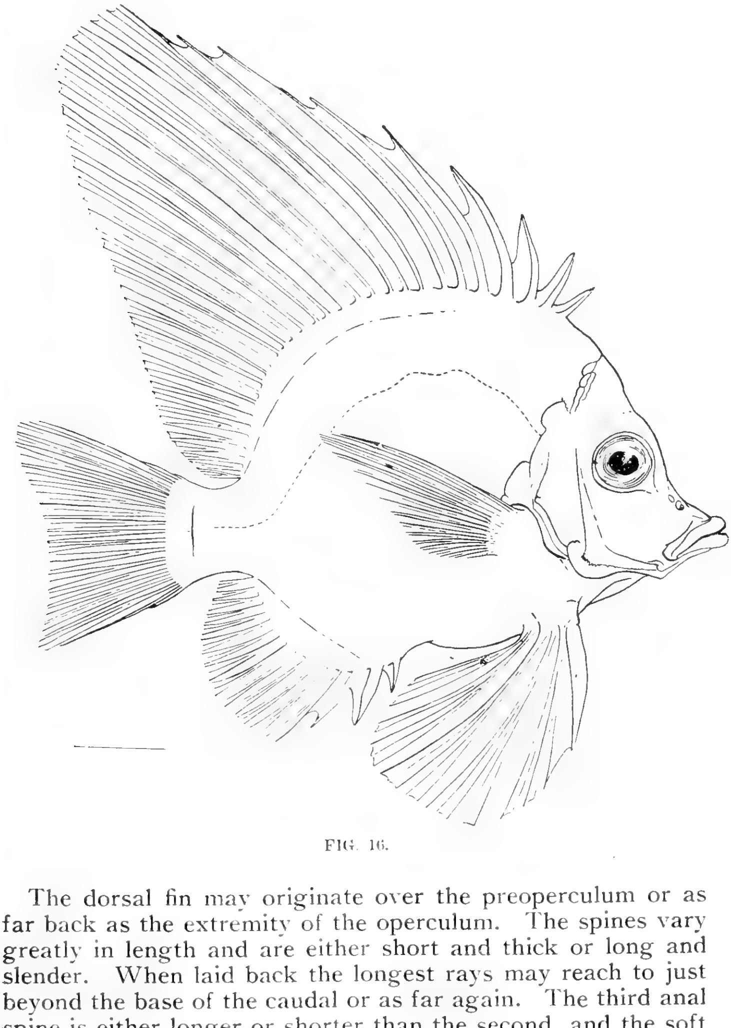

FIG. 16.

The dorsal fin may originate over the preoperculum or as far back as the extremity of the operculum. The spines vary greatly in length and are either short and thick or long and slender. When laid back the longest rays may reach to just beyond the base of the caudal or as far again. The third anal spine is either longer or shorter than the second, and the soft portion of the fin may be rounded or else the anterior rays are much the longest. The ventral spine is placed below the middle of the pectoral in some specimens and well in advance of it in others. Notwithstanding the variable form and position of the fins, their numbers of rays and spines are fairly constant, and in twenty-five specimens I find them to be as follows:—D. vi./25-28, A. iii./12-15, P. 14-16, V. i./5, C. 17.

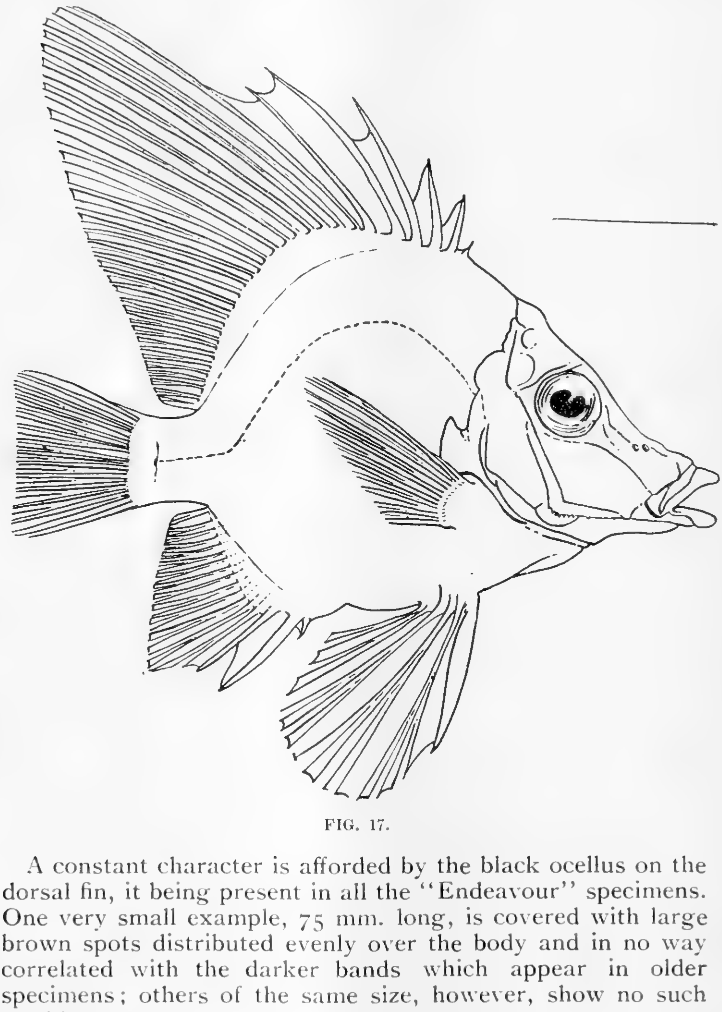

FIG. 17.

A constant character is afforded by the black ocellus on the dorsal fin, it being present in all the "Endeavour" specimens. One very small example, 75 mm. long, is covered with large brown spots distributed evenly over the body and in no way correlated with the darker bands which appear in older specimens; others of the same size, however, show no such marking.

The specimens came from the following stations:—

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Disaster Bay, New South Wales.

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

North-west of Greenly Island, South Australia, 44 fathoms.

Flinders Island, Investigator Group, South Australia, 37 fathoms.

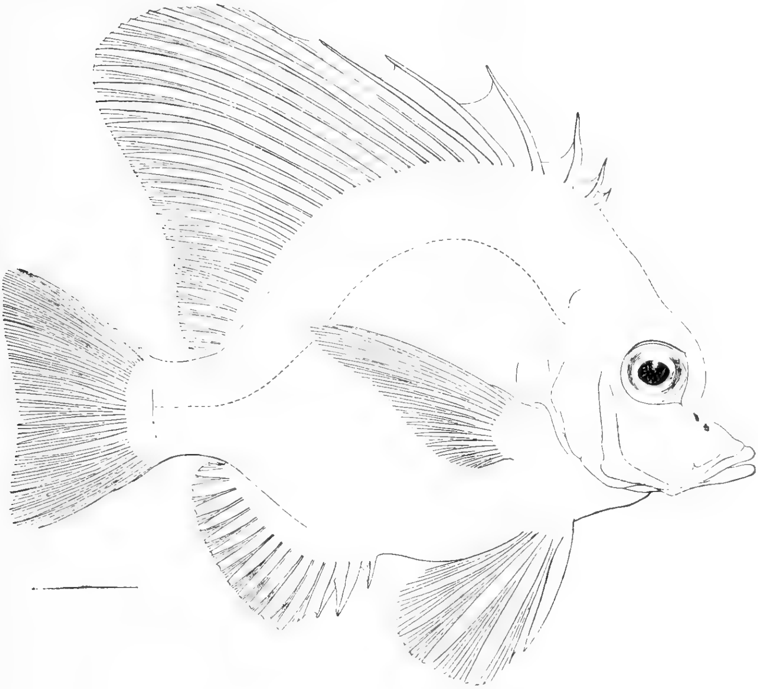

FIG. 18.

GENUS PENTACEROPSIS, *Steindachner.*

PENTACEROPSIS RECURVIROSTRIS, *Richardson.*

Striped Boar Fish.

Histiopterus recurvirostris, Richardson, Zool. Ereb. & Terr., Fishes, 1845, p. 34, pl. xxii., fig. 5-6; *id.*, Canestrini, Arch. Zool. Anat., i. (2), p. 152, pl. ii.; *id.*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 109; *id.*, Klunzinger, Sitz. Ak. Wiss. Wien., lxxx. i., p. 376; *id.*, Johnston, Proc. Roy. Soc. Tasm., 1882 (1883), p. 110.

Prosoplismus recurvirostris, Waite, Rec. Austr. Mus., v., 1903, p. 58, pl. vi.

Pentaceropsis recurvirostris, Waite, Ann. Mag. Nat. Hist., xii. (7), 1903, p. 288; *ibid.*, Rec. Austr. Mus., v., 1905, corrigenda, p. xiii.; *ibid.*, *loc. cit.*, vi., 1905, p. 62; *id.*, Jordan, Proc. U.S. Nat. Mus., xxxii., 1907, p. 236.

This species has been recorded from southern New South Wales, Victoria, Tasmania, South Australia and Fremantle, West Australia. Three specimens are included in the "Endeavour" collection which were trawled off the east coast of Flinders Island, Bass Strait.

Genus Maccullochia, *Waite.*

Richardsonia, Castelnau, Proc. Zool. Acclim. Soc. Vict., i., 1872, p. 112 (*insignis*=*labiosa*, not *Richardsonia*, Steindachner, 1866).

Richardsonia, Jordan, Proc. U.S. Nat. Mus., xxxii., 1907, p. 236.

Macullochia, Waite, Proc. N. Zealand Inst., pt. 1, 1910, p. 25 (*labiosa*), substitute for *Richardsonia*.

Maccullochia, Waite, Rec. Cantb. Mus., i., 1911, p. 217.

Anal spines two. Dorsal spines seven, the fourth longest and very high; soft dorsal low and short, with about seventeen rays.

Maccullochia labiosa, *Günther.*

Histiopterus labiosus, Günther, Proc. Zool. Soc., 1871, p. 658, pl. lix.; *id.*, Klunzinger, Sitz. Ak. Wiss. Wien., lxxx. i., p. 376; *id.*, Ogilby, Ed. Fish. and Crust. N.S. Wales, 1893, p. 29, pl. vii.

Richardsonia insignis, Castelnau, Proc. Zool. Acclim. Soc. Vict., i., 1872, p. 112.

Histiopterus farnelli, Waite, Mem. Austr. Mus., iv., 1899, p. 116, pl. xxvii.

Macullochia labiosa, Waite, Proc. N. Zealand Inst., pt. 1, 1910, p. 25.

Eleven specimens, 170-380 mm. long, prove that *H. farnelli*, Waite, is the young of Günther's species. From the deep-bodied form, with striking dark colour-markings, this fish changes into an elongate and uniformly coloured adult. The largest specimen in the collection is especially interesting in that it is just intermediate between the two extremes. While having the general appearance of *labiosus*, it has the long spines and markings of *farnelli*, but these latter, instead of being uniformly black, are composed of brown reticulating lines enclosing spots of the lighter ground colour. Mr. Waite has examined these specimens with me and agrees that they leave no doubt as to the identity of the two species.

A point worthy of consideration is the difference noted by Waite in the number of scales on the lateral line as counted by Ogilby and himself. I find that the lateral line may either follow the curvature of the body in an even line or else pursue an undulatory and irregular course. Bearing this in mind, together with the difficulty of counting the scales of these fishes, the seeming discrepancy disappears.

Shoalhaven Bight, New South Wales 15-45 fathoms.

Disaster Bay, New South Wales.

Off the east coast of Flinders Island, Bass Strait.

Family POMACENTRIDÆ.

Genus Chromis, *Cuvier*.

Chromis hypsilepis, *Günther*.

Brown Puller.

(Plate xiv.)

Heliastes hypsilepis, Günther, Ann. Mag. Nat. Hist. (3), xx., 1867, p. 66; *id.*, Castelnau, Proc. Linn. Soc. N.S. Wales, iii., 1879, p. 388; *id.*, Klunzinger, Sitzb. Ak. Wiss. Wien, lxxx. i., 1879, p. 398; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 71; *id.*, Ogilby, Mem. Austr. Mus., ii., 1889, p. 66.

Br. v.; D. xiii., 14; A. ii., 13; P. 20; V. i., 5; C. 15; l. lat. 20; Sc. 27.

The height of the body is $2\frac{1}{3}$ to $2\frac{1}{4}$, the length of the head $3\frac{3}{4}$ to $3\frac{1}{2}$ in the length from the snout to the hypural. Eye 3 to $2\frac{2}{3}$, caudal peduncle $2\frac{1}{6}$ in the head. Snout two-thirds as long as the eye.

Body ovate, compressed, the dorsal profile a little more arched than the ventral, and evenly curved from the snout to the first dorsal spine. Margin of the preoperculum striated, but smooth. Operculum ending in a single flat spine which is almost hidden by scales. Preorbital not very broad, equal to about one-third of the eye at its narrowest part. Interorbital space strongly convex, equal to or somewhat wider than the eye. Nostril round, a little nearer the eye than the end of the snout. Maxillary reaching a little behind the anterior margin of the eye; mouth small, oblique. Teeth conical, acute and spaced, arranged in a band in front, but gradually changing into a single series on the sides, the outer teeth larger than the others.

Entire body and head, with the exception of the chin and the tip of the snout, covered with ciliated scales; on the upper parts of the head they are small and irregular, larger on the cheeks, and very large on the operculum and body. They extend about half-way up the vertical fins between the spines and rays, and there is a scaly sheath at the bases of the spinous dorsal and anterior part of the anal; small scales also cover the base and sides of the tail and basal portion of the pectoral. A large pointed scale at the base of the ventral. Lateral line curved and terminating below the middle of the soft dorsal; a second, less distinct, series of tubes runs along the middle of the caudal peduncle, covering eight or nine scales. There are twenty-seven scales between the head and the hypural.

Origin of the dorsal over or a little behind the opercular spine. The first spine is short, two-thirds as long as the eye, the fifth and sixth the longest and half as long as the head; thence they decrease slightly, the last being three-fourths the length of the fifth. The soft dorsal is somewhat angular, its sixth ray the longest and one and a half in the head. Anal oblong, the first to the tenth rays subequal, one and a third in the head; second spine very strong and but little shorter than the rays. Upper rays of the pectoral longest, longer than the head. Ventrals pointed, the first ray produced and reaching beyond the vent. Caudal forked, the upper lobe longer and more pointed than the lower.

Colour.—Olive-green above, the head and lower surfaces yellowish, each scale of the back and sides with a darker centre. Spinous dorsal dusky, especially towards its margin. Soft dorsal and anal each with an indistinct dark median band. Base of the pectoral with a conspicuous blackish spot covering its upper half. A whitish spot on the upper part of the caudal peduncle immediately behind the dorsal.

Described from three specimens, one 188 mm. long, from the coast near Sydney, and two others in the Australian Museum from Lord Howe Island, 123-160 mm. long.

CHROMIS? IMMACULATUS, *Ogilby.*

Heliastes immaculatus, Ogilby, Proc. Linn. Soc. N.S. Wales, x., 1886, p. 446; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 86, pl. xiv.

When writing on this species, Waite (*loc. cit.*) suggested that it was identical with *C. hypsilepis*, and later, in his Catalogue of the Fishes of New South Wales,[1] he quotes his

[1] Waite—Mem. N.S. Wales Nat. Club, No. 2, 1904, p. 37.

figure of Ogilby's species under that name. *C. immaculatus*, however, is readily distinguished from *C. hypsilepis* by its much rounder body, shorter and broader caudal peduncle, larger number of rays in the dorsal and anal fins, and by the absence of the dark mark on the base of the pectoral and the white spot on the caudal peduncle. The teeth of the two species also are very different.

Ogilby has described the teeth as conical and arranged in a single series, but this is not altogether correct. In five specimens, including the type, there is an enlarged outer series of subcylindrical teeth with blunt points, arranged close together as in *Glyphisodon*. Behind these there is a second row of much smaller but similar teeth closely adpressed to the outer series, each tooth of which is placed behind the intersection of two front ones; this is doubtless a growing set to replace the outer one as it becomes worn or damaged, and an exactly similar arrangement is found in many species of *Glyphisodon* and *Hypsypops*. On the median line of the palate there is usually a single large depressible tooth of the same form as, but more slender than those of the outer row. These teeth are very different from those of *Chromis chromis*, Linn., or *C. hypsilepis*, Günther, which are conical, somewhat spaced, and arranged in a band; they approach much nearer to those of *Glyphisodon*, but are subcylindrical instead of compressed.

Three specimens were taken by the "Endeavour" at the following stations:—

Sixteen miles off the Bellenger River, New South Wales, 40-52 fathoms.

Six miles off Port Stephens, New South Wales, 43 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Genus Hypsypops, *Gill.*

Hypsypops microlepis, *Günther.*

Scalyfin.

Hypsipops microlepis, Günther—Waite, Rec. Austr. Mus., vi., 1905, p. 67, pl. xii.

Two specimens are in the collection from the New South Wales coast, one from five miles off the South Solitary Lighthouse, 35 fathoms, and the other from six miles off Port Stephens, 43 fathoms. It is surprising to find this common littoral species occurring in such deep water. It does not appear to have been previously recorded north of Port Jackson.

Family LABRIDÆ.

Genus Pseudolabrus, *Bleeker.*

Pseudolabrus cyanogenys, *Ramsay and Ogilby.*

Lilac-banded Parrot-fish.

(Plate xiii.)

Labrichthys cyanogenys, Ramsay and Ogilby, Proc. Linn. Soc. N.S. Wales (2), ii., 1887, p. 242.

?*Labrichthys ephippium*, Günther, Ann. Mag. Nat. Hist. (3), xi., 1863, p. 116; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 84 (nec *Labrus ephippium*, Cuv. and Val.).

?*Labrichthys vestita*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 151.

?*Labrichthys cuvieri*, Castelnau, Proc. Zool. Soc. Vict., ii., 1873, p. 53; *id.*, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 84.

The collection includes three specimens, one of which is figured, though, as all traces of the bands on the body have disappeared in formalin, these have been copied from the type specimen. A second example agrees exactly with the first, but the third is of a dark purplish tint in which the body bands can be traced, together with the blue markings on the pectorals, operculum and throat, while the ventrals, pectorals and spinous dorsal are yellowish. A careful comparison with the type specimen, which is badly stuffed, leaves no doubt that they are the same species.

The scales on the cheeks appear to vary somewhat, there being two rows in some specimens, while others have a single row of larger scales on the upper portion which splits into three below. The presence or absence of the posterior canines is unimportant since one, or even two may be well developed on one side of the mouth and wanting on the other. Apart from these characters, the original description fits the "Endeavour" specimens so well that it is unnecessary to redescribe them here.

P. cyanogenys is so far recorded only from the southern half of the New South Wales coast, but it is almost certain that it is identical with some of the earlier described species from Victorian or Tasmanian waters, though until the types can be examined it is impossible to be certain on this point. The "Endeavour" specimens were obtained in Oyster Bay, Tasmania, in 40-60 fathoms. The largest example is 410 mm. long.

[Since the above was set up I have examined a series of specimens 8½-16 inches long from Tasmania and the Melbourne markets. The smaller ones have the dark brown bands on the body and other characteristics of *P. vestitus*, while the larger ones are undoubtedly *P. cyanogenys*, and they also agree with the adults described by Castelnau. The others exhibit every intermediate stage between the two, so that there can be no doubt as to the identity of *P. vestita* and *P. cyanogenys*.]

Pseudolabrus psittaculus, *Richardson.*

(Fig. 19.)

Labrus psittaculus, Richardson, Proc. Zool. Soc., 1840, p. 26, and Trans. Zool. Soc., iii., 1849, p. 141.

Labrus, Tautoga, psittacula, Richardson, Zool. Ereb. and Terr., Fishes, 1848, p. 129, pl. lvi., figs. 7-10.

Labrichthys psittacula, Günther, Brit. Mus. Cat. Fish., iv., 1862, p. 114; *id.*, Castelnau, Proc. Zool. Soc. Vict., ii., 1873, p. 52.

Labrichthys rubicunda, Macleay, Proc. Linn. Soc. N.S. Wales, vi., 1881, p. 89.

Labrichthys mortoni, Johnston, Proc. Roy. Soc. Tasm., 1884 (1885), p. 256.

D. ix. 11; A. iii. 10; V. i. 5; P. 12; C. 12; l. lat. 25-26; l. tr. 2+8.

Height of body $3\text{-}3\frac{1}{2}$, length of head $3\frac{1}{4}\text{-}3\frac{1}{2}$ in the length to the hypural. Eye $4\frac{1}{4}\text{-}5$, snout $3\text{-}3\frac{1}{4}$, caudal peduncle $2\frac{1}{6}\text{-}2\frac{1}{4}$ in the head. Interorbital width $\frac{3}{4}\text{-}1$ in the orbit.

Body compressed, highest at the origin of the dorsal, the profile from the snout slightly convex or almost straight. Head conical, the snout somewhat pointed. Caudal peduncle very broad and flattened. Mouth slightly oblique, extending to below the nostrils. Anterior canines strong and curved, decreasing in size backwards; a second row of small teeth on the anterior portion of each jaw. Posterior canine strong and curved. Interorbital space convex over the eyes, flattened or slightly concave on the median line. Upper portion of the head, snout and space around the eyes, and the margin of the preoperculum covered with muciferous canals. Cheeks with four rows of small scales; operculum with four or five rows of large irregular scales. A broad skinny flap on the end of the operculum.

Lateral line following the curve of the back to below the last two dorsal rays, where it bends abruptly downwards to the mid-line of the tail. Scales extending over the base of the caudal fin, and series of smaller scales are continued up between the rays.

Dorsal spines increasing in length backwards, the last once and a half to twice as long as the first and about as long as the snout; the filament of each spine is produced beyond its point. Rays of the dorsal longer than the spines, the second or third last the longest and 2-$2\frac{1}{3}$ in the head. Anal similar to the dorsal. Second and third upper pectoral rays the longest; the upper portion of the hinder margin is either straight or slightly concave, while the lower angle is broadly rounded. Ventrals rather small and pointed, not reaching backwards to the vent. Hinder margin of the caudal truncate the upper lobe, and usually the lower one also, produced.

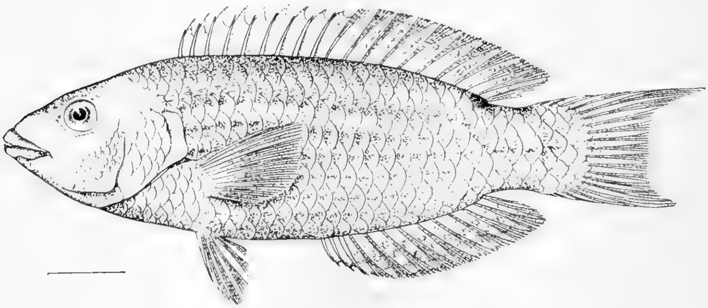

FIG. 19.

Colour.—Pink, with a large yellow spot in the centre of each scale on the sides. The head and back are darker, and there is a light green spot on the operculum. A black spot on the back at the base of the last dorsal rays may be present or absent, and may be followed by a second less distinct one on the free portion of the tail. After long preservation, the colour is almost uniformly whitish with only faint indications of longitudinal yellow bands along the rows of scales below the lateral line. There are very indistinct traces of light spots on the dorsal and anal fins which also appear to have had slightly darker margins with lighter inframarginal bands.

Described from eight specimens, 148-215 mm. long.

There are also three specimens in the Australian Museum which were received from the Tasmanian Museum as *Labrichthys mortoni*, Johnston, with the description of which they agree very well. They were afterwards identified by Ogilby as *Pseudolabrus psittaculus*, and they are certainly identical with the "Endeavour" specimens which I determine as that species.

A specimen in the Macleay Museum is labelled "*Labrichthys rubicunda*, Macleay, Tasmania," which, notwithstanding that that species was said to come from King George's Sound, I have no doubt is the type. It agrees with the description in every detail, even in the colours of the scales and in having two dark spots on the back, the second being indistinct and situated on the free portion of the tail. Its length, however, is only $8\frac{3}{4}$ inches, or $8\frac{11}{16}$ to the extreme tip of the upper caudal lobe, not 9 as stated. It is undoubtedly identical with the "Endeavour" specimens, and I would therefore regard Tasmania as the correct locality of the specimen.

The eight "Endeavour" specimens were taken at the following stations:—

Oyster Bay, Tasmania, 40-60 fathoms.

Off the east coast of Flinders Island, Bass Strait, 40 fathoms.

Twenty miles north-east of Babel Island, Bass Strait, 68 fathoms.

Family CARANGIDÆ.

Genus Trachurus, *Rafinesque*.

Trachurus declivis, *Jenyns*.

Yellowtail, Horse Mackerel.

Caranx declivis, Jenyns, Zool. Beagle, iii., 1842, p. 68, pl. xiv.

Two large specimens sixteen inches long were obtained off the mouth of the Murray River, South Australia, in 20 fathoms, and another nearly eighteen inches long from the Victorian coast. Two small ones are in the collection from between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Adult examples of this species have the last rays of the dorsal and anal fins much enlarged and forming a semi-detached finlet, thereby approaching *Decapterus*. This condition can also be traced in young examples, but it is much less striking than in the larger ones.

Genus Caranx, *Lacépède*.

Caranx platessa, *Cuvier and Valenciennes*.

Trevally.

Caranx platessa, Cuvier and Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 84; *id.*, Jordan and Seale, Bull. U.S. Bur. Fish., xxv., 1905 (1906), p. 437.

Caranx georgianus, Cuvier and Valenciennes, Hist. Nat. Poiss., ix., 1833, p. 85.

Many young specimens were obtained off the east coast of Flinders Island, Bass Strait.

Family SCOMBRIDÆ.
Genus Scomber, *Linnæus*.
Scomber japonicus, *Houttuyn*.
Mackerel.

Scomber japonicus (Houttuyn), Jordan and Evermann, Bull. U.S. Fish. Comm., xxiii., pt. 1, 1903 (1905), p. 169, fig. 62.

Eighteen young examples, four and a half inches long, were preserved from sixteen miles off Port Stephens, New South Wales. The trawl was shot in 75 fathoms, but the mackerel doubtless entered it as it neared the surface.

Family TRICHIURIDÆ.
Genus Thyrsites, *Cuvier*.
Thyrsites atun, *Euphrasen*.
Barracouta.

Scomber atun, Euphrasen, Vetensk. Acad. Nya. Handl., xii., 1791, p. 315.

Several young examples were preserved from off Flinders Island, Investigator Group, South Australia, 37 fathoms, and from forty miles west of Kingston, South Australia, 30 fathoms. The species does not appear to have been previously recorded from this State.

Family BRAMIDÆ.
Genus Schuettea, *Steindachner*.

Schuettea, Steindachner, Sitzb. Ak. Wiss. Wien., liii. i., 1866, p. 449 (*S. scalaripinnis*).

Bramichthys, Waite, Rec. Austr. Mus., vi., 1905, p. 72 (*B. woodwardi*).

The genus *Schuetta*, with *scalaripinnis* for its type, was described by Steindachner in 1866 from four small specimens taken in Port Jackson, but does not appear to have been again noted by later writers. The Australian Museum collection includes both young and adult examples which agree perfectly with the definition. In 1905 Waite described a new genus and species, *Bramichthys woodwardi*, from Western Australia, but a comparison of specimens of that species, recently received from Mr. A. Abjornssen, with others of *S. scalaripinnis* shows that they are undoubtedly congeneric.

The two species may be readily distinguished by the different form of their bodies:—

a. Depth at the origin of the dorsal less than half the length to the hypural:— *scalaripinnis*.

aa. The same depth more than half the same length:— *woodwardi*.

SCHUETTEA SCALARIPINNIS, *Steindachner.*

(Plate xv.)

Schuettea scalaripinnis, Steindachner, Sitzb. Ak. Wiss. Wien, liii., i., 1866, p. 449, pl. vi., fig. 1; *id.*, McCulloch, Proc. Linn. Soc. N.S. Wales, xxxvi., 1911, p. 82.

Bramichthys woodwardi, Stead, Proc. Linn. Soc. N.S. Wales, xxxi., 1906, p. 496; *id.*, Stead, Add. Fish. Faun. N.S. Wales (Dept. Fish. N.S.W.), 1907, p. 23 (*nec B. woodwardi*, Waite).

D. v. 28-30; A. iii. 28-33; P. 16; V. i. 5; C. 17; l. lat. 53-56; l. tr. 8+18.

Height of the body about $2\frac{1}{4}$, length of the head, $3\frac{1}{4}$-$3\frac{1}{2}$ in the length to the hypural. Eye very large, about $2\frac{1}{4}$, caudal peduncle $2\frac{2}{3}$ to 3 in the head. Interorbital width $\frac{2}{3}$, snout rather more than $\frac{1}{3}$ of the eye.

Body broadly ovate, compressed, the dorsal and ventral profiles almost evenly rounded. Back between the eyes and the dorsal fin with a well-developed keel in young specimens which is less marked in adults. Interorbital space more or less convex, snout flattened above, a slight concavity usually present over the nostrils. Maxillary reaching to below the anterior third of the eye; the distal end expanded, its breadth only a little less than the length of the snout, and either truncate or with the angles rounded. Preorbital narrow, smooth. Angle of the preoperculum broadly rounded, the inferior border minutely serrated in the young, almost or quite smooth in adults, the hinder border very thin. Operculum with two weak, flat spines separated by a broad, deeply concave interspace; above the superior one the bony margin forms three small points which are not always distinct. With the exception of the tip of the snout and the lips, the whole head is covered with small scales which extend backwards to the dorsal fin and form a marked line on the sides of the nape where they meet those of the body. Teeth minute, movable, in bands on both jaws but absent near the symphyses of each; they form a triangular patch on the vomer and a band on each palatine. Gill-rakers long, compressed, the longest about half as long as the eye, and roughened on their inner surfaces; there are about twenty-six on the lower limb of the first arch. A large pore is present on either side of the symphyses of the lower jaw.

Scales of moderate size, very thin, cycloid and finely striated. They are arranged in oblique rows on the sides and are largest above the pectoral fin; they cover the greater portion of the dorsal and anal fins, especially anteriorly, and also extend onto the caudal and basal portion of the pectorals. Lateral line more or less arched anteriorly, thence straight to the hypural and continued to between the tips of the middle caudal rays.

Origin of the dorsal over the interspace between the ventrals and the anal, and about twice as far from the end of the middle caudal rays as from the snout. The spines increase regularly in height and are closely adpressed to one another. The second and third rays are the longest and are from two-thirds to three-quarters as long as the head; the next three or four rays become rapidly shorter, and the following decrease regularly to the last. Anal originating below the second or third dorsal rays and terminating well behind that fin; its base is a little shorter than, but the rays are of similar form and length to those of the dorsal. Pectoral pointed, the third upper ray the longest and reaching backward to above the anal spines or even as far as the third ray of that fin. Ventrals short, reaching to or a little beyond the vent. Caudal forked.

Colour.—Silvery, tinged with pink, the upper parts of the head and back darker. Most of the scales dark edged, particularly at the bases of the dorsal, anal and pectoral fins. Tips of the dorsal and anal black. Caudal dusky, especially at the tips of the lobes, the outermost rays darker. Specimens long preserved in spirits are colourless, with the lower half of the body silvery.

Described from four specimens 100-190 mm. long, from Port Jackson and its vicinity. The "Endeavour" collection includes two specimens from near Sydney, while nine others were presented to the Australian Museum by Mr. J. Blair, who caught them in a meshing net at Bondi, near Sydney.

FAMILY ZEIDÆ.

GENUS ZEUS, *Linnæus*.

ZEUS FABER, *Linnæus*.

John Dorey.

Zeus faber, Günther, Brit. Mus. Cat. Fish., ii., 1860, p. 393; *id.*, Day, Fish. Gt. Brit. and Ireland, i., 1880-4, p. 138, pl. xlviii.; *id.*, Klunzinger, Sitz. Ak. Wiss. Wien, lxxx. i., 1879, p. 376; *id.*, Waite, Rec. Cantb. Mus., i., 1907, p. 25, and *loc. cit.*, 1911, p. 188.

Zeus australis, Richardson, Zool. Ereb. and Terr., Fishes, 1845, p. 36, pl. xxv., fig. 1; *id.*, Castelnau, Proc. Zool. Soc. Vict., i., 1872, p. 108; *id.*, Waite, Mem. Austr. Mus., iv., 1899, p. 89.

Having compared fifteen specimens from New South Wales with the descriptions and figures of the European species, I fail to find any specific differences between them. As has been pointed out by Waite, the characters relied upon to distinguish *Z. australis* from *Z. faber* are variable, and one must therefore follow Günther in regarding the two as identical.

Eight small specimens, 63-140 mm. long, differ from the larger ones in having much deeper bodies, which are marked with many wavy, dark lines extending from the snout to the tail.

This species was taken between Port Stephens and Newcastle, New South Wales, in 22-60 fathoms; in Disaster Bay, New South Wales; and thirty-six miles off Cape Everard, Victoria, 75 fathoms.

Genus Zenopsis, *Gill.*

Zenopsis nebulosa, *Schlegel.*

Mirror Dorey.

(Plate xvi., fig. 1.)

Zeus nebulosus, Schlegel, Fauna Japonica, Poiss., 1847, p. 123, pl. lxvi.

Zenopsis nebulosa, Jordan and Fowler, Proc. U.S. Nat. Mus., xxv., 1902, p. 515.

D. viii.-ix., 27-28; A. iii., 25-27; V. i. 5; P. 12-13; C. 13+2.

Height of the body 1·6 to 1·8, length of the head 2·8 in the length from the snout to the hypural. Snout twice as long as the eye which is 4·3 in the head and a little wider than the interorbital space. Maxillary very large, its greatest width 0·75 to 0·85 in the eye. With the exception of the rough orbital margins, the head is quite smooth, though the preoperculum ends in a broad spine below, and there is another more or less distinct flattened spine just below the end of the maxilla. Teeth small, conical, acute, arranged in two groups in front on the upper jaw, becoming rudimentary on the sides; in the lower jaw, though they are largest anteriorly, they are also quite distinct laterally. They form two groups on the vomer.

Skin wholly naked except for the bony bucklers which are each armed with a central spine, curved backwards and outwards, and ornamented with radiating ridges. There are twelve to fourteen bucklers along the base of the dorsal, the anterior ones being somewhat indistinct and commencing in advance of the third dorsal spine; those beneath the middle of the soft dorsal are the largest. Eight or nine are arranged along the base of the anal. There are two or three median plates and two to four pairs in front of the ventrals, while between that fin and the anal there is one median and six to eight of the paired series. Generally the bucklers of one side do not correspond to those of the other but are more or less alternate to one another. Lateral line strongly arched anteriorly, straight posteriorly.

Dorsal originating over the middle of the operculum. The second spine is usually the longest, and is either almost equal to the length of the head or somewhat shorter. The membrane of the spines is produced beyond their tips, the filament of the anterior ones being from one-fourth to one-half as long as the spine. The rays are all simple, and increase rapidly in length to about the fourteenth, which is more than twice as long as the first; behind this they are more uniform. Anal spines decreasing in length backwards, the first equal to about three-fourths the length of the eye; the rays are similar in form to those of the dorsal. Ventrals large, reaching to the first anal spine in old specimens and to the first ray in younger ones; the first ray not closely adpressed to the spine. Upper pectoral rays the longest, once and a half to twice as long as the eye. Caudal truncate or slightly rounded when expanded, its peduncle about two-thirds the diameter of the eye.

Colour.—Silvery, the first dorsal, ventral and hinder portion of the caudal blackish. A large dark spot on the middle of the sides in fresh specimens, which disappears in preserved examples.

The above description is drawn up from thirteen specimens 230-360 mm. long. In large examples the profile from the chin to the vent is evenly rounded, but in the smaller ones it descends obliquely to the ventrals, where it forms a sharp angle with the belly line. The latter is either straight or convex. The specimen figured on plate xvi. is 242 mm. long, and represents the angular stage, while the rather crude figure in "Fauna Japonica" shows the rounded profile characteristic of the larger fish.

Relying on the descriptions and figure quoted above, and with only the smaller specimens before me, I at first considered the Australian examples distinct from *Z. nebulosus*, as none showed the clouded body markings of Schlegel's figure, nor has the angular form been described in the Japanese works. Having since obtained a specimen from Tokio Bay, however, and larger ones from the Victorian coast, I find that they agree in every detail.

The thirteen specimens were trawled at the following stations:—

Off Cape Everard, Victoria, 70 fathoms.

Twenty miles north-east of Babel Island, Bass Strait, 68 fathoms.

Disaster Bay, New South Wales, 45 fathoms.

The genus *Zenopsis* is commonly regarded as pelagic, but this is obviously incorrect, though it would seem that some of the species pass through their earlier stages near the surface.

Genus Cyttus, *Günther*.

Cyttus novæ-zelandiæ, *Arthur*.

(Plate vii., fig. 2, and fig. 20.)

Zeus novæ-zelandiæ, Arthur, Trans. N.Z. Inst., xvii., 1885, p. 163, pl. xiv., fig. 3.

Cyttus novæ-zelandiæ, McCulloch, Proc. Linn. Soc. N.S. Wales, xxxv., 1910, p. 307; *id.*, Waite, Rec. Cantb. Mus., i., 1911, p. 190, pl. xxxii.

D. viii. 28; A. ii. 29; P. 11; V. i. 6; C. 13; l. lat. 83; l. tr. 9+47.

Height 1·62 to 1·68 in the length from the premaxillary when the mouth is closed to the hypural. Head almost 3 in the same. Eye very large, 2·4 in the head and longer than the snout. Interorbital width at its narrowest point 1·4 in the eye. Orbit defined above by a curved ridge which is armed with microscopic denticulations and forms an angle at either end with the rest of the orbital margin. Another curved ridge, perforated with numerous pores, extends from the origin of the lateral line to the anterior end of a triangular

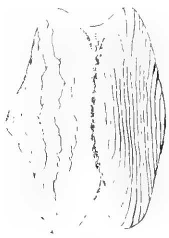

FIG. 20.

depression above the occiput, which receives the posterior processes of the premaxillaries. All the other bones of the head are very thin and have their edges smooth. When the mouth is closed, the hinder margin of the maxillary is slightly in advance of the anterior margin of the eye. The teeth are extremely small in both jaws, conical and arranged in several rows anteriorly. They are also present on the vomer, but the palatines and tongue are smooth.

The scales are of somewhat peculiar construction, consisting of two distinct parts separated by a constriction at either end.

The anterior portion is finely striated vertically, and lies flat upon the body. The posterior half is trilobed, and bears only five or six crenulated lines; it rises abruptly from the other portion and curls over upon the following scale, so that closed channels are formed beneath each transverse row. At the bases of the dorsal and anal fins the scales are slightly enlarged and rounded and armed with rows of denticulations. From the throat to the ventral fins there are two rows of angular scales defining a flattened ventral surface on which all the scales have denticulated edges. Behind the ventrals there is a deep groove, into which the fin can be folded, but its edges are not provided with specially modified scales. The lateral line is strongly arched anteriorly. A large triangular patch of scales covers the cheek, but the rest of the head is bare. The vent is situated somewhat in advance of the middle of the ventral groove.

The first dorsal fin commences vertically over a point midway between the ventral and anal fins. The first spine is very short, the second, third and fourth are subequal and slightly longer than the eye. The rays of the second dorsal increase regularly in length to a point behind the middle of the fin, where they are a little shorter than the longest spine; thence they decrease evenly backwards. First anal spine very stout and almost immovable and longer than the second, which is minute. The rays similar in form to those of the dorsal. Ventral spine strong, the longest rays not reaching to the anal spine. Pectorals rounded, the third ray longer than the eye. Caudal slightly emarginate, the outer rays almost twice as long as the eye.

Colour.—Silvery. First dorsal, ventrals and end of caudal black. Iris golden.

A very young specimen 39 mm. long differs only in having a deeper and more angular body, the depth being 1·3 in the length to the hypural. It is marked with large scattered darker blotches, the most conspicuous of which are two at the base of the anal fin.

Compared with specimens of *C. australis* of the same size, this species is at once distinguished by its much larger eye and its short dorsal and ventral fins. In *C. australis* these are very elongate as in the adult. The lateral line is also more arched, so that there are fewer scales between it and the first dorsal (nine) than in *C. australis* (fifteen). Finally, the scales of the last-named are armed on their outer surface and edges with minute spines, whereas in this species the edges are smooth and the surface bears only crenulated ridges.

The specimens described above differ from Arthur's description in lacking the small roughened scales between the dorsal fin and the interorbital space and in having only 83 scales along the lateral line instead of 114. Mr. Waite, however, has kindly compared some that I have sent him with other New Zealand examples which he identifies as *C. novæ-zelandiæ*, and has further forwarded me a half-grown example for examination. This last is undoubtedly identical with my specimens, the largest of which is 135 mm. long, and we are agreed that they are really Arthur's species.

The collection includes fifty-six examples from the following localities:—

Twenty-five miles south-west from Cape Everard, Victoria, 83-98 fathoms.

Off the east coast of Flinders Island, Bass Strait, 40-70 fathoms.

Oyster and Storm Bays, Tasmania, 40-60 fathoms.

CYTTUS AUSTRALIS, *Richardson*.

Silver Dorey.

Capros australis, Richardson, Trans. Zool. Soc., iii., 1849, p. 72, and Zool. Ereb. and Terr., p. 137, pl. lix., figs. 1-5.

Very young specimens of this species differ from the adults in having a much shorter and deeper body and larger eyes. In an example 75 mm. long the greatest height is $1\frac{1}{2}$ in the length to the hypural, and the eye is $2\frac{3}{4}$ in the head. The largest specimen obtained is 380 mm. long.

It was taken at the following stations:—

Between Port Stephens and Newcastle, New South Wales, 22-60 fathoms.

Shoalhaven Bight, New South Wales, 15-45 fathoms.

Thirty-six miles off Cape Everard, Victoria, 75 fathoms.

Off the east coast of Flinders Island, Bass Strait, 70 fathoms.

Oyster Bay, Tasmania, 40-60 fathoms.

Flinders Island, Investigator Group, South Australia, 37 fathoms.

II. Report on the Mollusca obtained by the F.I.S. "Endeavour," chiefly off Cape Wiles, South Australia.

PART I.

BY

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(Plates XVII.-XX.)

II.—REPORT ON THE MOLLUSCA.

Part I.

I.—Introduction.

Through the kindness of the Hon. the Minister for Trade and Customs, the writer, in August and September, 1909, enjoyed an opportunity of accompanying the Director of Fisheries on a cruise of the Fishery Investigation Ship, "Endeavour." The voyage extended from Melbourne to the Nuyts Archipelago, South Australia. At every opportunity Mr. Dannevig gave me facilities for using my dredge. By this means a large number of Invertebrates, not procurable by the trawl, were obtained. The largest collection was made on August 28th at a depth of 95-100 fathoms, south of Cape Wiles, South Australia, the precise position being thirty-nine and a half miles S. 43 E. from Liguanea Island, itself about four miles from Cape Wiles. Here three full loads of the bucket dredge were lifted and sieved. The bottom temperature here was not noted, but at 80 fathoms, a short distance away, it was 14·0 Cent. (=57·2 Fahr.), and the surface at midnight was 12·75 Cent. (=52·2 Fahr.). It was in this neighbourhood that in January, 1905, Dr. J. C. Verco, from the s.s. "Lady Diana," made a successful haul thirty-five miles south-west of the Neptune Islands in 104 fathoms, and whence he has recorded so many new species.

Including fragments, illegible or undetermined forms, the Cape Wiles haul contained more than three hundred and fifty species, of which I record two hundred and twenty-six. This agrees with my experience in New South Wales and Tasmania,[1] indicating that the molluscan fauna of a yard or two of the margin of the Australian Continental Shelf consists of from two hundred and fifty to three hundred and fifty species.

This is richer than usual. Based chiefly on American experiences, Dr. W. H. Dall[2] estimates that about four hundred species would constitute an entire fauna of shell-bearing molluscs from an ordinary region between the limits of 40-60 degrees Fahrenheit.

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1 Hedley—Rec. Austr. Mus., vi., 1907, p. 273; *Op. cit.*, vii., 1908, p. 109.

2 Dall & Harris—Bull. U.S. Geol. Survey, No. 84, 1892, p. 26.

The species identified from the Cape Wiles station are as follows:—

Nucula beachportensis, *Verco.*
Nucula obliqua, *Lamarck.*
Pronucula decorosa, *Hedley.*
Leda miliacea, *Hedley.*
Poroleda ensicula, *Angas.*
Limopsis erectus, *Hedley & Petterd.*
Limopsis eucosmos, *Verco.*
Limopsis tenisoni, *Tenison Woods.*
Limopsis tenisoni, var. penelevis, *Verco.*
Cyrilla concentrica, *Verco.*
Pleurodon maorianus, *Hedley.*
Arca pistachia, *Lamarck.*
Bathyarca perversidens, *Hedley.*
Glycymeris pectinoides, *Lamarck.*
Glycymeris tenuicostatus, *Reeve.*
Philobrya fimbriata, *Tate.*
Philobrya pectinata, *Hedley.*
Trigonia margaritacea, *Lamarck.*
Chlamys antiaustralis, *Tate.*
Cyclopecten favus, *Hedley.*
Lima bassi, *Tenison Woods.*
Lima bullata, *Born.*
Limæa austrina, *Tate.*
Limæa murrayi, *Smith.*
Limæa parvula, *Verco.*
Modiola linea, *Hedley.*
Modiolaria barbata, *Reeve.*
Arcoperna scapha, *Verco.*
Pholadomya arenosa, *Hedley.*
Myodora albida, *Tenison Woods.*
Verticordia ericia, *Hedley.*
Verticordia setosa, *Hedley.*
Ectorisma granulata, *Tate.*
Cuspidaria alta, *Verco.*
Crassatellites probleema, *Verco.*
Crassatellites producta, *Verco.*
Cuna atkinsoni, *Tenison Woods.*
Cuna comma, *Verco.*
Cuna concentrica, *Hedley.*
Cuna delta, *Tate & May.*
Cuna hamata, *Hedley & May.*
Cuna obliquissima, *Tate.*
Venericardia amabilis, *Deshayes.*
Venericardia bimaculata, *Deshayes.*
Venericardia delicata, *Verco.*

Venericardia dilecta, *Smith*, var. excelsior, *Verco.*
Venericardia rosulenta, *Tate.*
Mytilicardia calyculata, *Linne.*
Condylocardia compressa, *Hedley & May.*
Cyamiomactra mactroides, *Tate & May.*
Myrtaea bractea, *Hedley.*
Divaricella cumingii, *Adams & Angas.*
Corbis percostata, *Hedley.*
Thyasira flexuosa, *Montagu.*
Turquetia integra, *Hedley.*
Coriarius semiradiatus, *Tate.*
Cardium pulchellum, *Gray.*
Gafrarium angasi, *Smith.*
Chione mesodesma, *Quoy & Gaimard.*
Chione striatissima, *Sowerby.*
Tellina subdiluta, *Tate.*
Soletellina hedleyi, *Sowerby.*
Mactra jacksoniensis, *Smith.*
Saxicava arctica, *Linne.*
Acanthochites crocodilus, *Torr & Ashby.*
Schismope atkinsoni, *Tenison Woods.*
Schismope pulchra, *Petterd.*
Scissurella australis, *Hedley.*
Emarginula superba, *Hedley & Petterd.*
Lucapinella nigrita, *Sowerby.*
Megatebennus concatenatus, *Crosse & Fischer.*
Puncturella fumarium, *Hedley.*
Puncturella demissa, *Hedley.*
Gibbula ocellina, *Hedley.*
Monilea oleacea, *Hedley & Petterd.*
Monilea philippensis, *Watson.*
Calliostoma allporti, *Tenison Woods.*
Calliostoma columnarium, *Hedley & May.*
Calliostoma legrandi, *Tenison Woods.*
Calliostoma meyeri, *Philippi.*
Calliostoma retiarium, *Hedley & May.*
Danilia telebathia, *Hedley.*
Euchelus tasmanicus, *Tenison Woods.*
Leptothyra fugitiva, *Hedley.*
Leptothyra rosea, *Tenison Woods.*
Cirsonella weldii, *Tenison Woods.*
Cyclostrema denselaminatum, *Verco.*
Cyclostrema homalon, *Verco.*
Cyclostrema jaffaensis, *Verco.*
Liotia annulata, *Tenison Woods.*
Liotia denselineata, *Tate.*
Liota incerta, *Tenison Woods.*

Phenacolepas calva, *Verco.*
Cocculina tasmanica, *Pilsbry.*
Nacella crebristriata, *Verco.*
Helcioniscus illabratus, *Verco.*
Rissoa hulliana, *Tate*, var. eucraspeda, *Hedley.*
Rissoa incompleta, *Hedley.*
Rissoa lockyeri, *Hedley.*
Rissoa verconiana, *Hedley.*
Amphithalamus costatus, *Hedley.*
Amphithalamus pyramidatus, *Hedley.*
Epigrus ischnus, *Tate.*
Rissoina gertrudis, *Tenison Woods.*
Rissoina rhyllensis, *Gatliff & Gabriel.*
Rissoina tasmanica, *Tenison Woods.*
Cithna angulata, *Hedley.*
Calyptraea calyptraeformis, *Lamarck.*
Capulus devotus, *Hedley.*
Mathilda decorata, *Hedley.*
Cerithiopsis dannevigi, *Hedley.*
Cerithiopsis geniculosus, *Hedley.*
Triphora albovittata, *Hedley.*
Triphora angasi, *Crosse.*
Triphora armillata, *Verco.*
Triphora cana, *Verco.*
Triphora disjuncta, *Verco.*
Triphora epallaxa, *Verco.*
Triphora gemmegens, *Verco.*
Triphora granifera, *Brazier.*
Triphora novapostrema, *Verco.*
Triphora pfeifferi, *Crosse.*
Triphora regina, *Hedley.*
Triphora spica, *Verco.*
Triphora tasmanica, *Tenison Woods.*
Turritella atkinsoni, *Tenison Woods*, var. medio-angulata, *Verco.*
Turritella mediolevis, *Verco.*
Turritella quadrata, *Donald.*
Turritella smithiana, *Donald.*
Vermicularia flava, *Verco.*
Vermicularia nodosa, *Hedley.*
Ianthina exigua, *Lamarck.*
Epitonium acanthopleura, *Verco.*
Epitonium valida, *Verco.*
Syrnola micra, *Pritchard & Gatliff.*
Odostomia mayi, *Tate.*

Cymatium kampylum, *Watson.*
Cymatium olearium, *Linne.*
Natica elkingtoni, *Hedley & May.*
Natica sticta, *Verco.*
Polinices beddomei, *Johnston.*
Eunaticina albosutura, *Verco.*
Ancilla petterdi, *Tate.*
Cancellaria pergradata, *Verco.*
Marginella altilabra, *May.*
Marginella biplicata, *Tate & May.*
Marginella columnaria, *Hedley & May.*
Marginella flindersi, *Pritchard & Gatliff.*
Marginella fulgurata, *Hedley.*
Marginella gabrieli, *May.*
Marginella allporti, *Tenison Woods.*
Marginella indiscreta, *May.*
Marginella lodderæ, *May.*
Marginella microscopica, *May.*
Marginella multiplicata, *Tate & May.*
Marginella ovulum, *Sowerby.*
Marginella stanislaus, *Tenison Woods.*
Marginella stilla, *Hedley.*
Marginella vercoi, *May.*
Conus superstes, *Hedley.*
Daphnella bathentoma, *Verco.*
Daphnella fenestrata, *Verco.*
Daphnella legrandi, *Beddome.*
Daphnella triseriata, *Verco.*
Mangilia gatliffi, *Verco.*
Mangilia hilum, *Hedley.*
Mangilia kingensis, *Petterd.*
Mangilia spica, *Hedley.*
Drillia agrestis, *Verco.*
Drillia denseplicata, *Dunker.*
Drillia dilecta, *Hedley.*
Drillia dulcis, *Sowerby.*
Drillia hectorguia, *Verco.*
Drillia hedleyi, *Verco.*
Drillia jaffaensis, *Verco.*
Drillia lacteola, *Verco.*
Drillia saxea, *Sowerby.*
Drillia tricarinata, *Tenison Woods.*
Drillia trophonoides, *Verco.*
Drillia woodsi, *Beddome.*
Mitromorpha alba, *Petterd*, var. axiscalpta, *Verco.*
Mitromorpha axicostata, *Verco.*

Mitromorpha pallidula, *Hedley.*
Mitromorpha paucilirata, *Verco.*
Mitromorpha paula, *Verco.*
Mitromorpha solida, *May.*
Hemipleurotoma mayi, *Verco.*
Mitra retrocurvata, *Verco.*
Mitra scalariformis, *Tenison Woods.*
Mitra stadialis, *Hedley.*
Mitra tasmanica, *Tenison Woods.*
Imbricaria porphyria, *Verco.*
Pisania schoutanica, *May.*
Pyrene atkinsoni, *Tenison Woods.*
Pyrene axiaerata, *Verco.*
Pyrene beachportensis, *Verco.*
Pyrene calva, *Verco.*
Pyrene jaffaensis, *Verco.*
Trophon plicilaminatus, *Verco.*
Trophon recurvatus, *Verco.*
Trophon segmentatus, *Verco.*
Coralliophila lischkeana, *Dunker.*
Typhis bivaricata, *Verco.*
Actaeon retusus, *Verco.*
Ringicula meridionalis, *Hedley.*
Ringicula semisculpta, *Hedley.*
Cylichna arachis, *Quoy & Gaimard.*
Cylichna atkinsoni, *Tenison Woods.*
Philine columnarius, *Hedley & May.*
Philine oscitans, *Hedley.*
Cavolina inflexa, *Lesueur*
Cavolina trispinosa, *Lesueur.*
Cavolina virgula, *Rang.*
Limacina bulimoides, *D'Orbigny.*
Limacina inflata, *D'Orbigny.*
Clio balantium, *Rang.*
Clio pyramidata, *Linne.*
Dentalium lubricatum, *Sowerby.*
Dentalium thetidis, *Hedley.*
Terebratulina cavata, *Verco.*
Megasella cumingii, *Davidson.*
Megasella vercoi, *Blochman.*
Campages jaffaensis, *Blochman.*
Cryptopora brazieri, *Crane.*
Kraussina tasmanica, *Tenison Woods.*

II.—DESCRIPTIONS OF NEW OR NOTABLE SPECIES.

A.—PELECYPODA.

PLEURODON MAORIANUS, *Hedley.*

Pleurodon maorianus, Hedley, Rec. Austr. Mus., v., 1904, p. 87, fig. 14.

Numerous examples of this occurred off Cape Wiles in 100 fathoms. Some of these were of larger size than those found in New Zealand, being 3 mm. long and 4 mm. high. The species has not been seen previously in Australian waters.

CHLAMYS ANTIAUSTRALIS, *Tate.*

Pecten antiaustralis, Tate, Trans. Roy. Soc. S. Austr., viii., 1886, p. 106, pl. ix., f. 7a-7c; xxiii., 1899, p. 269; *id.*, Harris, Brit. Mus. Cat. Tert. Moll. Austr., 1897, p. 315.

Numerous small valves about half an inch in length were dredged in 100 fathoms, forty miles south of Cape Wiles, South Australia. Some are brightly coloured either entire lemon-yellow or irregularly clouded with opaque white and vermilion. Similar specimens were dredged by myself in 100 fathoms off Wollongong, New South Wales. Specimens reaching 100 mm. in diameter were taken plentifully by Mr. W. L. May and myself in 100 fathoms off Cape Pillar, Tasmania. We considered the species,[1] as Prof. R. Tate himself had done on first acquaintance, to be a variety of *C. asperrimus*, Lamarck. Valid distinctions pointed out by Prof. Tate between the two species are the concentric laminæ which lattice the intercostal furrows in the young and the multiplication of the ribs in the old stages of *C. antiaustralis.* Compared with actual fossils, the recent shell is flatter, but its author expressly notes that *C. antiaustralis* "exhibits variations in the degree of convexity." Probably this is the shell identified by Gatliff and Gabriel as the young of *C. radiatus*, Hutton.[2] In their reference, to my opinion of the shell, there is some misunderstanding.

The species has not hitherto been recorded as recent, and this identification adds another survivor from the Tertiary Fauna.

VERTICORDIA ERICIA, *sp. nov.*

(Plate xvii., figs. 1, 2, 3.)

Shell small, subcircular, rather solid, apex incurved. Sculpture, about eighteen prominent radiating spiral ribs, which rapidly enlarge with the increase of the shell and pro-

1 Hedley & May—Rec. Austr. Mus., vii., 1908, p. 113.
2 Gatliff & Gabriel—Proc. Roy. Soc. Vict., xxiii., 1910, p. 98.

ject at the margin. These are parted by broad and deep interstices, roughened with a grain surface, whereas the summits of the ribs bristle with short, stout, close-set, divaricating, little spikes. Lunule reduced to a narrow crescent under the umbo. Interior nacreous furrowed by the imprint of the external sculpture. In both valves a single conical tooth is set at the margin of the lunule. Length 6·7, height 6, depth of single valve 2·3 mm.

A couple of odd valves occurred in 100 fathoms forty miles south of Cape Wiles, South Australia. Prof. W. A. Haswell and I dredged a fragment in 80 fathoms twenty-two miles east of Narrabeen, New South Wales. The strong ribs and prickly sculpture readily distinguish the species.

VERTICORDIA SETOSA, *Hedley.*

Verticordia rhomboidea, Hedley, Trans. N.Z. Inst., xxxviii., 1905, p. 71, pl. ii., fig. 12, 13, 14; *id.*, Rec. Austr. Mus., vi., 1906, p. 215. [Not *Verticordia rhomboidea*, Tate, Trans. Roy. Soc. S. Austr., ix., 1886 (1887), p. 149, pl. xiv., f. 14.]

Verticordia setosa, Hedley, *nom. mut.* Rec. Austr. Mus., vi., 1907, p. 303.

A single valve from 100 fathoms, forty miles south of Cape Wiles, South Australia, represents a species new to the Adelaidean Region. I took the species first in 110 fathoms off Great Barrier Island, New Zealand, and again in 250 and in 800 fathoms off Sydney. In the South Australian example the radial ribs are less prominent than in the New Zealand shells.

VENERICARDIA ROSULENTA, *Tate.*
(Plate xvii., fig. 4.)

Cardita rosulenta, Tate, Trans. Roy. Soc. S. Austr., ix., 1887, p. 69, pl. v., f. 3

The "Endeavour" took *C. rosulenta* off Devonport, Tasmania, and in 40 fathoms north of Cape Borda, South Australia. A giant from the former locality is 45 mm. in length. As the original figure is vague I offer an illustration of a specimen 28 mm. long from St. Vincent's Gulf, for the identification and example of which I am indebted to Dr. J. C. Verco.[1]

The nomenclature of this species is involved in difficulty. After the publication of his name, Prof. Tate observed that Tenison Woods had previously recognised[2] his shell as *C. quoyi*, Deshayes, and he thereupon withdrew his *rosulenta* in

1 Verco—Trans. Roy. Soc. S. Austr., xxxii., 1908, p. 349.
2 Tenison Woods—Proc. Roy. Soc. Tasm., 1877, p. 59.

its favour.[1] But Deshayes proposed his name for a New Zealand shell figured and described by Quoy and Gaimard as *Venericardia australis*, Lamarck. Actually, Deshayes indicated for his species Pl. 80, f. 4 of the "Astrolabe" Atlas, but that illustration stands for a *Tridacna*, and the quotation is an evident error for Pl. 70, f. 12-14. The account of Quoy and Gaimard did not profess to introduce a new species but merely to restore the *V. australis* of Lamarck,[2] a small, suborbicular, purple, scale-ribbed shell from New Holland, not otherwise figured. The contention of Deshayes was that the Australian shell of Lamarck was wrongly identified with the New Zealand shell of the "Astrolabe" Expedition. Regarding the latter as a new and nameless species, he proposed to call it *Cardita quoyi*.[3] Until the Lamarckian type, now probably in the Geneva Museum, can be re-examined, we cannot judge whether Quoy and Gaimard were right in their identification, and consequently whether Deshayes was, or was not, justified in renaming their shell. But there can be no doubt that Reeve erred in reducing *Venericardia australis* to a synonym of *V. tridentata*, Say.[4]

In any case the verdict does not affect the name before us. Our species is quite different from that figured in the "Astrolabe" Atlas, and to which, if it be maintained, the name of "*quoyi*" can only apply. Incidentally it may be remarked that this name has never been adopted[5] by the conchologists of New Zealand whom it chiefly concerns.

V. australis, Lamarck, is not the only species of the genus that local workers have failed to recognise. *Cardita (Actinobolus) godeffroyi*, Dunker,[6] from Bass Strait, is here unknown. I suggest that it is likely to prove identical with *V. bimaculata*, Deshayes.

After being unseen for nearly forty years, the *Cardita raouli*, Angas,[7] has been rediscovered by Mr. W. L. May[8] in 40 fathoms off Schouten Island, Tasmania. Probably this is what Clessin intends by *Cardita racuti*, Angas (MS.), from New Zealand.[9]

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1 Tate—Proc. Linn. Soc. N.S. Wales, xxvi., 1901, p. 434.
2 Lamarck—Anim. Sans Vert., v., 1818, p. 610.
3 Deshayes—Proc. Zool. Soc. 1852 (1854), p. 103.
4 Reeve—Conch. Icon., i., 1843, Cardita sp. 22.
5 Suter—Index Faunæ Nov. Zeal., 1904, p. 93.
6 Dunker—Malak. Blatt., xviii., 1871, p. 172; Schmeltz—Cat. Mus. Godeff., v., 1874, p. 173; Clessin—Conch. Cab., Lief. 353, 1887, p. 12, pl. iv., f. 6, 7.
7 Angas—Proc. Zool. Soc., 1872, p. 613, pl. xlii., f. 12.
8 May—Proc. Roy. Soc. Tasm., 1910 (1911), p. 312.
9 Clessin—*Op. cit.*, p. 11, pl. ii., figs. 7, 8.

MYRTÆA BRACTEA, *sp. nov.*
(Plate xvii., figs. 5, 6, 7, 8.)

Shell rather solid, moderately convex, flatter in the young stages and becoming more inflated when adolescent, squarely oblong, subequilateral. Colour cream. No radial sculpture. Ribs strong, elevate, varying in number and disposition, usually about fifty and set their breadth apart, spaced medially crowded anteriorly and posteriorly. An occasional rib projects at the edge of the lunule and escutcheon, thus forming a dorsal crest of imbricating scales. Umbo small, prominent. Lunule narrow, excavate, chiefly developed in the left valve. Two cardinals in the left valve. Margins of the valve entire. Length 10·5, height 9·5, depth of single valve 2·5 mm.

This species is near *M. brazieri*, Sowerby,[1] but larger, rounder, more inflated and more densely ribbed.

M. mayi, Gatliff & Gabriel,[2] is also like it, but *M. bractea* differs by lacking radial sculpture, by being more inflated and closer ribbed.

Hab.—Several specimens from 100 fathoms, forty miles south of Cape Wiles, South Australia.

CORBIS PERCOSTATA, *sp. nov.*
(Plate xvii., figs. 9, 10, 11, 12.)

Shell small, rather solid, inflated inequilateral, anteriorly produced, dorsal margin rather straight, ventral margin rounded. Umbo incurved, bearing a distinct prodissoconch. Sculpture: About thirty-two elevated, strong concentric ribs run from end to end and closely follow one another from the umbo to the ventral margin. From each rib a thin broad flange arching downwards conceals most of the interspace between the ribs. Lunule small, limited by an indistinct groove. Pallial line entire, running from one adductor to the other. Within the ventral margin is set a line of small sockets and tubercles about forty-five in number. Dentition: In the right are two cardinals, the posterior strongest, the anterior half the size of its fellow, compressed and parallel to the hinge plate, anteriorly and posteriorly a slender lateral. In the left, the anterior cardinal of typical *Corbis* is represented by a minute tubercle, posterior cardinal is strong and pointed. Anteriorly a groove receives the right lateral, posteriorly the margin of the valve is produced to act as a lateral. Behind the main cardinals is a slight and elongate chondrophore. Length 4·5, height 3·6, depth of single valve 1·3 mm.

1 Sowerby—Proc. Zool. Soc., 1883, p. 31, pl. vii., f. 2, and Hedley—Mem. Austr. Mus., iv., 1902, p. 319.

2 Gatliff & Gabriel—Proc. Roy. Soc. Vict., xxiv., n.s., 1911, p. 189, pl. xlvii., figs. 8-12.

This species is nearest related to *Chione despecta*, Hedley,[1] from 100 fathoms off Wollongong, New South Wales, than which the novelty is larger, more inequilateral, longer in proportion to height and more closely ribbed. When I described *C. despecta* seven years ago I failed to distinguish the muscle scars. Now I find there is no pallial sinus. But the discrepancy between its hinge and that of typical *Chione* warned me of possible error. Revising the generic position with the aid of the new and related species, I am now constrained to refer both to *Corbis*. Hitherto only a single recent species, a large and handsome shell from the coral reef zone, has been admitted to this genus. The hinge characters do not exactly correspond. These two small species appear to have suffered such atrophy as descent to calm, deep water might be expected to induce in the hinge development of small and thin shells.

Hab.—Numerous specimens in 100 fathoms forty miles south of Cape Wiles, South Australia.

CHIONE MESODESMA, *Quoy & Gaimard.*

Venus mesodesma, Quoy & Gaimard, Voy. "Astrolabe," Zool., iii., 1835, p. 532, pl. lxxxiv., f. 17, 18; *id.*, Smith, Rep. Voy. Chall., Zool., xii., 1885, p. 131.

A few specimens in 100 fathoms forty miles south of Cape Wiles. Mr. W. L. May and I took it in abundance in 100 fathoms off Cape Pillar, Tasmania.[2] These specimens were worn, and, without close scrutiny, were passed for *Chione gallinula*, Lamarck. This is the first definite Australian record, though New Holland was assigned to the species in the original description.

B.—GASTEROPODA.

PUNCTURELLA FUMARIUM, *sp. nov.*

(Plate xviii., figs. 13, 14.)

Shell laterally compressed, thin, translucent, erect, the posterior profile usually slightly convex and the anterior slightly concave. Sculpture: Delicate concentric growth lines, small tubercles, conspicuous in profile, are set in radial rows. Summit irregularly notched, subcircular seen from above, cleft with a short, steep posterior limb seen from the side, the spiral apex disappearing from half-grown specimens Septal plate deeply inserted, nearly perpendicular. Length 2·15, breadth 1·35, height 1·85 mm.

1 Hedley—Proc. Linn. Soc. N.S. Wales, xxviii., 1904, p. 193, pl. x., f. 35-8.
2 Hedley & May—Rec. Austr. Mus., vii., 1908, p. 114.

Already from Australia there are recorded *P. hemipsila*, Tate, from the Tasmanian Eocene, and recent *P. corolla*, Verco, from South Australia; *P. demissa*, Hedley, now recorded from South Australia in association with *P. fumarium*, and previously from New South Wales, Victoria and New Zealand; *P. galerita*, Hedley, from Queensland; *P. harrissoni*, Beddome, from Tasmania, Victoria and New South Wales, and *P. kesteveni*, Hedley, from New South Wales. The novelty belongs to the section *Fissurisepta* now first represented in Australasia.

Hab.—Several specimens from 100 fathoms, forty miles south of Cape Wiles.

MONILEA OLEACEA, *Hedley & Petterd.*

Monilea oleacea, Hedley & Petterd, Rec. Austr. Mus., vi., 1906, p. 215, pl. xxxvii., fig. 1.

Some broken but recognisable specimens of this species were taken in 100 fathoms, forty miles south of Cape Wiles. The type was from 250 fathoms outside Sydney, so the present record extends it to another region. The specific name appeared in the description by a misprint as "*oleata*," but was spelt correctly on the previous page 214 and in the explanation of the plate.

GIBBULA OCELLINA, *sp. nov.*
(Plate xviii., fig. 15.)

Shell small, solid, imperforate, conical, with gradate spire, prominently keeled at the periphery and again at the shoulder. Colour: Below the periphery uniform buff, above it broad, radial stripes of buff pink, alternate with white. Along the periphery are pairs of dashes of madder brown, sometimes these enclose a tinted space and have a background of opaque white, thus assuming an ocellated aspect; apex pink. Whorls five. Sculpture: Base with seven flat evenly-spaced concentric riblets, a strong, revolving cord defines the periphery and ascends the spire. The last and penultimate whorls have four spiral riblets above the periphery, the uppermost stronger and forming the angle of a subsutural shelf. Upper whorls smooth. Aperture round, outer tip simple, dentate by the spirals, columella perpendicular. Length 3, major diam. 3, minor diam. 2·5 mm.

The profile recalls that of *G. coxi*, Angas, but by the sum of its characters this comes nearest to *G. tiberiana*, Crosse. From that the angulation and smaller size distinguish the novelty.

Hab.—Several specimens from 100 fathoms, forty miles south of Cape Wiles, South Australia.

DANILIA TELEBATHIA, *sp. nov.*
(Plate xviii., figs. 16, 17.)

Shell ovate, acuminate, imperforate, thin and slightly nacreous. Whorls seven, the first wound horizontally, thus giving the spire a decapitated aspect. Median whorls separated by a channeled suture, flattened on the shoulder and subangled at the periphery, the last slightly descending behind the aperture. Colour: Pale buff with scattered irregular dashes of ochre alternate chocolate dots on the outer lip. Sculpture: The last whorl carries eleven widely-spaced fine spiral cords, the peripheral strongest. Of these six appear on the penultimate and fade gradually away on the upper whorls. Both cords and interspaces are crossed by delicate oblique lamellæ which rise into scales upon the cords. They are crowded on the last whorl, do not cross the suture from whorl to whorl, and become fewer and fainter ascending the spire. The initial whorl is smooth. Aperture very oblique, subcircular. Outer lip effuse, fimbriated by the termination of the spiral sculpture, inner lip projecting over the umbilical region, thence spread from the axis to the right insertion as a solid sheet. Columella spirally ascending within, terminating below in a downwardly directed tubercle, succeeded by a deep notch and an answering ridge. Thence along the edge of the gullet underneath the external varix are about a score of callus rays, alternately long and short, leading to the throat. Behind the aperture, about a millemetre from the free edge, is a sharp, narrow varix rising gradually at the base and ending abruptly at the suture. Length 10, breadth 8 mm.

Judging from literature, our shell is more elevated and finely sculptured than *D. tinei*, Calcara.

This genus has not before been reported from the Southern Hemisphere. As in the Mediterranean and off the Azores, it appears to be confined to deep water.

While on the subject of deep-sea Trochoids, I take this opportunity of pointing out that *Trochus* (*Gibbula*) *glyptus*, Watson,[1] from 410 fathoms off Sydney, should be transferred to *Turcicula*.

Hab.—Several specimens from 100 fathoms forty miles south of Cape Wiles, South Australia.

LEPTOTHYRA FUGITIVA, *sp. nov.*
(Plate xviii., figs. 18, 19, 20.)

Shell small, solid, depressed-turbinate, narrowly perforate. Colour white. Whorls three and a half, rapidly increasing, last rounded, descending at the aperture. Spire slightly

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1 Watson—Chall. Rep., Zool., xv., 1886, p. 75, pl. vi., fig. 6.

gradate. Sculpture: On the base and spire are faint traces of radial sculpture. Along the suture runs a deep groove followed by a corresponding ridge. The remainder of the last whorl is surrounded by a succession of numerous fine spiral threads parted by equal grooves. Aperture subcircular, above with the vestige of a varix, below a fold running from the anterior edge of the mouth to the margin of the umbilicus, edge of lip simple bevelled within, columella excavate. Base rather flat. Umbilicus narrow but deep, a sixth of the shell's diameter. Major diameter 1·85, minor diameter 1·55, height 1·2 mm.

This is smaller, flatter and more finely grooved than other Australian species.

Hab.—Numerous specimens were dredged in 100 fathoms forty miles south of Cape Wiles, South Australia.

RISSOA HULLIANA, *Tate*,
VAR. EUCRASPEDA, *var. nov.*
(Plate xviii., fig. 21.)

This deep-sea variety differs from the typical shore form by being pure white, slightly larger and comparatively broader, and by having fewer and more prominent radials. Thus it acquires a lip broader and more scalloped, approaching a varix.

Hab.—Several specimens in 100 fathoms forty miles south of Cape Wiles, South Australia.

RISSOA LOCKYERI, *sp. nov.*
(Plate xviii., fig. 22.)

Shell small, rather thin, ovate-conical, imperforate. Colour white. Whorls four, of which the two first are sharply marked off as the protoconch. Sculpture: On the shoulder is a smooth, unbroken slope, succeeded by elevated, widely-spaced spiral keels, of which the last whorl bears eight and the penultimate three. On the earlier whorls are numerous fine spiral striæ. The interstices of the keels are engraved with close radial scratches. Aperture subcircular, lip slightly expanded. Behind the columella is a narrow axial crevice. Length 2, breadth 1·3 mm.

The species is named in honour of Mr. N. Lockyer, Comptroller of Customs, under whose auspices these collections were made. It is related to *R. imbrex*,[1] than which it is smaller, broader in proportion, and possesses more spirals.

Hab.—Numerous specimens were taken in 100 fathoms forty miles south of Cape Wiles, South Australia.

1 Hedley—Proc. Linn. Soc. N.S. Wales, xxxiii., 1908, p. 469, pl. x., f. 33.

RISSOA VERCONIANA, *sp. nov.*

(Plate xix., fig. 23.)

Shell small, ovate, thin, translucent. Colour white. Whorls four, rounded and parted by deep sutures. Sculpture: First whorl and a half smooth, next with about twenty-five sharp though delicate radial ribs, these increase till on the last whorl they amount to about forty, below the periphery they fade gradually. Different individuals vary in the development and number of these radials. On the last whorl eight or ten spirals equal in grade to the radials override them, thus enclosing rectangular meshes. On the upper whorls the spirals gradually vanish, so that on the base are spirals alone and on the upper whorls radials alone. A secondary microscopic sculpture of close spiral scratches is most conspicuous in the meshes of the body whorl. Aperture subcircular, angled above. Outer lip fortified by a slight external varix, columella margin expanded and reflected over a small umbilical furrow. Length 2, breadth 1·25 mm.

This species is closely related to *R. filosa*, Hedley and Petterd,[1] from the east coast, but that is larger, has an extra whorl and is more coarsely sculptured. That the difference is not due to growth is shown by the contrast between the upper whorls of the two species. The novelty is dedicated to Dr. J. C. Verco, who has done such admirable work on the Marine Mollusca of South Australia.

Hab.—Numerous specimens from 100 fathoms forty miles south of Cape Wiles, South Australia.

AMPHITHALAMUS COSTATUS, *sp. nov.*

(Plate xix., fig. 24.)

Shell small, rather solid, imperforate, narrowly oblong, glossy. Colour uniform ivory white. Whorls five, including a smooth turbinate protoconch of two whorls. Adult whorls wound obliquely, parted by a deeply channeled suture. Sculpture: Broad, flat radial ribs of irregular breadth, crowded on the last half whorl, their ends denticulate the summits of the whorls. So sharp and narrow are the interstices as to resemble cracks. On the last whorl the radials amount to twenty-two. Aperture trumpet-mouthed, oblique, submedian. Length 3, breadth 1·3.

Attempts have been made by Tryon[2] and by Tate[3] to subdivide the *Rissoa* of Australia into groups. These arrangements, though helpful, cannot be regarded as final. If only

1 Hedley & Petterd—Rec. Austr. Mus., vi., 1906, p. 217, pl. xxxvii., f. 2.
2 Tryon—Man. Conch., ix., 1887, pp. 314-69.
3 Tate—Trans. Roy. Soc. S. Austr., xxiii., 1899, pp. 232-7.

as a convenience it would be desirable to break up a genus so unwieldy as *Rissoa* is according to Tryon's presentation. Bearing in mind that the type of *Rissoa*, Freminville, 1814, is *Turbo cimex.*, Linn.,[1] it is clear that many of the Australian shells usually so called are not entitled to the name.

In studying the Rissoidæ taken by the "Thetis" Expedition,[2] I noted that, though Watson's subgenus *Scrobs* had been reduced by Tryon to a synonym of the earlier *Amphithalamus*, Carpenter, yet Carpenter's type was rejected by Tryon as insufficiently known. Under these circumstances it seemed unsafe to use *Amphithalamus*.

By the kindness of Mrs. B. Williamson, of Los Angeles, California, I have received a specimen of the type species of the genus *A. inclusus*, Carp., collected by Mr. Henry Hemphill. No illustration of the species seems to have yet appeared, so I figure (Pl. xx., fig. 34) the gift of Mrs. Williamson, which had been identified as *A. inclusus*, Carp.,[3] by Dr. W. H. Dall. On this foundation I can now accept and use Tryon's interpretation of the synonomy. A paper on the West American members of *Amphithalamus*, which Dr. P. Bartsch has published this year, has not yet reached me.

The American shell at once recalls *A. jacksoni*, Brazier, to a less extent *A. petterdi*, Brazier, and *A. scrobiculator*, Watson. Besides these three small species with detached aperture there are others tightly coiled which vary from broad and short to tall and slender. As uncoiling is considered a degenerate feature, the larger, longer, more tightly wound, many whorled, elongate, fusiform shell is probably nearer to the ancestral form of the genus.

Hab.—Numerous specimens from 100 fathoms forty miles south of Cape Wiles, South Australia.

It has frequently happened that the Australian species of this group have been described under one name in one serial and figured under another name in another publication. Under these circumstances it seems useful to indicate what species might be referred to *Amphithalamus*. I would suggest the following:—

A. APPROXIMUS, *Petterd.*

Rissoa approxima, Petterd, Journ. of Conch., iv., 1884, p. 138; *id.*, Tate and May, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxvi., f. 69.

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1 Herrmannsen—Ind. Gen. Malacol., ii., 1849, p. 400.
2 Hedley—Mem. Austr. Mus., iv., 1903, p. 353.
3 Carpenter—Ann. Mag. Nat. Hist., xv., 1865, p. 181.

A. BICOLOR, *Petterd.*

Rissoa bicolor, Petterd, Journ. of Conch, iv., 1884, p. 137; *id.*, Tate and May, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxvi., f. 63.

This seems synonymous with *R. annulata*, Hutton (N.Z. Journ. Sci., ii., July, 1884, p. 173; Proc. Malacol. Soc., iii., 1898, p. 3), from New Zealand, over which it has priority.

A. CAPRICORNEUS, *Hedley.*

A. capricorneus, Hedley, Proc. Linn. Soc. N.S. Wales, xxxii., 1907, p. 495, pl. xvii., f. 22.

A. COLUMNARIUS, *Hedley & May.*

Rissoa columnaria, Hedley and May, Rec. Austr. Mus., vii., 1908, p. 117, pl. xxii., f. 9.

A. COSTATUS, *Hedley*, as above.

A. DUBITABILIS, *Tate.*

Rissoa dubitabilis, Tate, Trans. Roy. Soc. S. Austr., xxiii., 1899, p. 232; *id.*, Tate and May, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxvi., f. 71 [*nom. mut.* for *R. dubius*, Petterd (not Defrance), Journ. of Conch., iv., 1884, p. 137].

A. FLAMMEUS, *Frauenfeld.*

Sabanæa flammea, Frauenfeld, Reise der Novara, Zool., ii., 3, 1867, p. 12, pl. ii., f. 18.

R. flamia, Beddome, Proc. Roy. Soc. Tasm., 1882, p. 169.

R. sophiæ, Brazier, Proc. Linn. Soc. N.S. Wales, ix., 1895, p. 697.

R. beddomei, Tate, 1899 [*nom. mut.* not *R. flammea*, Pease, Am. Journ. Conch., iii., 1867, p. 297, pl. xxiv., f. 33].

A. FLINDERSII, *Ten. Woods.*

Rissoina flindersii, Ten. Woods, Proc. Roy. Soc. Tasm., 1876, p. 154; *id.*, May, Proc. Roy. Soc. Tasm., 1902 (1903), p. 111, f. 8.

A. FRAUENFELDI, *Frauenfeld.*

Rissoa frauenfeldi, Frauenfeld, Reise der Novara, Zool., ii., 3, 1867, p. 10, pl. ii., f. 13.

A. FRENCHIENSIS, *Gatliff & Gabriel.*

Rissoa frenchiensis, Gatliff and Gabriel, Proc. Roy. Soc. Vict., xxi., 1908, p. 379 [*nom. mut.* for *Rissoa cyclostoma*, Ten. Woods, Proc. Roy. Soc. Tasm., 1877, p. 153; *id.*, Tryon, Man. Conch., ix., 1887, p. 344, pl. 71, f. 8. (Not *R. cyclostoma*, Recluz., 1843.)]

A. INCIDATUS, *Frauenfeld.*

Sabanæa incidata, Frauenfeld, Reise der Novara, Zool., ii., 3, 1867, p. 12, pl. ii., f. 19.

A. JACKSONI, *Brazier.*

Rissoa jacksoni, Brazier, Proc. Linn. Soc. N.S. Wales, ix., 1895, p. 695 [*nom. mut.* for *R.* (*Scrobs*) *badia*, Watson, Chall. Rep., Zool., xv., 1886, p. 612, pl. xlvi., f. 3. (Not *R. badia*, Petterd, 1884.)]

A. KERSHAWI, *Ten. Woods.*

Risoina kershawi, Ten. Woods, Trans. Roy. Soc. Vict., xiv., 1878, p. 57.

R. tumida (Ten. Woods), Tate and May, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxvi., f. 67.

A. OLIVACEUS, *Frauenfeld.*

Alvania olivacea, Frauenfeld, Reise der Novara, Zool., ii., 3, p. 11, pl. ii., f. 14.

As synonyms of this Brazier (Proc. Linn. Soc. N.S. Wales [2], ix., 1895, p. 696) has reduced *Diala tumida* (Ten. Woods, Proc. Roy. Soc. Tasm., 1875, p. 14) and *Rissoa diemenensis* (Petterd, Journ. of Conch., iv., 1884, p. 138.)

A. PELLUCIDUS, *Tate & May.*

Rissoa (*Nodulus*) *pellucida*, Tate and May, Trans. Roy. Soc. S. Austr., xxiv., 1900, p. 100; *id.*, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxiii., f. 8.

A. PETTERDI, *Brazier.*

Rissoa petterdi, Brazier, Proc. Linn. Soc. N.S. Wales, ix., 1895, p. 697; *id.*, Tate and May, Proc. Linn. Soc. N.S. Wales, xxvi., 1901, pl. xxvi., f. 73 [*nom. mut.* for *R. pulchella* (Petterd, Journ. of Conch., iv., 1884, p. 138)].

A. PULVILLUS, *Hedley.*

Rissoa pulvillus, Hedley, Proc. Linn. Soc. N.S. Wales, xxx., 1906, p. 526, pl. xxxii., f. 25.

A. PYRAMIDATUS, *Hedley.*

Scrobs pyramidatus, Hedley, Mem. Austr. Mus., iv., 1903, p. 354, f. 77.

A. RUBICUNDUS, *Tate & May.*

Rissoa (*Cingula*) *rubicunda*, Tate and May, Trans. Roy. Soc. S. Austr., xxiv., 1900, p. 100; *id.*, May, Trans. Roy. Soc. Tasm., 1902 (1903), p. 114, f. 13.

A. SALEBROSUS, *Frauenfeld.*

Alvania salebrosa, Frauenfeld, Reise der Novara, Zool., ii., 3, 1867, p. 11, pl. ii., f. 15.

A. SCROBICULATOR, *Watson.*

Rissoa (*Scrobs*) *scrobiculator*, Watson, Chall. Rep., Zool., xv., 1886, p. 611, pl. xlvi., f. 4.

A. SUBFUSCUS, *Hutton.*

Barleeia subfusca, Hutton, Cat. N.Z. Moll., 1873, p. 28.
Rissoa purpurea (Hutton), Tryon, Man. Conch., ix., 1887, p. 344, pl. lxxi., f. 89.

Recorded as Victorian by Gatliff and Gabriel (Proc. Roy. Soc. Vict., xxiii., 1910, p. 94).

A. TASMANICUS, *Ten. Woods.*

Eulima tasmanica, Ten. Woods, Proc. Roy. Soc. Tasm., 1875 (1876), p. 29; *id.*, May, Proc. Roy. Soc. Tasm., 1902 (1903), p. 110, f. 6.

A. WOODSI, *Pritchard & Gatliff.*

Rissoa woodsi, Pritchard and Gatliff, Proc. Roy. Soc. Vict., xiv., 1902, p. 104; *id.*, May, Proc. Roy. Soc. Tasm., 1902 (1903), p. 112, f. 9 [*nom. mut.* for *R. cyclostoma* var. *rosea*, Ten. Woods, Proc. Roy. Soc. Tasm., 1877, p. 154].

ONOBA BASSIANA, *sp. nov.*
(Plate xix., fig. 25.)

Shell solid, oblong, subcylindrical, rounded at each extremity. Colour, the upper part of each whorl is dull white, the lower slate-purple, the anterior extremity is again dull white, the dark band on the median third of the last whorl fading away before reaching the aperture, apex brown. Whorls five, rapidly increasing, wound obliquely the last two-thirds of the total length. Sculpture: The earlier whorls are smooth, the later bear fine incised spiral grooves, of which the last has about thirty, the penultimate eighteen, and the antepenultimate twelve. Occasional growth striæ cross the shell obliquely. Aperture pyriform. Columella excavate, outer lip grooved within and bevelled to a sharp edge. Length 4·5, breadth 2 mm.

Compared with *O. glomerosa*, Hedley,[1] from Masthead Island, this is far larger, more solid, comparatively broader and darker in colour. It is probably the species reported by Messrs. Gatliff and Gabriel[2] from Port Albert, Victoria.

Hab.—Two specimens from off Devonport, Tasmania (depth unrecorded).

1 Hedley—Proc. Linn. Soc. N.S. Wales, xxxii., 1907, p. 495, pl. xvii., f. 23.
2 Gatliff & Gabriel—Proc. Roy. Soc. Vict., xxi., 1908, p. 379.

Capulus calyptra, *Martyn.*

Patella calyptra, Martyn, Universal Conchologist, 1784, pl. 18.

On previous examination of this South Australian species[1] I pointed out that the *Patella australis*, Lamarck, was really a *Capulus* and had been wrongly transferred to *Hipponyx* by later writers. Placing reliance on Watson's observation that the apices of the two species turned in different directions, I separated *C. australis* from *C. danieli*, Crosse (= *C. calyptra*, Martyn). Further examination indicates that the direction of the apex is not so constant a character. Weight was also attached to the discrepancy of a tropical species occurring as far south as Bass Strait. Since then I have learnt that there is a drift of warm water species from Western Australia round Cape Lewin and across the Bight. By this route it is possible to trace *C. calyptra* back to the tropics.

As *C. danieli*, Prof. R. Tate recorded this from South Australia as a Tertiary fossil.[2]

Cerithiopsis dannevigi, *sp. nov.*

(Plate xix., figs. 26, 27.)

Shell small, acicular, translucent. Colour pale buff, the gemmule rows opaque white, apex translucent. Whorls eleven, plus a four or five-whorled protoconch, separated by deep sutures. Sculpture: On the earliest adult whorl are two bead rows, subsequently another row anterior to these develops and becomes fully established about the centre of the shell, on the last whorl a fourth spiral without beads runs along the angle and, as a thread, appears along the suture of the upper whorls. The gemmules amount to about twenty-two on the last whorl, are small and about their breadth apart. Each gemmule of the median row is linked to its neighbour above and below by a perpendicular bar, thus enclosing a deep square pit in the interstice. Whereas the spirals are opaque, the radials are translucent. Protoconch, first whorl smooth, fourth with a median keel, remainder traversed by oblique threads. Base excavate, aperture subquadrate, canal short. Length 5·5, breadth 1 mm.

Named in honour of Mr. H. C. Dannevig, Director of Fisheries, under whose direction these species were obtained.

Hab.—Several specimens from 100 fathoms forty miles south of Cape Wiles, South Australia. Also taken previously by Mr. W. L. May and self in 100 fathoms off Cape Pillar, Tasmania.

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1 Hedley—Proc. Linn. Soc. N.S. Wales, xxvii., 1903, p. 601.
2 Tate—Trans. Roy. Soc. S. Austr., xvii., 1893, p. 334.

Cerithiopsis geniculosus, *sp. nov.*

(Plate xix., figs. 28, 29.)

Shell rather large and solid, regularly tapering, much constricted between the whorls, glossy. Colour uniform snow white. Whorls thirteen, including the protoconch. Sculpture: First two whorls smooth, remainder strongly radiately ribbed. Ribs prominent medially, above diminishing towards the suture, below suddenly cut off at the basal angle, not continuous from whorl to whorl, about fourteen to a whorl. Intercostal spaces terminating squarely below, in the interstices a few faint spiral scratches appear. Base smooth. Aperture pyriform, outer lip simple, canal short and broad. Length 9, breadth 2 mm.

Hab.—A few specimens from 100 fathoms forty miles south of Cape Wiles, South Australia.

Mathilda decorata, *Hedley.*

Mathilda decorata, Hedley, Mem. Austr. Mus., iv., 1903, p. 352, f. 75.

Hab.—A single specimen from 100 fathoms, forty miles south of Cape Wiles, adds this species to the South Australian fauna. It was originally taken by the "Thetis" off Port Kembla, New South Wales.

Eulima munita, *Hedley.*

Eulima munita, Hedley, Mem. Austr. Mus., iv., 1903, p. 358, f. 81.

This species has not hitherto been noted from South Australia. A specimen was found attached to an Echinoderm, *Goniocidaris tubaria*, Lamarck, trawled at some unrecorded position off the South Australian coast.

Natica elkingtoni, *Hedley & May.*

Natica elkingtoni, Hedley and May, Rec. Austr. Mus., vii., 1908, p. 119, pl. xxiii., f. 18.

This species was recently discovered off the Tasmanian coast, and is new to South Australia. It appears in the dredging of 100 fathoms forty miles south of Cape Wiles, South Australia.

Marginella fulgurata, *sp. nov.*

(Plate xix., figs. 30, 31, 32, 33.)

Shell ovate, solid, glossy, with a buried spire. Colour variable; ordinarily on a white ground are drawn narrow, longitudinally directed, orange, zig-zag lines describing about a dozen angles in the shell's length, about ten such to a whorl.

The elbows pointing to the right are filled in with three or four longitudinal strokes. Two spiral bands are indicated by the darkening of one line of markings near the shoulder and of another above the centre. Complete gradations occur between this pattern and one in which the cross strokes and dark spirals are both absent, while broader, fewer, orange lines describe fewer and larger angles. In form the shell passes through a metamorphosis. For about three whorls it is rolled in the same plane, thus exposing above the summits of previous whorls in a flat spire. Passing from a subcylindrical to an ovate shape, the whorl commences to ascend. A callus pad proceeding from the inner lip is piled on the summit. The axis of the shell is marked by a slight depression from beside which the lip springs. A spiral crest, to which the growth striæ are brushed backwards, runs from the vertex around the summit.

The columella plaits are variable. Two prominent ones always appear at the anterior extremity, above these and decreasing in size posteriorly there may be from one to seven, the uppermost usually too deep-seated to be visible externally. The inner margin of the lip is finely denticulated for the whole length by about twenty tubercles. In the young stage the throat is grooved to correspond. Length 8·5, breadth 5 mm.

This species ranges west to Cape Lewin and north along the West Australian coast to the tropics. It is well known from the beaches of the latter region. Australian collectors have commonly received it through Tryon and Brazier's identification as *M. sagittata*, Hinds. But that is a native of the tropical West Atlantic,[1] and in colour pattern does not correspond. The record of *M. sagittata*, from Hao in the Paumotus, by Couturier,[2] appears to me to need confirmation.

M. pulchella, Kiener, from Norfolk Island,[3] is near this, but is narrower above and appears to have a regular involute growth. In many respects the description of *Marginella liturata*, Menke,[4] agrees, but that unrecognised West Australian shell is excluded by "spira breve conica."

CONUS SUPERSTES, *sp. nov.*

(Plate xx., figs. 35, 36.)

Shell small, solid, regularly conical, angled at the shoulder. Apex mamillate smooth, two whorled, slightly oblique. Sculpture: The whole shell is decorated with flat spiral cords

1 Smith—Journ. Linn. Soc., xx., 1890, p. 489.
2 Conturier—Journ. de Conch., lv., 1907, p. 132.
3 Brazier—Proc. Linn. Soc. N.S. Wales (2), ii., 1888, p. 997.
4 Menke—Moll. Nov. Holl., 1843, p. 28.

defined by narrow, shallow grooves. On the last whorl there are three sulci above and twenty-five below the shoulder, anteriorly these become more crowded and oblique. The whole shell is traversed by delicate growth-striæ. Colour white, in a few examples faint brown dashes appear on the shoulder. Aperture linear. Whorls six, including the protoconch. Length 8·5, breadth 4 mm.

Probably the species attains a larger size, but, as the apex is the chief distinction, larger examples would be recognisable from the present information. Apparently its nearest relation is *C. convexus*, Harris,[1] from the Victorian Eocene, of which I have not seen specimens. Compared with *C. anemone*, Lamarck, the apex of *C. superstes* is more mamillate, and the spiral grooves are stronger; the shoulder of the spire whorls are not tuberculate in *superstes*, as they are in *anemone*.

Hab.—Several specimens, mostly young, from 100 fathoms forty miles south of Cape Wiles, South Australia.

Mitra stadialis, *sp. nov.*

(Plate xx., fig. 37.)

Shell small, thin, fusiform. Colour white, opaque and glossy above the horizon of the lip insertion, below that level dull and subtranslucent, a spiral pair of orange threads run along the centre of each whorl. Whorls seven, of which two form a small and glossy protoconch. Sculpture: Low, rounded radial ribs, about eighteen to a whorl, their breadth apart, traverse the upper whorls and cease at the subtranslucent zone. On the upper part of the whorl are a few lightly engraved spirals, the most conspicuous following the pair of colour lines. Six slight and crowded spirals run along the tip of the snout. Aperture narrow, canal short, bent, outer lip lirate within, inner lip a thin callus. Plaits four, deep-seated, upper nearly horizontal, lower oblique. Length 8·5, breadth 3 mm.

This species is allied to *M. tasmanica*, Ten. Woods, but is narrower, with slighter sculpture.

Hab.—Several specimens from 100 fathoms forty miles south of Cape Wiles, South Australia.

Ringicula meridionalis, *sp. nov.*

(Plate xx., fig. 38.)

Shell ovate, thin, glossy, the more solid parts opaque white, the less solid translucent pearl grey. Whorls five. Sculpture: The whole shell is girt with flat-topped spiral ribs parted

1 Harris—Brit. Mus. Cat. Tert. Moll. Austr., i., 1897, p. 31, pl. ii., f. 5.

by sharp but shallow spiral grooves, these are evenly distributed, they amount to sixteen on the last whorl and to six on the penultimate and antepenultimate in the example drawn. In other instances the ribbing is closer. Aperture: The outer lip is thickened to form a slight external varix but is not dentate within. Columella with two strong plications, above which a callus thick-spread on the body whorl projects a broad, blunt tubercle into the aperture. Length 2·5, breadth 1·65 mm.

R. australis, Hinds, also from South Australia, is larger but proportionately narrower. *R. delecta*, Murdoch and Suter, from New Zealand, is larger, proportionately broader and more densely striated.

Hab.—Numerous specimens were dredged in 100 fathoms forty miles south of Cape Wiles.

RINGICULA SEMISCULPTA, *sp. nov.*

(Plate xx., figs. 39, 40.)

Shell rather large and thin for the genus, ovate-globose, glossy, subtranslucent. Whorls rounded, five, including a tilted subimmersed apex. Suture impressed, bordered by an opaque line. Sculpture: Everywhere are fine microscopic growth lines, and on the shoulder a few microscopic revolving scratches, on the base half a dozen widely-spaced spiral grooves. Outer lip thickened in a low varix, not dentate, sinuate posteriorly, insertion rising a little above the line of the suture. Inner lip spread on the body whorl in a thick callus, but without any tubercle. Columella with two prominent, deeply-entering folds, the anterior larger and projecting beyond the canal. Length 5, breadth 3·5 mm.

Judging from literature, it is related to *R. nitida*, Verrill, from which the spiral sculpture would distinguish it.

Hab.—A few specimens from 100 fathoms forty miles south of Cape Wiles, South Australia. I have also taken it in 80 fathoms off Narrabeen, New South Wales, and in 300 fathoms off Sydney.

C.—SCAPHOPODA.

DENTALIUM THETIDIS, *Hedley.*

Dentalium thetidis, Hedley, Mem. Austr. Mus., iv., 1903, p. 327, f. 61.

This species is new to the province, not having yet been recorded beyond the original habitat of New South Wales. A few specimens occurred in 100 fathoms forty miles south of Cape Wiles, South Australia. Whereas the type has but seven ribs, these have mostly eight, but sometimes nine or even ten. The intercostal threads are less distinct in the western examples.

D.—BRACHIOPODA.

CAMPAGES JAFFAENSIS, *Blochmann.*

(Plate xx., figs. 41, 42.)

Magasella jaffaensis, Blochmann, Trans. Roy. Soc. S. Austr., xxxiv., 1910, p. 92, pl. xxvii., f. 6-9.

In describing this species, Professor Blochmann seems to have used imperfect material, at any rate, his figure displays the brachial apparatus in a broken state. It is therefore here refigured.

The original definition of *Magasella*[1] runs:—"Shell with the reflected portions of the apophyses united, forming a loop." In the Australian shell the union of the apophyses is carried to a much greater extent. They join in a hood or funnel rather than a loop. The ascending and descending limbs also coalesce in a fold which forms a double wall to the funnel. Further, the mesial septum does not project beyond the fold and is insignificant compared to the development attained in typical *Magasella*.

These characters seem as substantial as those by which *Magasella* is differentiated from other groups, and I have therefore already employed them to found a genus *Campages*.[2] *C. jaffaensis* is quite distinct from the type species *C. furcifera*, which attains a larger size and has the corners of the mouth turned down. From P. Eichler's illustrations[3] it would appear that *Magellania joubini*, Blochmann, should also be referred to *Campages*.

In describing *Cistella australis*, Blochmann[4] appears to have overlooked Dall's correction[5] of that generic name. *Cistella*, Gray, 1853, was preoccupied by *Cistella*, Gistel, 1848; in substitution, Dr. Dall has proposed "*Argyrotheca*."

Hab.—The "Endeavour" trawled *C. jaffaensis* in 40 fathoms north of Cape Borda, South Australia. I have taken it in 250 fathoms outside Sydney, in 80 fathoms outside Narrabeen, and, in conjunction with Mr. W. L. May, in 100 fathoms off Cape Pillar, Tasmania.

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1 Dall—Am. Journ. Conch., vi., 1871, p. 134.

2 Hedley—Rec. Austr. Mus., vi., 1905, p. 43, f. 5, 6.

3 Eichler—Deutsch. Sud-Pol. Exped., xii., Zool., iv., 1911, p. 388, pl. xliv., f. 23, 24.

4 Blochmann—Trans. Roy. Soc. S. Austr., xxxiv., 1910, p. 93, pl. xxvii., f. 10, 12.

5 Dall--Nautilus, xiv., Aug. 1900, p. 44.

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Department of Trade and Customs.

FISHERIES.

Zoological Results of the Fishing Experiments carried out by the F.I.S. "Endeavour," 1909-10

(H. C. Dannevig, Commonwealth Director of Fisheries).

PART II.

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CONTENTS TO PART II.

III. Report on the Sponges obtained by the F.I.S. "Endeavour" on the Coasts of New South Wales, Victoria, South Australia, Queensland, and Tasmania.

PART I.

BY

E. F. HALLMANN, B.Sc., ZOOLOGIST

Australian Museum,
Sydney.

Plates XXI.-XXXVI.; Text-figs. 21-69.

III.—REPORT ON THE SPONGES.

Part I.

I.—Introduction.

The Sponges which have so far been obtained by the "Endeavour" consist almost exclusively of Monaxonellida and Keratosa in approximately equal numbers. In this Report I propose to deal only with the former of these; the latter will scarcely prove suitable for purposes of investigation unless taken in conjunction with additional material, since in the main they are preserved in a dry condition, and there are among them altogether too few specimens of any one species. Inasmuch as an extensive collection of well-preserved Keratose sponges, particularly from the Australian area, would unquestionably be of extreme scientific value, it is greatly to be hoped that the fullest advantage will be taken of the unique opportunities provided by the trawling operations of the "Endeavour" to bring together as large a number as possible of these forms.

In order to deal effectively with the material placed at my disposal, it was found necessary, as a preliminary task, to undertake the re-investigation of certain previously described species, including more particularly a number of those which were first described by Dr. R. von Lendenfeld in his "Descriptive Catalogue of Sponges in the Australian Museum,"[1] and afterwards by Mr. T. Whitelegge in his "Report on Sponges from the Coastal Beaches of New South Wales."[2] As a result I find that, whereas the latter author is correct in pronouncing the original descriptions of these species to be in many instances inaccurate, yet he himself has committed a number of serious errors, owing to a too hasty conclusion that the specimens investigated were the actual types. This explains the anomalous circumstance that the descriptions which the two authors have given of certain species are devoid of agreement in any essential particular. Unfortunately, however, not all the discrepancies can be thus explained, and considerable caution will be necessary in deciding particular cases. Mr. Whitelegge evidently proceeded on the assumption that the specimen carrying the author's label must be accepted unquestioningly, in preference to the description, as the ultimate criterion of the species; but, although such a

1 8vo, Sydney, 1888.
2 Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 55, pls. x.-xv

course may be perfectly reasonable and right so long as the authenticity of the specimen remains undoubted, it surely can no longer be pursued when sufficient evidence exists to prove the contrary.

It was not my intention, at the outset, to include in this Report any details of the results of this subsidiary investigation (except in so far as they bore directly upon the species of the "Endeavour" collection), but to reserve them as the subject of an independent paper. Owing, however, to the very unsatisfactory state of the descriptions of many of the species examined, and in view of the possibility that a considerable time may elapse before a complete account of them can be furnished, I came to the conclusion that it would be wrong to allow this opportunity to pass without at any rate making such corrections as might render possible their identification. Accordingly I have added to the Report, often in the form merely of foot-notes, a series of observations which practically amount to a brief revision of the Ectyoninæ originally described in various publications of the Australian Museum. As the work of preparation was conducted in the Australian Museum itself, I have had the advantage of having before me in most cases the actual specimens, and in many cases the actual slides upon which the original descriptions were based. In addition, very material assistance was afforded me in the identification of species by a valuable series of mounted sections of Port Phillip sponges and a large number of fragments of Australian sponges preserved in the British Museum, which Prof. A. Dendy some years ago generously placed at the disposal of this Museum.

In regard to certain Ectyonine species I have expressed the opinion that new genera should be established for them, but I have purposely refrained from introducing such new genera because I recognise that, in order to do this in a thoroughly satisfactory manner, it would be necessary to undertake a much wider comparative study of the species of this group than—owing to lack of literature, if for no other reason—I have found to be possible.

After the manuscript of the Report had been completed and at too late a date to admit of any alterations in the text, I received a copy of the second part of Dr. Hentschel's paper on the sponges of South-west Australia; consequently any deductions which it has enabled me to make are necessarily relegated to the footnotes, or to concluding paragraphs.

II.—DESCRIPTION OF THE GENERA AND SPECIES.

Family SPIRASTRELLIDÆ.

Genus Spirastrella, *Schmidt*.

Spirastrella montiformis, *sp. nov.*

(Plate xxi., fig. 3, and fig. 21.)

Sponge mound-shaped, rising to a central peak, on the summit of which one or several oscula are situated; upper aspect of sponge with short digitiform or ridge-like processes on which apical oscula are rarely to be found. No rind. Spicules not aggregated into definite fibres. Megascleres:—Tylostyli (sometimes reduced to styli), of varying length and stoutness, reaching a maximum size of 710 x 12 μ. Microscleres:—Spirasters of two kinds, viz., shorter tuberculated forms principally confined to the superficial layer, 25 μ long; and slender zigzag sharp-spined forms chiefly to be found in the canal walls of the interior and reaching to 80 μ or more in length.

This species is represented in the collection by eight specimens, all of which are preserved in the dry state. Although showing a moderate amount of variability in external form, they may be satisfactorily described in general terms as massive, sessile, somewhat mound-shaped sponges, roughly circular in horizontal section, and usually prolonged upwards into a more or less well-defined pinnacle. They are attached by a broad base of only slightly lesser extent than the maximum transversal of the sponge, which is attained some short distance above it. The fact that the maximum girth does not coincide with the actual base, renders the term "mound-shaped" not perfectly applicable, and admits of a distinction into an extensive upper surface, and a restricted lower one. From the former there arise few or many elevations in the form either of short digitiform processes, or of compressed ridges. The interior of the sponge, to within a few millimetres of the surface, is traversed by numerous rather wide canals, some of which attain a diameter of 10 mm.; they are lined by a distinct aspiculous membrane, which also forms dissepiments across their lumina. The central peak is penetrated to its apex by one or several of these canals, which terminate in a corresponding number of oscula. Occasionally a few of the secondary elevations are similarly provided, but usually they contain only minor branches of the canal system.

In the present condition of the sponges, the oscula are closed, and not readily perceived; but their presence is, in every case, indicated by longitudinal furrows and puckers of the extremity of the processes bearing them, and is, of course, readily demonstrated by sectioning. Of the specimens of the present series, the largest and the smallest are those which depart most from the mean form. The former is sub-elliptical in horizontal outline, and in 120 mm. in height; the principal diameters of its base are 140 mm. and 90 mm. respectively, whilst the corresponding measurements of its greatest transverse section are 200 mm. and 120 mm. It is furnished with more than 100 processes, the greater number of which are ridge-shaped. The smallest specimen is subfusiform in shape, and is provided with only four digitiform processes. The consistency in the dry state is, one might say, intermediate between that of cork and pith; the superficial layer is slightly harder and more friable, but there is no indication of a rind. The colour is pale grey within, and yellowish-grey on the surface. The skeleton is diffuse, without any indication of definite fibres, and consists of a fairly dense and irregular aggregation of straight spicules showing all gradations between styli and tylostyli. Even in proximity to the surface there is no well-defined arrangement of the megascleres, although a considerable proportion of them stand more or less perpendicularly, with their points (or not infrequently, in the case of the larger spicules, with their basal extremities) impinging on, or barely projecting beyond, the surface. The spirasters are comparatively few in number and are confined almost exclusively to the external surface and to the walls of the canals immediately beneath their lining membrane.

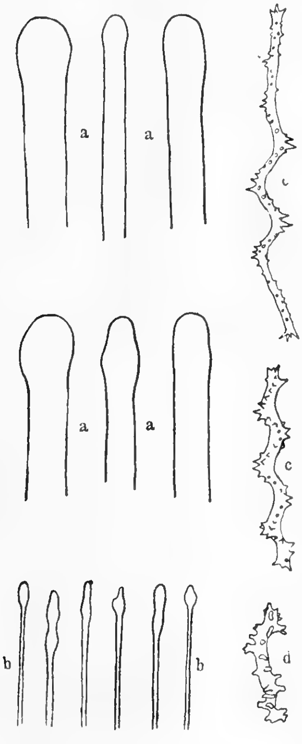

Fig. 21—*S. montiformis.* a Larger tylostyli (basal extremity). b Slender tylostyli (ditto). c Spined spirasters. d Tuberculated spiraster.

Megascleres.—It is difficult to say whether these belong to one, two, or three categories. At first sight it might appear that two kinds are to be distinguished, viz., (i.) stouter tylostyli, with a tylosis of only moderate size, which is perhaps most frequently subterminal in position and more or less reduced (or sometimes absent) and which has a quite smooth surface and not very variable contour; and (ii.) very slender tylostyli (of scarcely lesser length), in which the frequently relatively large tylosis is extremely variable in shape and size, often exhibits tubercular irregularities of the surface, and is occasionally several times repeated. The former spicules vary in length from less than 200 μ to slightly more than 700 μ, and in diameter up to 12 μ; it is seldom, however, that their length exceeds 650 μ or their diameter 10 μ; usually they taper to a quite sharp point, but more or less strongylote terminations occur. The latter or slender tylostyli appear to be rarely more than 3 μ in diameter and may attain a length of at least 640 μ. A more thorough scrutiny of the spicules shows, however, that forms intermediate between these kinds occur, though they are comparatively few in number; and, taking all the facts into consideration, it is not possible to decide with certainty whether the two degrees of stoutness are merely the expression of different developmental stages, or whether they have a more important significance and indicate either that the spicules have undergone a partial differentiation into two groups or actually represent two distinct orders. Again, it is to be observed that the stouter spicules vary considerably in length; and on analysis it appears not improbable that in another respect also a certain amount of differentiation into two groups has been affected since a relatively large proportion of the spicules below a length of 300 μ or thereabouts (the diameter of which is 6 to 8 μ) are simply stylote, and are subfusiform in shape. But these peculiarities are not confined to the shorter spicules, and are not, indeed, strikingly characteristic of them. These shorter spicules appear to greatly predominate amongst those which stand perpendicularly at the surface of the sponge.

Microscleres.—Spirasters of two kinds occur:

(i.) Small tuberculated forms, extremely variable in shape, often with the tubercules chiefly confined to one side, 12 to 32 μ in length, and up to 4 μ in breadth exclusive of the tubercules. These, together with an inconsiderable admixture of those of the second kind, form an exceedingly thin but apparently not continuous superficial layer, and also occur in limited numbers in the canal walls.

(ii.) Elongated spined forms, occurring for the most part only in the immediate circumference of the canals, in the walls of which they lie tangentially, loosely scattered in a single layer. It frequently happens that several together are apposed so closely, and in such a way, that they cannot by any means be distinguished from a single large branched spicule. Speaking generally, they are characterised by their slender zigzag form, and the very evident spiral arrangement of their spines. Their length, which is rather variable, sometimes reaches above 80 μ; their diameter rarely exceeds 3 μ.

Loc.—East coast of Queensland, seven miles east of Double Island Point, 33 fms. ("Endeavour").

S. montiformis is probably most nearly related to *S. vagabunda*, Ridley, and *S. tentorioides*, Dendy. The striking resemblance which its elongated zigzag spirasters bear to those of *Clionopsis platei*, Thiele, and to certain species of *Cliona*, not only supports the opinion that *Spirastrella*, *Cliona* and *Clionopsis* are allied genera, but seems also to show that such spirasters are of primitive form.

SPIRASTRELLA POCULOIDES, *sp. nov.*

(Plate xxi., fig. 1, and fig. 22.)

Sponge sessile, massively cup-shaped. Surface smooth; even, or provided with a few low dome-shaped elevations. The oscula (?) are microscopic circular openings on an average ·25 mm. apart. Skeleton semi-diffuse, non-fibrous; spirasters scattered in moderate abundance throughout all parts and forming a cortical layer. Megascleres:—Tylostyli of a single kind measuring 560 x 13 μ. Microscleres:—Spirasters of a single kind, 50 x 10 μ.

The following description is based on a single specimen.

The sponge is a stout-walled and exceeding thick-bottomed, compressed, sessile cup. Its shape may be conceived as having been attained by the upgrowth of a broad pillar, in which growth has proceeded most rapidly at the periphery. The surface is very smooth, and generally even; the only inequalities are in the form of a few broad, rounded protuberances. The interior of the sponge is free from noticeable cavities, and of very uniform structure throughout. The texture of its internal substance, when dry, is such as might result from the close compression of some finely divided fibrous material; there is no appearance macroscopically of extended fibres. Owing to the firmness and density of the superficial layer and the compactness of the skeleton generally, the sponge is (in the dry state) fairly hard and incompressible. The dimensions of the specimen are as follows:—Height, 100 mm.; depth of cup, 40 mm.; average thickness of cup-wall, 15 mm.; principal internal diameters of cup, 120 mm. and 30 mm. No oscula are visible to the naked eye. The surface, however, is pierced by minute circular openings 40 to 50 μ in diameter and, on an average, about 250 μ apart. In a thick vertical section, cut transversely through the cup-wall, two regions are roughly distinguishable:

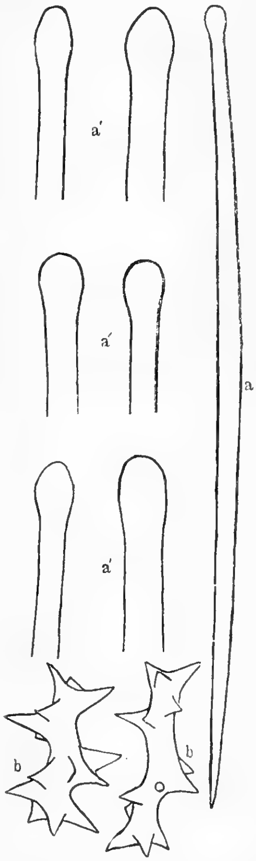

Fig. 22—*S. poculoides* **a Tylostyle. á Ditto basalextremity). b Spirasters.**

(i.) A superficial layer varying from 1 mm. to 4 mm. wide, in which the spicules are not at all collected into strands, but are closely crowded without recognisable order except in some parts of its outer limits, where the majority of the spicules may stand more or less perpendicularly to the surface. The spirasters, which are plentifully scattered throughout the whole sponge, become more and more closely aggregated as the surface is approached, and ultimately produce, by their close crowding, a dense and compact thin external crust.

(ii.) An extensive central region traversed by irregularly sinuous, ascending "fibres" or "columns" composed of loosely associated spicules. In the section the "columns" appear to be discontinuous, owing probably to their passing out of the plane of section. They sometimes broaden out into diffuse bands, sometimes contract into more compact strands. The spaces between the "columns" are occupied by a profusion of single spicules, spicule bundles, short spicule strands and sheet-like patches, as well as by scattered spirasters: all of which together constitute no inconsiderable proportion of the entire skeleton, and in macroscopic examination mask from view the more definitely fibrous aggregations of the spicules.

Spicules.

(i.) The megascleres are tylostyli which, as a rule, are straight; they are of uniform diameter throughout the greater part of their length and gradually taper thence to a sharp point; greatest size 560 x 13 μ.

(ii.) The spirasters are of a single kind and reach a length of 50 μ (though usually much shorter) and a diameter, exclusive of spines, of 5 to 10 μ. The spines are large, approximating in length to the diameter of the spicule-shaft, and in the case of the larger spicules are about twenty in number.

Loc.—North coast of New South Wales, eight miles east of Sandon Bluffs, 35-40 fms. ("Endeavour").

Spirastrella alcyonioides, *sp. nov.*

(Plate xxi., fig. 2, and fig. 23.)

Sponge an erect, compact, sessile cluster of frondiform or of angular or only slightly compressed digitiform upgrowths, of which some proceed from the very base of the sponge, whilst some arise as outgrowths or lobes from others. Oscula situated apically on the digitiform terminals. Surface smooth, with slight longitudinal inequalities and a few small ascendant papilliform projections. Sponge in the dry state very hard. Skeleton semi-diffuse; without fibres, but with occasional very broad columns of parallely-arranged spicules. The substance of the sponge is abundantly traversed by brownish spongin-like streaks which, however, show no particular relation to the spicule arrangement. Spirasters of a single kind are plentifully scattered through all parts and form a compact superficial layer. Spicules:—Tylostyli of one kind, with blunt rounded distal extremity, measuring 440 x 8 μ; and large-spined stout spirasters, 40 x 7 μ.

Two specimens of this species were obtained, both of which are preserved in a dry state. The characteristic form of the sponge appears to result from the upgrowth, in the first place, of a few processes from a basal disk of limited extent, which processes, as they grow, either remain simply digitiform, or become broadened and flattened (frondiform) and more or less subdivided. In any case the uppermost part of the sponge consists chiefly, of separated digitiform terminals, which are usually tapered and somewhat pointed, and are provided apically each with one or a few oscula. The larger specimen (Plate xxi., fig. 3), which measures 130 mm. in height, consists almost entirely of frondiform components; the smaller, if digitiform. In its dried condition, the sponge is particularly dense, hard and tough; although the amount of shrinkage has seemingly been but slight. The surface is smooth, but slightly uneven owing to the presence of discontinuous undulations and obscure ridges, which, however, may be due to contraction. In addition, the sponge is provided with small scattered verruciform upwardly directed elevations; these are sometimes fairly numerous on the upper margins of the more flattened upgrowths, but, generally speaking, their occurrence is irregular and it is not certain that they are a constant feature. The colour of the sponge is yellowish-grey.

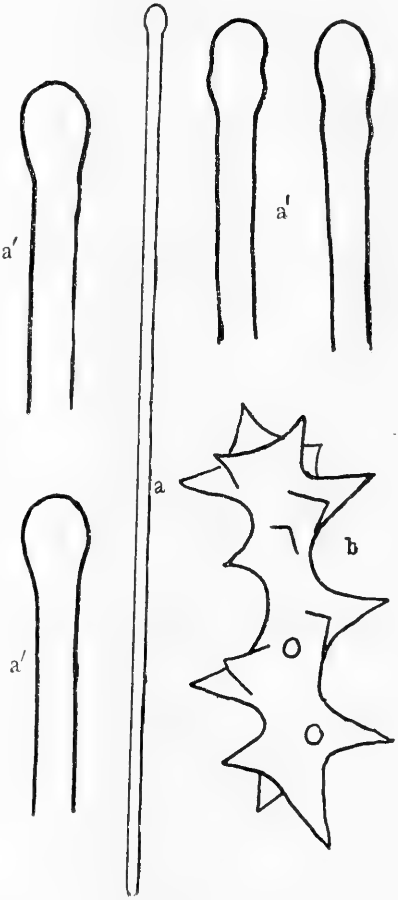

Fig. 23—*Spirastrella alcyonioides.* a Tylostyle. á Ditto. (basal extremity). b Spiraster.

The precise arrangement of the skeleton is not apparent in the present condition of the specimens owing to the distortion which it has undergone, consequent upon drying. It is only possible to refer in general terms to its main features (*e.g.*, as exhibited in longitudinal section of a digitiform terminal). Such a section, in general, shows one or two main or oscular canals cut longitudinally, and a spicular skeleton which is, for the most part, of a diffuse type, without any definite aggregation of spicules into fibres. It is traversed, however, by a few broad "columns" of rather closely packed parallel spicules, somewhat resembling the "axial condensations" of certain Axinellids. Some of these run longitudinally, whilst others are cut transversely. Another feature, perhaps deserving of note, is the occurrence of numerous longitudinal pale brownish-coloured streaks, the appearance of which is somewhat suggestive of spongin. These streaks are absent from the columnar spicule-tracts.

Megascleres.—The megascleres are straight cylindrical tylostyli of a single kind, with strongylote distal extremity; size, 400-440 x 4-8 μ.

Microscleres.—The spirasters are fairly straight spicules, provided with twenty to thirty large spines, which are about 7 μ in length. They are plentifully scattered through the tissues, and form a dense superficial layer 100 to 200 μ in thickness; the size of the largest is about 40 x 7 μ.

Loc.—East coast of Queensland, twenty-five miles southeast of Double Island Point, 33 fms. ("Endeavour.")

SPIRASTRELLA PAPILLOSA, *Ridley and Dendy.*

1887. *Spirastrella papillosa*, Ridley and Dendy, "Challenger" Monaxonida, 1887, p. 232, pl. xli., fig. 5, pl. xlv., figs. 11, 11a.

The Museum collection contains six speciments of this species. They vary considerably in shape, but are always provided with several large apically situated oscula, and in other respects agree exactly with the description of the type, except that they do not show any sign of "deep longitudinal wrinkles" near the apex. The warty appearance of the surface appears to be a constant character.

Locs.—Shoalhaven Bight, New South Wales, 15-45 fms. ("Endeavour"); Port Jackson, New South Wales, 30-35 fms. ("Challenger"); Port Jackson, New South Wales, and Port Phillip, Victoria (Austr. Mus. Coll.).

GENUS LATRUNCULIA, *Bocage.*

LATRUNCULIA CONULOSA, *sp. nov.*

(Plate xxii., fig. 1, and fig. 24.)

Sponge submassive, sessile, with aculeated surface. Consistency and texture dense, somewhat rubber-like. No oscula. Surface glabrous, dotted with minute pore-groups. Main skeleton a reticulation of strongly-

developed, stout fibres composed of styli. Surface conuli, each forming the centre of a radiate system of slender fibres. There is a dermal layer of discasters of the larger kind. Megascles:—Blunt-pointed styli 365 x 11 μ, together with a few (probably immature) sharp-pointed, slenderer spicules which attain an equal length. Microscleres:—Discasters of two kinds, of which the larger form a superficial layer and a packing round the main fibres, and are also scattered through the ground substance along with the smaller. The larger are provided with simple spines, the smaller often with compound spines, the spines in both cases being arranged in four whorls, two at either end.

The single specimen consists of a sessile, submassive, erect, cylindrical main portion, together with a similar but smaller upgrowth which arises partly from the substratum in continuity with the base of the former and partly from its side. The main trunk is 70 mm. in height, and 30 mm. in diameter. The surface, which is smooth and glabrous, is provided with numerous spine-like conuli, 1 to 3 mm. in height. There are no oscula. The surface is closely dotted with minute pore areas, about .2 mm. in diameter, and each with two to four pores. The texture is dense and compact, the consistency firm and fairly tough; in both respects the sponge is somewhat suggestive of india-rubber, although, of course, not so dense, homogeneous or elastic. The colour (in spirits) is pale brownish-grey.

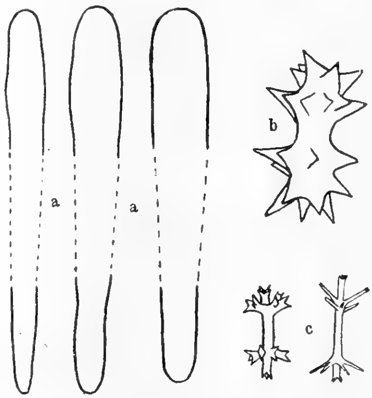

Fig. 24—*Latrunculia conulosa.* a Styli. b Larger discaster. c Smaller discasters.

The main skeleton consists of a very loose reticulation of stout fibres (up to 400 mm. or more in thickness) which are composed solely of densely packed parallel styli. Each surface-conulus forms the apex of a convergent pencil of fibres, of which the axial or principal fibre only is derived from the main skeletal reticulation, whilst the remainder—which are very much slenderer fibres—both begin and terminate at the surface. Probably it would be more correct to say of the latter, that they proceed *from* the apex of the conulus, and after running inwards, with gradually increasing divergence, for a short distance towards the sponge-interior, gradually curve round and return again to meet the surface at varying distances from their starting point—the more centrally situated fibres of the pencil proceeding to a further distance than the more peripheral. Styli similar to those composing the fibres are sparingly scattered through the tissues together with discasters of two kinds, a larger and a smaller. The former are closely aggregated in the immediate surrounding of all the main fibres encircling them as a kind of loose sheath. The cortical skeleton is a layer of closely packed discasters almost exclusively of the larger kind; it is about 300 to 400 μ in thickness.

Megascleres.—These are styli, probably of a single kind—the stouter with a more or less blunt or rounded distal extremity, and occasionally becoming almost perfectly strongylote; the slenderest usually sharply pointed. They are sometimes elongately subtylote at the basal end, and have a maximum size of 365 x 11 μ.

Microscleres.—(i.) The larger discasters are stout spicules, having a short central region devoid of spines, and on either side of this two more or less distinct whorls of large spines: those of the terminal whorl projecting obliquely forwards; those of the sub-terminal, standing more or less perpendicularly to the spicule-axis. They are about 40 μ in length (exclusive of spines), and have a diameter in their spineless central region of about 12 μ. The spines are 10 to 12 μ long.

(ii.) The smaller discasters are very variable in form, no two apparently being quite alike. They are much slenderer spicules than the preceding, with an elongated spineless central region, and at either end, two more or less distinct whorls of simple or (more usually) compound spines, the latter of which are columnar in form, with a few terminal spinules. The terminal whorl of spines is often reduced and then appears as a prolongation of the axis of the spicule. These spicules are at most 38 μ in length (inclusive of spines), and have a diameter centrally of 1 to 4 μ (rarely more than 2.5 μ). The stouter individuals may represent a third kind of discaster intermediate between the other two.

Loc.—North coast of Tasmania, off Devonport. ("Endeavour.")

Family POLYMASTIIDÆ.

Genus Polymastia, *Bowerbank*.

Polymastia craticia, *sp. nov*.

(Plate xxii., fig. 3, and fig. 25.)

Sponge depressed dome-shaped, sessile, with thick-walled digitiform tubular processes some of which are provided with a single apical osculum. Main skeleton consisting of a fairly dense matrix of scattered spicules and spicule bundles traversed vertically by fairly stout distant fibres. The fibres lying immediately beneath the cortex of the processes comprise an outer series of wavy fibres running circumferentially and forming an elegant wickerwork, and of an underlying series of equidistant longitudinal fibres. The cortex consists of styli arranged in a dense palisade. Spicules:—These are of three kinds, viz., fusiform styli of two orders of size which (particularly the larger) are scarcely distinguishable from oxea, the larger occurring in the main skeleton, the smaller in the cortex; and fusiform tylostyli which occur along with the larger styli scattered through the ground tissues. The first attain a size of 1200 x 22 μ; the second, 350 x 9 μ; and the last, 200 x 5 μ.

The sponge is sub-circular in horizontal outline, broadest at the base, with a convex upper surface from which numerous longer or shorter stout digitiform processes arise. Of four specimens, the two which differ most in their proportions are respectively 55 x 80 x 50 mm., and 40 x 90 x 75 mm. in height, length and breadth. These two also differ most in the lengths of their processes, which in the former are never more than 10 mm. long, in the latter usually between 15 and 30 mm. The processes are usually tapered to a point and vary from 60 to 80 in number. When, as sometimes is the case, they are cylindrical and distally rounded, the osculum, if it occurs, is situated on the summit of a small terminal papilla.

The specimens are preserved in a dry state, and the following remarks therefore apply to the sponge in that condition. The surface is quite smooth to the touch but has a minutely velvety appearance due to the slightly projecting points of the densely crowded cortical spicules. Internally the sponge consists of a dense, but rather soft and friable matrix traversed vertically by fibres about 250 μ in stoutness. The fibres are composed solely of closely packed spicules of the largest kind, which are fusiform styli closely resembling oxea; the matrix consists of a disorderly profusion of spicule-bundles and single spicules of the same kind together with smaller tylostyli. The cortical skeleton proper consists of crowded fusiform substyli arranged perpendicularly to the surface, but immediately beneath and closely associated with it is a thin matted layer of mostly horizontally disposed styli of the larger kind. Fibres from the inner skeleton penetrate into the cortex, spreading out slightly at their extremities in a penicillate fashion; the terminal spicules of these fibres usually project slightly at the surface. The arrangement of the fibres immediately underlying the cortex is one of marked regularity. In the body of the sponge, a series of equidistant parallel fibres running upwards from the base is most conspicuous, but in the processes, a series of circumferentially directed fibres external to these also comes into prominence. The latter run undulatingly and intercross so as to form a wickerwork-like structure of very elegant pattern. The specific name has been bestowed in reference to this feature.

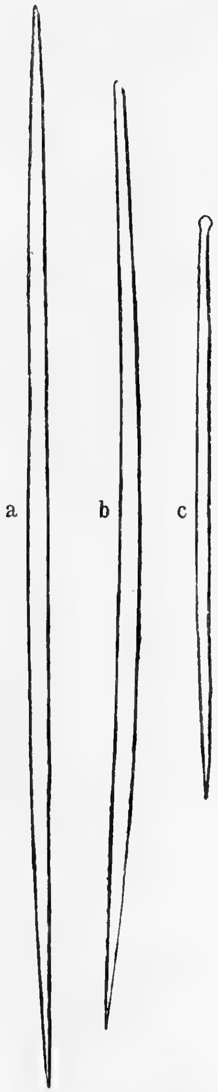

Fig. 25– *P. craticia*.
a Stylus (of the fibres).
b Stylus (of the cortex, drawn to a larger scale than the preceding).
c Tylostylus (of the cortex).

Spicules.—

(i.) The larger oxea-like styli are straight, and measure 660-1200 x 12-22 μ.

(ii.) The smaller are usually slightly curved and more distinctly stylote; they range in size from 220 x 6 to 350 x 9 μ.

(iii.) The tylostyli (or subtylostyli) are fusiform and usually slightly curved. They occur singly and in small bundles in the ground substance. Size: 120 x 3 to 200 x 5 μ.

Loc.—North coast of New South Wales, eight miles east of Sandon Bluffs, 35-40 fms. ("Endeavour.")

FAMILY ASTRAXINELLIDÆ, *Dendy*.

Dendy[1] has suggested the advisability of instituting a new family—Astraxinellidæ—for the reception of certain Axinellidæ which are distinguished by the possession of astrose microscleres. The Astraxinellidæ he would place in the division Astromonaxonellida, whilst the Axinellidæ in the restricted sense would remain in the Sigmatomonaxonellida. If we could learn all the facts concerning the phylogeny of the Axinellidæ it would no doubt be found that, whereas some have been evolved from Desmacidonid and Haplosclerid ancestors and some (*? e.g.*, *Trachycladus*[2]) directly from more primitive sigmatophorous forms, yet a considerable number have developed along lines of descent which diverge from the Astrotetraxonid stem. In a natural system of classification the last-mentioned would be excluded from the Sigmatomonaxellida, and they would probably require several families for their reception. Unfortunately, it is impossible in the present state of our knowledge to determine, in the majority of cases, to which of the two primary Tetraxonid subdivisions a given Axinellid genus belongs, and consequently no altogether satisfactory bipartition of the family is to be expected without much further enquiry. Nevertheless, there is much to be said in favor of a removal forthwith from the Axinellidæ of such genera as afford sufficient evidence of their Astrotetraxonid affinities; and these might very well be placed provisionally in a single family, irrespective of any question as to whether their relationships are close or distant. On this understanding I feel but slight hesitation in placing under the family Astraxinellidæ the new genus *Paracordyla*, which possesses an Axinellid type of skeletal structure and yet has microscleres in the form of amphiasters.

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1 Dendy—Rept. Pearl Oyster Fisheries, Gulf of Manaar, with Rept. Mar. Biol. Ceylon, Part 3, 1905, p. 107.

2 In this connection, I would suggest that a new family—Spirasigmidæ—be established to include *Trachya globosa*, Carter (Ann. Mag. Nat. Hist., 5, xvii., 1886, p. 121), and its variety, *rugosa* (*Op. cit.*, xviii. 1886, p. 457), *Gellius aculeatus*, Whitelegge (Sponges of Funafuti, Austr. Mus. Mem., iii., 5, 1897, p. 326), and perhaps also the genus *Trachycladus*. For the first-mentioned of these species Topsent (Mém. Soc. Zool. France, vii., 1894, p. 8), has already proposed the genus *Trachygellius*; for the second I now propose a new genus *Spirasigma*. In both of these genera the microscleres resemble the sigmaspires of *Trachycladus* more closely than they resemble ordinary sigmata, and the conformation of the skeleton is strongly suggestive of their derivation from the Tetillidæ. Of these species I have examined (only) sections which were prepared by Mr. Whitelegge—those of *T. globosa* and its variety having been cut from pieces of British Museum specimens, and that of the latter from its type-specimen. If the former sections are correctly labelled—and I scarcely doubt that they are—*T. globosa* and *T. globosa*, var. *rugosa* are specifically distinct. Both in *Trachygellius* and *Spirasigma* the skeleton has a radial arrangement recalling that of the Donatiidæ. In the former the large diactinal spicules (oxea in the two known species) are accompanied by sigmata only; in the latter (in which, in the single species, the large

Genus Paracordyla, *gen. nov.*

The inner skeleton is a dense columnar aggregation of large oxea which, in linear outgrowths of the sponge-body (if these be present), takes the form of a very compact axial core. Spongin appears to be wholly absent. The ectosomal skeleton is a dense palisade of vertical microxea supplemented by "dermal brushes" of styli or oxea. Between the ectosomal layer and the inner skeleton-mass is a narrow zone penetrated by canals and crossed by strands of the large oxea. In addition to microxea, microscleres in the form of small amphiasters are present.

The spiculation of this genus is remarkably similar to that of *Scolopes moseleyi*, Sollas;[1] but since Sollas speaks of fibres in connection with his species, and remarks that the general character of its skeleton reminds one forcibly of that in Carter's genus *Trachya*, there is evidently a distinct generic difference between *Paracordyla* and *Scolopes*. Amongst the Axinellidæ, the genus which makes the nearest approach to *Paracordyla*, appears to be *Ceratopsis*, Thiele.[2]

Paracordyla lignea, *sp. nov.*

(Plate xxii., fig. 2, and figs. 26, 27.)

Sponge sessile, with a massive body from which branch-like elongations may arise. Consistency, owing to the enormous development of the spicules, very dense and solid. Surface even, pilose. Oscula wanting. The skeleton of the whole of the inner mass of the sponge to within a few millimetres of the surface is formed of closely aggregated large oxea, with a general parallel arrangement, which, in the branch-like parts, form an almost solid core. Between the core and the superficial layer (cortex) is a narrow zone, 2 to 3 *mm. wide, crossed by strands of similar oxea, the outer spicules of which project well beyond the surface. The surface is also protected by brushes of shorter spicules varying in form from styli to oxea. The canals of the subcortical zone are surrounded by radially disposed microxea, and similar spicules, together with minute amphiasters, are scattered through the ground substance. Megascleres:—(i.) Oxea of the main skeleton reaching a size of 3200 x 50 μ; (ii.) styli and asymmetrical oxea of the dermal brushes varying in length from less than 200 to about 700 μ, with*

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spicules of the fibres are substrongyla) there are in addition scattered small oxea. If in *Spirasigma aculeata* the fibre-forming strongyla disappeared, the species would, without doubt, owing to the mode of distribution of its smaller oxea, be classed as a *Gellius*.

1 Sollas—"Challenger" Tetraxonida, 1885, p. 432, pl. xliii., figs. 1-9.

2 Thiele—Studien uber pazifische spongien, Zoologica, Heft 24, 1898, p. 56.

maximum diameter of 18 μ. Microscleres:—(i.) Microxea, 100 to 140 μ in length by about 4 μ in diameter; (ii.) amphiasters, 4 to 5 μ long.

The single specimen is a moderately large, massive, sessile sponge, of great density and solidity, with a rounded cuboidal or sub-globose body which measures about 120 mm. in each of its three principal directions. From the marginal region of the somewhat flattened upper surface of the main body there are given off, at sub-equal distances, three stout branch-like processes, 100 to 150 mm. in length. One of these is cylindrical, the others are club-shaped and are polytomously divided at their extremities into incipient branches. The specimen, which has been longitudinally bisected, is, with the exception of one of its processes, preserved in a dry state. The contraction resulting from drying has caused the surface to split in places, giving rise to a number of shallow gaping fissures, such as are occasioned under similar circumstances in many Axinellids. The surface of the dried portion somewhat resembles short-piled velvet, both in appearance and to the touch; that of the spirit piece has a harsher feeling. The colour of the former is yellowish-white, both externally and internally; the latter is similarly tinted, except superficially, where to a depth of about one-third of a millimetre, it exhibits an intense purple colouration which, however, is almost certainly a stain derived from crinoids originally preserved in the same liquid. The texture, as revealed by the cut surface resulting from the bisection of the specimen, bears a close resemblance to that of some coarse and exceedingly short-grained hardwood. The densely packed spicules are visible to the naked eye, and throughout the entire central mass of the sponge have

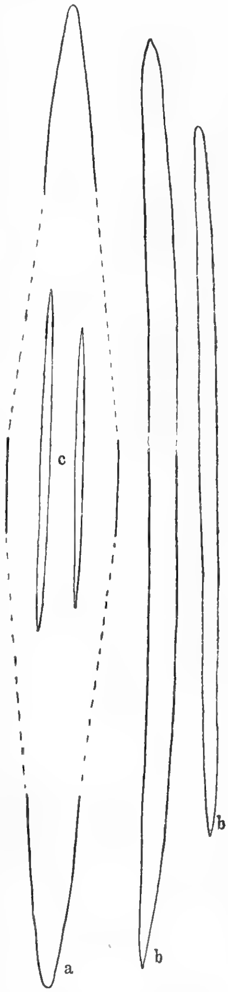

Fig. 26 — *P. lignea.* a Oxea (showing the spicule's extremities and its diameter relatively to that of the other spicules). b Styli (of the dermal brushes). c Microxea.

an approximately parallel arrangement. (The general structure and arrangement of the skeleton were examined microscopically only in the branch-like processes; the following description is drawn from a rather thick median longitudinal section of one of such preserved in alcohol. Owing to the great development of spicules and their disposition, the preparation of a transverse section would be wholly impossible without desilicification. The structure of the main body of the sponge is apparently not essentially different from that described for the processes).

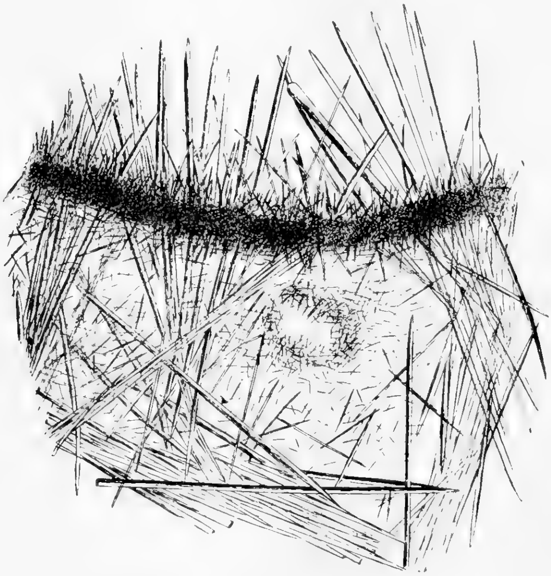

Fig. 27—*Paracordyla lignea*. Vertical section, showing the arrangement of the skeleton in the cortical and subcortical region.

Superficially, there is a fairly well-defined layer, about 150 μ in thickness, densely packed with perpendicular microxea which appear to project about half their length beyond the surface. In addition, the surface is provided with brushes of fusiform styli and oxea, of much shorter length than the spicules composing the main skeleton. The components of a single bundle diverge from a point close beneath the cortex. With the exception of a sub-cortical zone about two or three millimetres wide the whole of the interior of the branch-like process is occupied by an almost solid core of longitudinally-disposed large oxea. The sub-cortical zone is crossed at close intervals by slightly penicillate fascicles of similar spicules, which give support to the cortical layer. The innermost spicules of these bundles emerge from between the spicules of the core; the outermost project for a considerable distance beyond the surface. There are thus three orders of projecting spicules at the surface. The inter-fascicular spaces of the subcortical zone are filled-in with soft tissues containing scattered spicules and traversed by canals which in cross-section show a circular outline and a surrounding whorl of radially-disposed microxea. The largest canals occur in the deeper parts of the zone, and may attain a diameter of .6 mm. In the immediate neighbourhood of the cortex, the canals are of capillary dimensions, and the microxea—which presumably surround them—are so closely and confusedly intermingled, that the precise inner limit of the cortex is very often difficult of determination.

Megascleres.—

(i.) The oxea of the inner skeleton are straight or only slightly curved symmetrical fusiform spicules attaining a size of 3200 x 50 μ. They are usually much more than 1000 μ long, but spicules of all lengths between these larger oxea and the dermal oxea occur, and (since the asymmetry of the latter is sometimes inappreciable) consequently no actual lower limit can be assigned to their size. Abnormalities of these spicules in the shape of styli of only about one-half their length are of extremely rare occurrence.

(ii.) The fusiform styli and (usually asymmetrical) oxea, which form the dermal brushes and are also to be found in small number scattered in the subcortical zone, range in length from somewhat less than 200 to slightly more than 700 μ; the largest may attain a diameter of 18 μ. All intermediate grades of form between styli and oxea occur.

Microscleres.—

(i.) The microxea are similar in form to the largest oxea, but are about twice as stout in proportion to their length. They are rarely less than 100 μ, or more than 140 μ long, and attain a diameter of slightly more than 4 μ. Occasionally spicules intermediate in size between these and the shortest dermal oxea are met with, but appear to belong rather to the latter category.

(ii.) The amphiasters[1] bear at either end a terminal whorl of about six to eight rays which stand almost perpendicularly to the shaft or are directed forwards at a small angle (up to 30°, say). The width of the spicule, between the tips of the rays, measures from about three-fourths of, to slightly less than the length of the spicule, which is rarely as much as 5 μ.

Loc.—Coast of New South Wales, eight miles east of Sandon Bluffs, 35-40 fms. ("Endeavour.")

Family DESMACIDONIDÆ.

Whether the Desmacidonidæ be divided into two sub-families, Mycalinæ and Ectyoninæ, in the usual way; or whether, in accordance with Topsent's proposal, the Mycalinæ be sub-divided so as to yield an additional sub-family, the Dendoricinæ—the result, if a natural grouping of the genera be our aim, is not altogether satisfactory. Of the two, Topsent's classification is the better since, with very few exceptions as their microscleres show, the genera which remain in the Mycalinæ after the removal of the Dendoricinæ stand well apart from the rest of the family. The main fault lies in the artificiality of the distinction upon which the separation of the Ectyoninæ and Dendoricinæ is based. Species are placed in one or the other of these sub-families according as spicules of one particular kind—the accessory spicules—are present or absent, whilst no value at all is placed upon the presence or absence of the equally important "skeletal" and "dermal" spicules, nor any notice taken of the plain indications afforded by the microscleres. As a consequence, we have closely allied if not almost identical genera like *Ectyodoryx* and *Lissodendoryx*, *Ectyomyxilla* and *Myxilla*, *Pocillon* and *Iophon*, *Hymetrochota* and *Iotrochota* placed, the one in the Ectyoninæ, the other in the Dendoricinæ, whilst on the other hand wholly unrelated species like those of *Wilsonella* and *Clathria* are put in a single genus without question or comment. Under these circumstances there is no advantage in maintaining these subdivisions, and I propose therefore to merge the Dendoricinæ and Ectyoninæ in a single sub-family, to be called the Myxillinæ. It is probable that the Myxillinæ are capable of subdivision into two fairly natural groups in the way suggested below, but on this question I prefer to reserve judgment. I would, however, venture the opinion that the Myxillinæ are derived from a single stem distinct from that from which the great majority of the Mycalinæ have sprung, and from this point of view will enter upon a brief discussion of the sub-family.

1 Not having succeeded in making out the details of the structure of this spicule, I have not attempted to figure it. The rays appear to be often bifurcate and to have at times a slightly tuberculated surface.

SUB-FAMILY MYXILLINÆ.

The preponderance of evidence is in favour of the supposition that the most primitive Myxillinæ possessed a type of organisation closely resembling that which obtains in certain existing genera such as *Leptosia*, *Hymenancora*, *Hymetrochota* and *Hymeraphia*; and it is possible, in accordance therewith, to imagine a common ancestral form, or hypothetical "Promyxilline," characterised by the following features:—The sponge grew in the form of a thin encrustment, and produced in contact with the substratum a basal layer of spongin echinated by erect acanthostylote spicules which acted as pillars for the support of the soft structures. These spicules (which for convenience will be termed the *basical* megascleres) exhibited a tendency to differentiate into two kinds, a less spiny larger, and a more spiny smaller kind, and this was probably associated with an accompanying tendency towards an arrangement of the spicules in clusters, in each of which larger individuals were surrounded by smaller. Megascleres of a second kind, smooth and probably monactinal, were also present, these (which may be distinguished as *auxiliary*[1] megascleres) occurred, without definite arrangement, more particularly in the superficial layers of the sponge, and also formed descending strands stretching towards the sponge-base. Sponginous fibres were not produced, but the primordia of such, in the form of low dome-shaped elevations of the basal spongin lamina, coinciding in position with the areas occupied by the spicule-clusters, had probably made their appearance. It is difficult to say what the microscleres were, but since cheloids, sigmata, toxa and rhaphides (often in dragmata) are found in the group, it is necessary to assume that these, or at least the forms from which they have been derived, were present.

From such a hypothetical form all the different types of Myxillinæ are capable of being derived.

The evidence afforded by the microscleres, considered in conjunction with other facts, indicates either that a considerable amount of evolution in various directions had been accomplished, and that the prototypes of quite a number of different groups of co-related genera had already come into existence prior to the origin of sponginous fibres and to the

1 These spicules are commonly known as "dermal" or "ectosomal" megascleres; but the part which they play in the conformation of the skeleton varies to such an extent in different genera that it is advisable in a comparative treatment to designate them by a term unsuggestive of position or function. The term "auxiliary" is not altogether an appropriate one, but it will suit the present purpose; the spicules to which it applies correspond for the most part, in the Myxillinæ, to the megascleres which Bowerbank included under the same name. I shall apply the epithet "dermal" only to those spicules, of whatever category, which are specially concerned in the formation of a dermal skeleton.

assumption of an erect habit of growth, or that a return to a primitive condition on the part of more or less highly evolved species has occurred again and again within the group; otherwise it is impossible to account for the existence of groups of genera—*e.g. Hymeraphia*, *Microciona*, *Clathria* and *Ophlitaspongia*; *Leptosia*, *Stylostichon*, *Ectyodoryx and Lissodendoryx*; *Hymenancora*, *Plumohalichondria*, *Ectyomyxilla* and *Myxilla*; *Dragmatyle*, *Tedania* and *Acheliderma*; and others—each of which comprises a natural series connecting "promyxilline" with Ectyonine and Dendoricine forms. Whilst it is probable that each of the two possible explanations contains some portion of the truth, it would seem that the former is more satisfactorily in accord with the bulk of the evidence, although it involves the assumption that, amongst the Myxillinæ, sponginous fibres have originated independently many times over. If, however, as is scarcely to be doubted, such fibres have arisen as linear upgrowths of the basal sponginlamina, there is no great improbability in such an assumption provided that there already existed in the common ancestor an incipient tendency, such as has been postulated, towards fibreformation.

Taking into account only those features which belong to the skeleton, but neglecting, for the time being, any considerations in reference to the microscleres, it may be said that nearly all of the diversities of spiculation and structure which occur in the Myxillinæ are ascribable to (*a*) modifications in the form of the megascleres and the division of either or both of the original groups of megascleres into two or more kinds; (*b*) differences in the arrangement and constitution of the fibres, and in connection therewith different combinations of the megascleres in respect to their particular location in the skeleton; or (*c*) the loss by atrophy of one or more groups of megascleres formerly present.

Of very common occurrence has been the differentiation of the basical megascleres into two kinds, a larger, in the case of which the primitive spination has usually undergone partial reduction or become entirely lost, and a smaller, in which it has almost invariably been retained; these may be distinguished as *principal* and *accessory* basical megascleres respectively, or simply as "principals" and "accessories." The resultant trimegascleric condition is that which is characteristic of normal "Ectyoninæ." In many Myxillinæ, however, the "basicals" are only incompletely differentiated and in such cases, unless (as in *Crella*) there be a determinable difference of function between the spicules which lie at one end of the series and those which lie at the other, it is difficult to decide whether they should be regarded as belonging to one or to two groups (*e.g.* species of *Stylostichon*, *Clathrissa*, etc.). The maximum degree of differentiation between principal and accessory spicules appears to have been attained in genera like *Raspailia* and *Echinodictyum* and in those in which the microscleres are isochelæ palmatæ and toxa, though amongst the last-mentioned there are species (*vide Clathria caelata, sp. n.*) in which an unbroken transition of spicule forms occurs between the small echinating spined "accessories" and the large (often quite smooth) principal styli of the fibre-core. Finally, in a third group of genera, comprising the "Dendoricinæ" and certain "Ectyoninæ" (*e.g.*, *Ophlitaspongia*, *Echinoclathria*, *Wilsonella*, *Agelas*, etc.) the basical spicules are unequivocally of but a single kind. The iogical conclusion with regard to these is that either a differentiation of their basical spicules has never occurred or that one or the other of the resultants of such a differentiation has subsequently disappeared in the course of evolution; in most cases, the probability is that the absence of a second kind is due to loss, inasmuch as the (basical) spicules actually present, usually exhibit, in the matter of form and function, features which are more characteristic either of principal megascleres or of accessory. The further consideration of the spicules renders it necessary to take into account other features of the skeleton, and particularly the fibres.

In the Myxillinæ skeletal fibres have originated in apparently two quite independent ways, viz., by the upgrowth of processes from the basal lamina, and by the "ingrowth" of strands of auxiliary spicules from the superficial layer. In many cases, however, the fibres are the product of both modes of formation. Fibres which are wholly or partly of basal origin are, with possible exceptions, more or less sponginous and traverse the whole extent of the sponge; those of purely superficial origin are, at the most, scantily provided with spongin and proceed from the surface (usually?) only for a short distance (as, for example in "*Echinodictyum*" *arenosum*, "*Plumohalichondria*" *gravida* and *Fusifer fistulatus*).[1] The former might be distinguished as *basifugal*, the latter as *basipetal* fibres.

The mode of origination of basifugal fibres in the Myxillinæ is capable of being explained as follows:—The spongoblasts (and probably also the "basical" scleroblasts) which primitively—it may be presumed—were uniformly distributed over the surface of the basal lamina, became at particular points on it more closely aggregated. The consequent more rapid deposition of spongin at these points produced at each of them a thickening of the lamina which gradually assumed the form, say, of a papilla. Scattered over the surface of this papilla, just as over other portions of the surface of the lamina, though perhaps more closely, were scleroblasts

1 Dendy—Proc. Roy. Soc. Victoria, ix. (n.s.), 1897.

producing echinatingly-disposed basical megascleres. As a final step the cells, which, by their proliferation, maintain the supply of spongoblasts and scleroblasts, became localised at the extremity of the papilla, the further growth of which was thereby limited to increase in length. The manner of growth of the fibre might accordingly be likened to that of a Phanerogam stem—the spongoblast- and scleroblast-producing cells of the former corresponding to the apical meristematic cells of the latter, and the spicules, like the leaves, developing in acropetal succession. Thus at every stage of growth the fibre would be surmounted at its extremity by a "tuft" of newly-formed basical spicules, and it would depend almost solely upon the initial orientation of these spicules with regard to the direction of growth of the fibre, and their precise location (whether at the extreme tip of the fibre or subterminally) whether they subsequently became wholly enveloped by the onwardly developing spongin as *coring* spicules or whether, being more or less perpendicularly disposed, they were left with only their bases imbedded in spongin, as *echinating* spicules. When the fibre-forming spicules are of a single kind the attempt to draw a distinction between *coring* and *echinating* spicules is, to a great extent, artificial, and usually breaks down in practice; as a matter of fact the spicules at the time of their formation at the growing-point of the fibre are, in a sense, all of them *echinating*. Accordingly *Ophlitaspongia* and *Echinoclathria* which, by common agreement, were placed in the "Ectyoninæ," should logically have been included in the "Dendoricinæ."

The foregoing remarks concerning the mode of origin and formation of basifugal fibres apply more particularly to those of which the constituent spicules are basical megascleres only. Although fibres of this kind are the rule, there are a number of genera in which auxiliary spicules also participate in their formation and some again in which these are the only fibre-forming spicules. In these exceptional cases we may consider either that the ascending sponginous fibres have come into association with, and have enveloped in their progress the "descending" (basipetal) strands of auxiliary spicules;[1] or that in connection with the formation of the fibres, "auxiliary" scleroblasts have come to take a regular place amongst the cells of the fibre-growing point. From the point of view of spicular constitution merely, the skeletal fibres of the Myxillinæ are referable to three main types, according as basical megascleres only, basical and auxiliary both, or auxiliary megascleres only, take part in their formation.

1 In *Aulospongus tubulatus*, Bowbk. (Proc. Zool. Soc., 1873, p. 29; Dendy, Ann. Mag. Nat. Hist. (6), iii., 1889, p. 29), the fibres appear to grow up in an analagous way around the tubes of commensal worms.

This introduces an interesting point in connection with the megascleres, viz., their versatility in respect to the different parts they play in different genera in the conformation of the skeleton; and it also raises the question as to the nature of the criteria at our disposal for determining, in a given species, to which category—principal, accessory or auxiliary—the megascleres of each kind belong. According to my interpretation, if we take into account only the *situation* of the megascleres, the following types of skeleton are, amongst others, distinguishable:—

I.—The spicules of the fibres are "basicals" of one or two kinds; the "auxiliaries," if (as is almost invariably the case) present, occur interstitially and dermally.

(*a*) The "basicals" are of two kinds, both of which occur in connection with the fibres.

(i.) The fibres are cored by "principals" and echinated by "accessories." Normal "Ectyoninæ."

(ii.) Both kinds of "basicals" are longitudinally disposed in the fibres. "*Clathria*" *chartacea* (*vide* remarks on *Clathria*); *Heteroclathria*.

(*b*) The "basicals" are scarcely or not at all differentiated into two groups, and echinating spicules, if present, are not distinguishable in form from the directive spicules; or either the one kind or the other of the "principal" and "accessory" groups has been lost by atrophy.

(iii.) The "basicals" are imperfectly differentiated. *Stylostichon*.

(iv.) "Accessories" are absent. Normal "Dendoricinæ," *Ophlitaspongia*, *Echinoclathria*.

(v). "Principals" are absent. "*Clathria*" *mollis*,[1] *Paramyxilla infrequens*.[2]

II.—The spicules composing the fibres comprise both "basicals" and "auxiliaries;" the latter, which are situated axially in the fibres also occur interstitially or dermally.

(vi.) Principal and accessory spicules are well distinguished, and both kinds are associated with the fibres. "*Echinodictyum*" *ridleyi* (p. 151).

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1 Kirkpatrick—Marine Investigations in South Africa, ii., 1904, p. 249.

2 Carter—Ann. Mag. Nat. Hist. (5), vii., 1881, p. 369; Dendy—Report Pearl Oyster Fisheries, Gulf of Manaar, iii., 1905, p. 233.

(vii.) Principal and accessory spicules are more or less well distinguished; the former echinate the fibres, the latter are interstitial and dermal. *Crella.*

(viii.) The "basicals" are scarcely or not at all differentiated into two kinds or are represented only by accessory spicules. *Clathrissa*, *Plumohalichondria*, *Stylotellopsis*, *Wilsonella*, *Fusifer*, "*Echinodictyum*" *spongiosum*,[1] "*E.*" *arenosum*,[1] "*Microciona*" *scabida* (p. 150).

(ix.) The "basicals" are represented only by principal spicules. *Echinochalina.*

III.—The fibre-forming spicules are "auxiliaries" only; basical spicules, if present, are (so far as known) of a single kind, and, on account of their spination, appear to belong rather to the category of accessory than of principal megascleres.

(x.) Basical megascleres are present. *Pseudoclathria Grayella*, *Histodermella*, *Microtylotella.*

(xi.) Auxiliary megascleres only are present. Species of *Iotrochota* and *Melonanchora*, and certain species included in the Mycalinæ.

In the case of those Myxillinæ in which the megascleres are of three kinds, the homologies of the spicules are, as a rule, obvious; and almost invariably it is found that the directive or axial spicules of the fibres belong to the *principal*, the echinating spicules to the *accessory*, and the interstitial or dermal to the *auxiliary* category of megascleres. When this mode of arrangement of the spicules obtains, or when it is departed from only through the loss of accessory spicules, the skeleton might be described as being of the *normal* type, since it is that in particular which is characteristic of most Myxillinæ. Amongst "trimegascleric" genera, *Crella* is exceptional in the fact that in it the fibres are cored by auxiliary and echinated by principal megascleres whilst the accessory occur extra-fibrally. From a study of the different forms assumed by the spicules (both megascleres and microscleres) amongst the *normal* Myxillinæ, we obtain much information which is of service in enabling us to form a conclusion concerning the identity of the megascleres in cases where the skeleton is of an anomalous or aberrant type. Thus there can be absolutely no doubt that the "skeletal" spicules of *Melonanchora emphysema*, *Forcepia*

1 Dendy—Proc. Roy. Soc. Vict., viii., 1896, p. 50.

colonensis,[1] *Iotrochota coccinea*[2] and of other species which might be mentioned, are auxiliary megascleres, and that they therefore differ from normal species of their respective genera in the absence of principal megascleres; and since we are enabled to detect the relationships of these species only by reason of the marked peculiarities of their microscleres, it is extremely probable that a number of the species included in certain Mycaline genera (*e.g.*, *Desmacidon*, *Amphilectus*, *Esperiopsis* and *Batzella*) are similarly derived from various Myxillinæ which are lacking in striking microscleric characters. Further, one feels scarcely any hesitation in asserting that the dermal spicules of *Pseudoclathria*, *Crella* and *Grayella*, and the scattered spined diactinal spicules of *Histodermella*, are *accessory* or, at any rate, undifferentiated *basical* megascleres; whilst the peculiar forms assumed by the accessory spicules in certain species of *Acarnus*, *e.g.*, by the "cladotylostyles" of *A. tortilis*[3] and the cladotylota of *A. tenuis*[4] lead one to suspect that the microtylota of *Microtylotella güntheri* belong to the same category, and that this genus ought therefore to be given a place in the vicinity of *Acarnus*. Also, it is not altogether improbable that the spined forcipes of *Leptobasis* and *Forcepia* are derivatives of accessory megascleres; the larger forcipes of *L. arcuata*[5] are especially suggestive of such a derivation, and it is worthy of notice also that in the genera *Crella*, *Grayella* and *Histodermella*, which, like *Forcepia* and *Leptobasis*, possess chelæ arcuatæ, the scattered accessory spicules are frequently curved and diactinal. If the megascleres other than the accessory are of a single kind only, it is not always possible to decide with certainty whether they are principal or auxiliary spicules; as a rule, however, reasons can be found, depending upon their form, in support of their identification with one, rather than with the other, of these categories. Principal megascleres, in nearly all cases in which their identity is certain, are sub-conical or more or less fusiform, somewhat curved styli, which are either quite smooth or are provided with spines over a greater or less portion of their length extending from the basal extremity upwards. The auxiliary megascleres, on the other hand, are typically straight and of fairly uniform diameter, and are rarely spined except at their extremities; in comparison with the principal spicules they are of relatively slender proportions, and in most genera are typically diactinal in the fully developed state, with usually tornote,

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1 Carter—Ann. Mag. Nat. Hist. (5), xv., 1885, p. 110. For this species Hentschel (1911) has recently proposed a new name, *F. Michaelseni*.

2 Carter—Ann. Mag. Nat. Hist. (5), xviii., 1886, p. 378; Dendy—Proc. Roy. Soc. Vict., viii (n.s.), 1896, p. 23.

3 Topsent—Résultats Camp. Scient. Pr. de Monaco, Fasc. xxv., 1904, p. 171, pl. xiv., fig. 8.

4 Dendy—Proc. Roy. Soc. Vict., viii., (n.s.), 1896, p. 50.

5 Topsent—*Op. cit.*, p. 183, pl. xv., fig. 18b.

strongylote or tylote extremities. One is inclined to think, therefore—in regard to those genera included in the Mycalinæ which afford reason for believing that they are degraded Myxillinæ—that the megascleres of typical species of *Desmacidon* and *Homœodictya* are homologous with *principal* spicules whilst in some species at least which have been assigned to the same genera and to *Amphilectus* and *Batzella* they are homologous with *auxiliary* megascleres.[1] The presence or absence of spination on the principal spicules has been found lacking in generic value, and everything points to the fact that the spined condition is the more primitive; it is perhaps not a rare occurrence in species in which they are smooth when fully mature, that they are spined in their early developmental stages (as, for example, in *Myxilla diversiancorata*[2]), or during the larval period of life of the sponge (as in *Myxilla pedunculata*[3]). It is a peculiar circumstance that the principal megascleres are almost invariably curved; exceptions to the rule are provided by *Raspailia* and its allies, but it is significant that these are also aberrant in other respects. In *Echinodictyum* and *Trikentrion* amongst the "Ectyoninæ," and in *Dendoricella* and some species of other genera (*e.g.*, *Iotrochota*) amongst the "Dendoricinæ," they are diactinal (as in *Desmacidon* and *Homœodictya*), and take the form of oxea or strongyla; yet they still exhibit the curvature and fusiformity which, in general, are characteristic of principal megascleres.

Certain Myxillinæ are possessed of more than three kinds of megascleres owing to the division of one or more of the primary groups into two kinds; and this division usually appears to be correlated with, and to have been the outcome of a performance by the spicules concerned of two different functions. Instances of such, in which the principal megascleres have undergone division, are provided by *Echinodictyum clathratum*[4] and species of *Raspailia* (*e.g.*, R. *ramosa*, Mont., and *R. tenuis*, R. and D.); and in which the "accessories" have undergone division by the species of *Plocamia*. That the "dumbbell" spicules of the last-named genus are derivatives of the accessory megascleres, the indication afforded by *P. plena*[5] leaves scarcely any room to doubt; and this species also, by reason of its possession of stunted abnormal forms of the principal megascleres, renders it probable

1 Examples of such are provided by *Homœodictya dendyi* (Whit.); *Desmacidon plicatum* (= *D. stelliderma*, Carter); *D. psammodes* and *Batzella inæqualis*. (Hentschel, Fauna Südwest-Australiens, Bd. iii., 1911); and by *Amphilectus ceratosus*, R. and D.

2 Lundbeck—Porifera Danish Ingolf-Expedition, Pt. 2, 1905, p. 150.

3 Lundbeck—*Loc. cit.*, p. 149.

4 Dendy—Rept. Pearl Oyster Fisheries, Gulf of Manaar, Pt. 3, 1905, p. 175.

5 Sollas—Ann. Mag. Nat. Hist. (4), v., p. 44.

that in *P. clopetaria*, Schmidt,[1] with its "pegtop-shaped" styli we have a species in which there are present two kinds of principal and two kinds of accessory spicules. The differentiation of the auxiliary megascleres into two groups, as in *Rhaphidophlus*, appears to have occurred but seldom.

An interesting point in connection with the microscleres, and one which possesses considerable classificatory importance is the rarity of the occurrence of sigmata and toxa in the same species. These two microscleres are found together in certain Mycalinæ, but not to my knowledge in any species of the Myxillinæ. Furthermore, in the latter sub-family, the microscleres which occur in association with toxa are (except in *Plocamiopsis*) isochelæ palmatæ, whilst those associated with sigmata are isochelæ arcuatæ, isancoræ, or rhaphides (usually in dragmata). Thus we have on the one hand the genera *Hymeraphia*, *Microciona*, *Clathria*, *Rhaphidolphus*, *Ophlitaspongia*, *Echinoclathria*, *Heteroclathria*, *Plocamia*, *Acarnus*, *Microtylotella*, *Fusifer*, *Cornulum*, and *Artemisina* in which the microscleres are toxa and (or) isochelæ palmatæ but not sigmata; and, on the other hand, *Leptosia*, *Stylostichon*, *Ectyodoryx*, *Lissodendoryx*, *Clathrissa*, *Crella*, *Grayella*, *Paramyxilla*, *Forcepia*, *Leptobasis*, *Hamigera*, *Dendoricella*, *Histodermella*, *Histoderma*, *Hymenancora*, *Myxilla*, *Ectyomyxilla* and *Melonanchora* in which the microscleres are sigmata and isochelæ arculatæ or isancoræ with or without trichodragmata, but not toxa. There can scarcely be any doubt that these groups of genera are representative of two distinct lines of evolution in the Myxillinæ; and since they comprise between them the majority of the species the question naturally arises as to whether they can be utilised as a basis for the division of the sub-family. The probability is that they can. In the former group, the accessory megascleres, when present, are well distinguished from the principal, and the auxiliary spicules are typically stylote; whereas in the latter, principal and accessory spicules as a rule are not widely different in form, and often graduate insensibly one into the other, and the auxiliary spicules are typically more or less diactinal. This is not only significant in itself, but it provides a means whereby one is enabled to arrive at an opinion concerning the allotment of most of the remaining genera. Thus the genera *Raspailia* and *Clathriodendron* (and with them *Syringella*); *Echinodictyum*, *Trikentrion* and *Cyamon*; *Aulospongus*; and *Spanioplon*—all of which are lacking in microscleres—are evidently to be assigned to the former group; *Acheliderma*, *Tedania* and *Dragmatyle*; *Hymetrochota*, *Iotrochota* and *Amphiastrella*; and perhaps also the somewhat aberrant *Iophon* and *Pocillon*—to the latter. To the former group

1 Ridley—Jour. Linn. Soc., Zool., xv., 1881, p. 479.

also, one is inclined to refer: *Mesapos*, *Tethyspira*, *Hymerhabdia* and *Cerbaris* (which appear to be lacking in auxiliary megascleres) on account of the analogy which their spicules bear to principal and accessory spicules; *Echinochalina*, which seems to be related to *Echinoclathria; Suberotelites*, regarded by Topsent as allied to *Plocamia;* and the aberrant genus *Agelas* (including *Ectyonopsis*) the affinities of which appear to be rather with the toxa-bearing Myxillinæ. On the other hand, one would assign rather to the latter group: *Pseudoclathria*, which presents some analogies with *Grayella; Stylotellopsis*, on account of its resemblance in many respects to *Clathrissa;* and (necessarily) *Tylosigma*, because of its sigmata.

A few genera still remain to be accounted for, the position of which is not quite clear; but sufficient has been adduced, I think, to indicate the feasibility of such a subdivision of the Myxillinæ as has been suggested. It is clearly evident, however, that no wholly satisfactory grouping of the species and genera of the *Desmacidonidæ* can be arrived at, until other characters, in addition to those which the spicules afford, are taken into account in classification.

Genus Clathrissa, *Lendenfeld.*

1888. *Clathrissa*, Lendenfeld, Descr. Cat. Sponges, Austr. Mus., 1888, p. 217.

The genus *Clathrissa* was introduced by Lendenfeld for three Port Jackson sponges which he named *C. arbuscula*, *C. elegans*, and *C. pumila* respectively; of these, the first mentioned possesses chief claim to be regarded as the type-species, and is here so considered. They were defined as "Desmacidonidæ with a skeleton composed of dense bundles of slender oxea with very little spongin, echinated by spined styli." Concerning the precise nature of *C. elegans*, nothing can be said with certainty, since in the existing collection of the Museum, no sponges identifiable as such have so far been met with. An examination of the type-specimens of the other species shows that in both the structure of the main skeleton is similar to that of *Plumohalichondria*, and that microscleres are present in the form of chelae arcuatae. In *C. pumila*, however, there is, in addition, a dermal skeleton of acanthostyles, so that this species belongs to the genus *Crella*. The other, *C. arbuscula*, agrees essentially with many species at present included in *Plumohalichondria*, viz, those with arcuate chelae. If, however, the microscleres of *P. microcionides* (the type of *Plumohalichondria*) be ancoræ, as Thiele's figures of the spicules of *P. neptuni*[1] and his statement concerning the

[1] Thiele—Archiv. Naturg., 1903, i., Heft 3, p. 387, pl. xxi., fig. 19.

likelihood of the latter species' identity with *P. microcionides* would lead one to suppose, the retention in *Plumohalichondria* of the species referred to, will be contrary to established practice. If this supposition be correct, the genus *Clathrissa* will be a valid one, standing in the same relation to *Leptosia* as *Plumohalichondria* to *Hymenancora*.

I was at first in doubt whether the specimens which are labelled as the types of *Clathrissa arbuscula* were genuine examples of the species, partly because the lengths of their spicules do not agree very well with those which Lendenfeld has given, but mainly on account of their lack of resemblance to the figure (*Loc. cit.*, pl. v., fig. 2). I am now, however, quite sure in my own mind that this figure is wrongly represented as illustrating *Clathrissa arbuscula*, inasmuch as it bears a striking likeness to ordinary specimens of *Clathiodendron arbuscula*, a species which is described in the same Catalogue; and I would therefore go so far as to say that the latter species has been figured in mistake for the former. One can the more easily conceive the possibility of such an error in connection with these two species owing to the sameness of their specific names and of the initial letters of their generic names. It is confirmatory also of the opinion here expressed that the example of *Clathrissa arbuscula* in Prof. Dendy's donation of pieces of British Museum sponges agrees with the Australian Museum specimens so labelled. The other discrepancy mentioned—that in regard to the lengths of the spicules—is of negligible import, since Lendenfeld seems usually to have taken the mean length of spicules into account, rather than their maximum.

A brief description of *Clathrissa arbuscula* may not be out of place. The sponge grows in the form of a tussock of numerous, prolifically multiplying, erect slender branches with highly uneven, warty surface. Lendenfeld's description of the external features is fairly satisfactory, but requires some slight emendation. It reads, "Small, irregular, lobose or digitate sponges wih erect processes, attaining a height of 150 mm. The living sponge is very soft and resilient, orange-red in colour. Spirit specimens are brownish-grey. The whole of the surface is covered with densely-situated villous, distally rounded or thickened outgrowths, which are about 1.5 mm. thick and from 2-8 mm. long." The description might suggest that the sponge has a more massive basal portion, but this is not so; though the sponge is sessile and occupies an extended base, the primary branches, except for occasional anastomoses, are independent almost to the subtratum. The

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1 Ridley—Zool. Coll. H.M.S. "Alert," 1884, p. 430, pl. xl., fig. G, pl. xlii., figs. a-a″.

warty out-growths of the surface are probably incipient or abortive branches; in fact, the longer ones ("8 mm. long") mentioned by Lendenfeld are more correctly described as young branches. This species is closely allied to, if not actually identical with, Ridley's *Myxilla arborescens*[1] which also comes from Port Jackson. The spicules are asymmetrical straight oxea, acanthostyles of two sizes and isochelæ arcuatæ. The oxea, when more fully developed, show a very faint sub-terminal constriction at both extremities, so that the end portions appear somewhat lanceolate in shape. This feature is usually more distinct at one extremity than the other, and is often confined to one end. Sometimes one extremity is much more rounded than the other, and then the spicule may appear monactinal. In young spicules the asymmetry is more pronounced, and the end which corresponds to the lanceolate extremity of older spicules usually bears an elongated slender tylosis. The spicules vary in length from about 160 to 285 μ, though comparatively few exceed 220 μ; the stoutest are 5 μ in diameter. The acanthostyles are conical and tapering, and almost invariably curved; the spines are densely crowded on the basal end (the spicule appears in consequence somewhat tylote), and decrease in abundance progressively from base to tip; more than one-third of the length distally, particularly in the case of the larger spicules, may be free from spines. Their length varies from about 85 to over 200 μ; the largest actually seen was 225 μ long. Individuals between 120 and 160 μ in length are extremely rare. The spicules accordingly appear to conform to two sizes, the odd ones of intermediate length being possibly stunted individuals of the larger kind. Both kinds echinate the fibres. The largest acanthostyles are, at most, 8 to 9 μ in diameter immediately above the base. The chelæ are abundant and measure 20 to 26 μ in length. Their end parts are relatively small and the shaft may reach 4.5 μ in thickness. A peculiar feature of the skeleton is the occurrence of elongated tufts of oxea, often standing off from the main fibres as if they were short branches from them, which have been left unprovided with echinating spicules.

Stylostichon conulosum, Whitelegge,[1] is sufficiently closely related to *Clathrissa arbuscula* to be regarded as a variety of it. The oxea are similar in shape to those of the latter, and exhibit in some degree the same peculiarity. The sponge is not encrusting in the proper sense of the word, but from an encrusting base numerous miniature crumpled lamellæ with conulated surface arise vertically. The oxea vary in length from about 165 to 215 μ; the stoutest are 6 μ in diameter.

1 Whitelegge—Austr. Mus. Mem., iv., 10, 1907, p. 492.

The acanthostyles bear a close resemblance to those of *C. arbuscula* and like them are divisible into two sizes. Their lengths lie between 90 and 210 μ, but individuals between 120 and 180 μ in length have not been observed; the stoutest are 12 μ in diameter. The isochelæ arcuatæ differ from those of *C. arbuscula* only in their slightly larger size; they measure from 21 to 28 μ in length, with a maximum stoutness of shaft of slightly more than 4.5 μ. Whitelegge's description would imply that the oxea do not occur as coring spicules, and that the larger acanthostyles do not to any notable extent echinate the fibres. The fact that he placed the species in the genus *Stylostichon* would imply the same. However, I find that wherever the fibres are not so densely echinated as to obscure the coring spicules, oxea in small numbers are usually to be seen; at the same time, the larger acanthostyles occur plentifully as echinating spicules. Nevertheless, it must be confessed that the occurrence of oxea in the fibres appears to be more or less sporadic, and accordingly it would seem that no hard and fast distinction can be drawn between *Clathrissa* and *Stylostichon.*

Plumohalichondria cæspitosa (Carter), as identified by Dendy,[1] is another species sufficiently closely related to *C. arbuscula* to admit almost of its being regarded as a variety of it. I have examined a slide of this sponge, presented to the Australian Museum by Professor Dendy, and find that the spicules are of the same general character as those of *C. arbuscula.* The oxea are slightly smaller, rarely reaching quite as much as 4 μ in stoutness and varying in length from 150 to 200 μ. Acanthostyles of all lengths from 84 to 240 μ occur, there being no actual separation into two sizes, although spicules of intermediate lengths are of less frequent occurrence. The isochelæ arcuatæ are 27 to 32 μ in length. It will be noticed that the lengths of the two last-mentioned spicules are much greater than those given by Carter, viz., 20-6000ths and 3½-6000ths of an inch respectively.

Yvesia commensalis, Whitelegge[2] is possibly a *Stylostichon*, that is to say, the main skeleton consists of stout vertical columns composed solely of acanthostyles. The acanthostyles are, however, arranged plumosely, making an acute angle with the direction of the fibres, and are not differentiated into coring and echinating spicules. The dermal skeleton is a layer of a closely packed isochelæ arcuate, beyond which the outer ends of divergent tufts of smooth oxea project slightly. The

1 Dendy—Proc. Roy. Soc. Vict., viii., 1896, p. 41; Carter—Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 352.

2 Whitelegge—Austr. Mus. Mem., iv., 9, 1906, p. 483.

dermal, or rather sub-dermal, tufts are sometimes prolonged below into strands which may descend for a moderate distance towards the base of the sponge. A remarkable feature of the species is the occurrence of small irregularly monilated rods, scattered in the ground substance. The rods are apparently proper to the sponge—at any rate they are siliceous; they are possibly homologous with the forcipes of *Forcepia*. The acanthostyles vary in length from about 80 to 240 μ and may attain a diameter of 17 μ. They are covered, except for a varying distance from the pointed end, with relatively short and stout recurved spines. The microscleric rods are 20 to 50 μ long and, even in their most swollen portions, rarely as much as 5 μ in diameter. The oxea are very abruptly and often acuminately pointed spicules ranging in length from about 80 to 180 μ, though rarely less than 100 μ, or more than 160 μ long; the stoutest are 8 μ in diameter. The chelæ are very abundant; they usually have a much curved shaft, so that the extremities of the anterior teeth approach each other very closely and sometimes overlap or fuse; size variable, the length ranging from 10 to 24 μ. The dimensions of the spicules given above differ slightly from those given by Whitelegge, so that probably some amount of variation in their size occurs in different specimens.

It is of interest to note that *Microciona scabida*, Carter,[1] differs from *Clathrissa* mainly through the possession of stylote, instead of diactinal auxiliary spicules. The microscleres are chelæ apparently of three or four kinds, viz. :—(i.) a stout isochela arcuata, 30 μ long; (ii.) a smaller slender isochela with curved shaft and very sharply pointed flukes, which occurs in great abundance; (iii.) a cheloid with much curved shaft, which appears to be an abnormality of the first-mentioned; and (iv.) a peculiar cheloid also with much curved shaft and of smaller size than the others, which apparently belongs to the same category as certain of the forms termed bipocilla, but which may be a derivative of the second kind. As my object in referring to this species is merely to draw attention to its relationship with *Clathrissa* on the one hand and with *Stylotellopsis* on the other I have not undertaken the possibly difficult task of determining the precise nature of these cheloids. The fibres are echinated and to some extent cored, by acanthostyles of two orders of size, the smaller rarely exceeding say 110 μ in length, the larger reaching to 220 x 7 μ. The coring spicules are chiefly straight slender subtylostyli, of which the

1 Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 31; Carter—Ann. Mag. Nat. Hist. (5), xv., 1885, p. 112, figs. 4, 5.

largest measure about 270 x 4 μ. Beneath the surface of the sponge and running perpendicularly towards it are numerous wispy strands of the same spicules. With regard to the arrangement of the skeleton *Microciona scabida* stands precisely in the same relation to the type-species of *Stylotellopsis*—*S. amabilis*[1]—as does *Crella incrustans* var. *levis to C. incrustans* var. *pumila*; and, in compliance with the present scheme of classification, should accordingly be placed in Thiele's genus.

Another interesting species whose systematic position appears to be somewhere in the vicinity of *Clathrissa* and *Stylotellopsis* is *Echinodictyum ridleyi*, Dendy.[2] The skeleton is made up almost entirely of slender longitudinal wispy fibres and is consequently rather of the dendritic than of the reticulate type. Accompanying the slender oxeote or rather tornotoxeote spicules (size about 270 x 4 μ) which chiefly compose these fibres, are a few conical smooth styli (190 x 7 μ) and acanthostyles (100 x 6 μ), both kinds of which occasionally project from the fibres somewhat in the manner of echinating spicules. There are no microscleres. The diactinal spicules of the fibres evidently correspond to the auxiliary megascleres of normal Myxillinæ, and the species accordingly possesses no claim to a place in the genus *Echinodictyum* in which the fibres are formed by principal spicules and in which the auxiliary spicules are represented by interstitial or dermal styli. Also, it is scarcely to be doubted that the smooth conical styli are homologues of the larger acanthostyles of *Clathrissa arbuscula*, *Stylotellopsis amabilis* and *S.* (*Microciona*) *scabida* and to the principal styli of normal Myxillinæ. *C. arbuscula* and *S. amabilis* differ in generic characters mainly in this respect, that in the latter the auxiliary megascleres are pointed at one end only, whilst in the former they are pointed at both ends. But this difference cannot be regarded as of much importance since the probability is that the tornotoxea of *C. arbuscula* are, strictly speaking, just as truly monactinal as the tornostrongyles of *S. amabilis*. Consequently *Echinodictyum ridleyi* owing to the perfect smoothness of its principal styli, stands farther removed from either of the two last mentioned species than these do from each other, and is thus fairly entitled to distinction under a new generic name. In *E. ridleyi*, as already mentioned, the principal and accessory styli are both comparatively rare in their occurrence; if the former spicules were to disappear, such a species as *Echinodictyum spongiosum*, Dendy,[3] would result; whilst if both kinds were lost, there would be scarcely anything in the struc-

1 Thiele—Fauna Chilensis, Bd. 3, p. 456, fig. 72 a-d.

2 Dendy—Proc. Roy. Soc. Vict., viii., 1896, p. 44.

3 Dendy—Proc. Roy. Soc. Vict., viii., 1896, p. 45.

ture of the skeleton to distinguish it generically from certain species at present included in the genus *Axinella*.

The three sponges described by Lendenfeld[1] under the name of *Echinonema anchoratum*, Carter, have, according to their description, the spiculation of *Clathrissa*, but the skeleton is reticulate. The best plan to adopt in regard to these sponges is to regard them as *species dubiæ* of *Wilsonella* (*q.v.*).

Genus Crella, *Gray*.

Thiele[2] has expressed the opinion that *Plumohalichondria incrustans*, Carter, should be placed in the genus *Pytheas* which, as Lundbeck has recently shown, must now be called *Crella*. Accordingly I employ the latter name for the sponges about to be described. These agree so closely in the characters and dimensions of their spicules that, despite considerable differences in some other respects, they might very well be treated—in contrast with other species of the genus—as varieties of a single species, *Crella incrustans*. In this species, as in *Clathrissa arbuscula* the smooth oxeote spicules are secondarily diactinal.

Crella incrustans, *Carter*, et varr.

(Plate xxiii., figs. 2, 3; Plate xxiv.; and figs. 28-34.)

General diagnosis: External form various; encrusting, massive or ramose. Oscula present in probably all the varieties. Typically (unless in encrusting varieties) the branching ascendent fibres of the main skeleton are sinuous and interosculate so as to form a kind of loose reticulation (pseudo-reticulation); connecting fibres, in small number, may occur. The fibres are fairly closely, sometimes extremely densely, echinated with straight conical acanthostyles; the coring spicules may be exclusively smooth oxea, or exclusively acanthostyles, or a mixture of both. Foreign particles are in some cases included in the fibres. The dermal skeleton is a layer of shorter (usually slightly curved) acanthostyles, with a reticulate or more or less confused arrangement, rarely accompanied by relatively few smooth oxeotes. All three kinds of megascleres occur interstitially, the dermal acanthostyles typically in greatest abundance. The microscleres are of a single kind, isochelæ arcuatæ, scattered interstitially and in the dermal layer in moderate abund-

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1 Lendenfeld—Cat. Sponges Austr. Mus., 1888, p. 219. The three sponges referred to bear the varietal names, *ramosa*, *dura* and *lamellosa*. Their type-specimens appear to have been lost, since the specimens which Whitelegge regarded as such cannot at all be reconciled with Lendenfeld's descriptions (*vide* Appendix).

2 Thiele—Archiv. Naturg., 1903, p. 388.

ance. The smooth oxeotes are asymmetrical, and when they attain in the fullest degree their characteristic shape are tornotoxea with a slight flexion at the tip of the oxeote extremity. The extremes of the maximum dimensions of the spicules in the known varieties are as follows:—Tornotoxea: Length, 160 to 220 μ; diameter, 4.5 to 6 μ. Echinating acanthostyles: Length, 145 to 200 μ; diameter, 8 to 12 μ. Dermal acanthostyles: Length, 80 to 100 μ; diameter, 5 to 8 μ. Isochelæ arcuatæ: Length, 16 to 25 μ.

The several sponges now to be described agree so closely in the form and dimensions of their spicules that—despite considerable differences in some other respects—it has been considered preferable to treat them as varieties of a single species. Any differences that there may be in the shapes of the spicules in the different varieties are too slight to be of diagnostic value, and a single description will therefore suffice for all. The megascleres are smooth oxeotes, and acanthostyles of two kinds; the microscleres are isochelæ arcuatæ of a single kind. The oxea are slender, asymmetrical, slightly fusiform straight spicules which in their very earliest stages of growth appear to be monactinal. Their characteristic peculiarity—which is usually, however, to be observed only in small proportion of them—is a slight bending to one side of the tip of one extremity. This peculiarity as it appears when most highly developed, is illustrated in text-figure 29, where it is also to be observed that the spicule is most correctly described as a tornotoxea. Throughout the descriptions they will be referred to merely as the *oxea*, or sometimes as the *auxiliary spicules*. The extent to which they enter into the formation of the fibre-core varies greatly in the different varieties; in the variety *digitata* they are pretty well the sole constituents; in the varieties *perramosa* and *levis* they are mingled with a variable proportion of acanthostyles; in the varieties *arenacea* and *rubra* they are usually more or less completely supplanted by acanthostyles. An interesting condition is found in the variety *pumila*, where columns of oxea, descending downwards from the surface without admixture of acanthostyles, form a common and characteristic feature of the skeleton. The oxea also occur as interstitial spicules, but except in the variety *digitata* are outnumbered as such by the accessory acanthostyles; in the last named variety also, they participate in the formation of the dermal skeleton. The acanthostyles, as previously mentioned, are of two kinds. Those which predominate as echinating spicules and often in addition core the fibres are straight conical spicules of variable length, provided with more or less recurved spines which are usually absent, for a short distance, from the distal extremity. These spicules will be referred as the *principal* acanthostyles. The acanthostyles of the second kind are the characteristic and usually the sole elements of the dermal skeleton and at the same time the predominant spicules of the ground substance. From the evidence afforded chiefly by the varieties *perramosa* and *digitata*— in which, owing to the absence of crowding, the echinating spicules are, with greater advantage than in the other varieties, individually discernible in detail—I am convinced that spicules, similar in all respects to these dermal acanthostyles, may also occur quite commonly both as echinating and coring spicules. Accordingly, I will not in general use the terms "*echinating*" and "*dermal*" to distinguish the two forms of acanthostyles, but instead "*principal*" and "*accessory*." One sees also in the different varieties that there is a perfect gradation between the extremes of form shown by the accessory spicules on the one hand and the principal spicules on the other. Accordingly in determining the dimensions of the accessory acanthostyles I have measured those spicules only which are situated actually *in* the dermal skeleton, and as regards the principal acanthostyles, have taken account of their maximum size alone. The accessory acanthostyles are slightly curved and slightly fusiform spicules covered, almost or quite to the distal extremity, with spines which stand perpendicularly to the axis of the spicule. The isochelæ arcuatæ are rather abundant and show a tendency, which is strongly marked in some varieties, to become differentiated into two sorts, a larger and a smaller. The arrangement of the skeleton shows appreciable differences in the different varieties, though not always to an extent that permits of distinction in a verbal description. In the non-encrusting varieties with the exception of *levis*, the fibres, owing to their undulating courses and anastomoses, often form a kind of pseudo-reticulation; in the variety *perramosa*, actual transverse fibres in moderate number are developed. This last-mentioned variety is therefore of considerable interest, since it shows that a reticulate type of skeleton may be developed directly from a dendritic type—a fact which lessens the importance of a generic distinction based solely on such a difference in the character of the skeleton. In all the varieties the fibres are rich in spongin. The typical variety of the species is Carter's *Echinonema incrustans* from Port Phillip, which has been described as "massive incrusting, thick, covering the whole of a Pecten." I have not so far met with any specimen in the Australian Museum collection of Port Phillip sponges which admits of identification with Carter's species, but I have before me two mounted sections prepared by Mr. Whitelegge from pieces of British Museum specimens, labelled "*Echinonema incrustans* Carter *type*," and "*Plumohalichondria mammillata*, Carter" respectively. These do not satisfactorily corroborate Dendy's assertion of the synonymy of the two names, since the latter slide shows a skeletal structure rather resembling that of the var. *levis*, and chelæ varying from 13 to 26 μ in length; whilst in the former the structure is much looser—somewhat similar to that of the var. *digitata*—and the chelæ are only 12 to 22 μ long. Without wishing to attach any great importance to this discrepancy, I simply point to the possibility of a varietal difference between the sponges of Carter's two species. The point can only be settled by a re-examination of the original specimens. In view of the existence of so many distinct but closely allied varietal forms of this species,[1] it is necessary to proceed cautiously in introducing synonymy; unless a complete connecting series between two forms is known to exist, it is far better—because less liable to lead to confusion—to treat them as distinct varieties, each with a distinguishing name. Accordingly I would recommend that the *Plumohalichondria mammillata* of the "Challenger" Report be still considered a variety distinct from the *Echinonema incrustans*, Carter. In their description of this variety, Ridley and Dendy state that the dermal skeleton is a reticulation made up exclusively of acanthostyles; they also refer to their examination of a small piece of the type-specimen of Carter's *Plumohalichondria mammillata* and mention concerning it that the dermal acanthostyles are intermingled with smooth oxea and not reticulately arranged. These differences in the dermal skeletons of the two sponges, they allowed, might very well prove distinctive; but the other characters showed so close a correspondence that, under the circumstances, taking into account the small size of the piece examined, and the possibility of some amount of variation with age they did not consider it advisable to distinguish the two by the introduction of a new name. Of the varieties whose descriptions follow there is only one, viz., *digitata*, in which the oxea have been found to enter into the formation of the dermal skeleton; accordingly, there is good reason to believe that the presence or the absence of dermally situated oxea may be a characteristic which is constant for any given variety. The variety from Oyster Bay to which I

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1 In addition to the varieties described in this Report, I have before me three others which are unquestionably quite distinct. Owing to the scantiness of the material and its unsuitable state of preservation, I do not venture to describe them. One is probably identical with a British Museum sponge bearing the manuscript name "*Clathrissa membranacea*, Lendenfeld." Another bears a label in Lendenfeld's writing with the name, "*Clathrissa arbuscula*," a species to which it bears some external resemblance. The third is a ramose sponge of irregular growth with the oscula situated singly at the extremities of branches.

give the name *digitata* is probably identical with the typical variety, but in the absence of sufficiently full information concerning the latter, I do not feel justified, on mere assumption, in naming it as such.

Crella incrustans, *Carter*, *var.* digitata, *var. nov.*

(Plate xxiii., fig. 2, and figs. 28, 29.)

> *Sponge, so far as known, growing upon the shells of bivalve molluscs in the form of a thick encrusting layer from which arise shorter lobes or longer digitations. Texture loose; consistency soft, though moderately tough. Oscula? Fibres sinuous, anastomosing, cored solely by smooth oxea, and plentifully, though by no means densely echinated. The dermal skeleton comprises oxea in addition to acanthostyles; the latter spicules do not form a definite reticulation. Megascleres, maximum sizes:—(i.) Oxea 220 x 4.5 μ; (ii.) principal acanthostyles 170 x 9 μ; (iii.) dermal acanthostyles 90 x 8 μ. Isochelæ arcuatæ 13 to 20.5 μ* long.

This variety is represented by six specimens which were obtained by the "Endeavour" from a single locality. Each of them grows upon the shell of a *Pecten*, forming a thick cushion-like layer which spreads over the entire exterior surface of both valves, the two portions being in continuity only across the hinge-line. Though the shells are now empty, it is evident that the animals must have remained alive until the sponge grew to considerable proportions. At the free margin of the valves further growth is effected by the formation of processes which vary in form from short thick blunt lobes to elongated branch-like digitations (Plate xxiii., fig. 2). Similar processes may also arise from other parts of the surface. The condition presented in some specimens indicates that the sponge may attain to a considerable size without any formation of outgrowths; in others, the total mass of the branches may exceed that of the encrusting portion. Anastomoses of the branch-like processes occasionally occur. The surface may be glabrous and even, or may exhibit minute conuli at the points where the fibres impinge. The oscula, which in the typical variety have been described by Carter as large and scattered, are not with certainty discernible in the present specimens: the dermal membrane is, however, ruptured in places, and thus, on account of its elastic tension, rounded openings result, which might easily be mistaken for oscula. The non-appearance of oscula in the present instance is possibly due to their closure whilst the sponges were being dragged in the trawl-net. The dermal membrane is thin, yet tough, and when dry forms an obscure whitish incrustation; in alcohol it is translucent and of light greyish colour. Beneath the membrane, the sponge is dull yellow. The texture is much looser and the consistency much softer than in the varieties *arenacea* and *levis*. In a dry state the consistency varies according to the extent to which the sarcode has been removed, from firm, yielding to pressure and slightly brittle, to soft, spongy and elastic.

The main skeleton consists of exceedingly tortuous branching fibres running longitudinally. In the deeper parts they might almost be described as curled, but towards the surface they straighten out somewhat, though still remaining sinuous. The spicular axis of the fibres, consisting of oxea only, is surrounded by a thick sheath of transparent spongin in which the echinating spicules are deeply imbedded with their bases quite in contact with the spicules of the core. The winding courses which the fibres pursue, result in the frequent crossing and apposition of adjoining fibres, and where contact occurs connections are frequently formed by the fusion of their spongin-envelopes. There are no proper connecting fibres, though occasionally the union of fibres in the manner described produces the appearance of such. The fibres might be said to form a pseudo-reticulation, in which the meshes are for the most part of elongated form. In sections prepared from dry specimens it is seen that the spongin—or what appears to be spongin—in addition to its envelopment of the fibre-spicules, extends as thin films or membranes between the fibres, dividing the interior of the sponge into incomplete compartments, as it were. The interstitial spicules, consisting of acanthostyles and oxea in about equal number, appear to be entirely restricted to these membranes. The echinating spicules are never so abundant as to obscure the axial spicules.

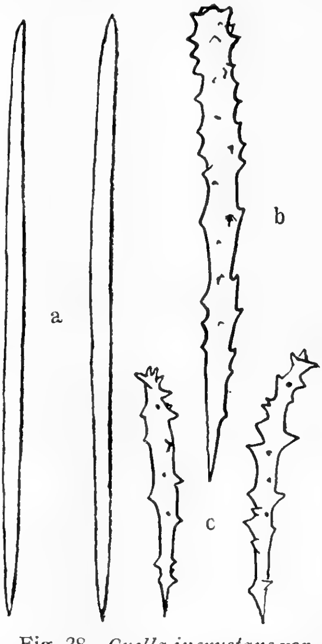

Fig. 28—*Crella incrustans* var. *digitata*. a Oxea. b Principal acanthostyle. c Dermal acanthostyles.

The dermal skeleton consists of acanthostyles and oxea. The proportion in which each occurs is variable, but the smooth spicules are always present, and in places—particularly where the membrane overlies large subdermal spaces—are more numerous than the spined spicules. Occasionally, over small areas, an approach to the reticulate arrangement is met with; or the acanthostyles may be clustered in small patches so as to give a mottled appearance, but there is never (in any observed case) a parallel arrangement of spicules to form the sides of meshes of a distinct reticulation such as is found in the varieties *arenacea* and *levis*.

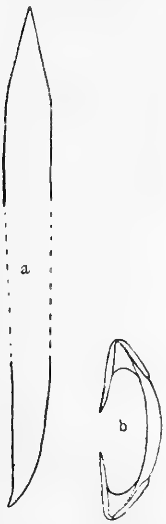

Fig. 29—*C. incrustans* var. *digitata*. a Oxea (showing the extreme of asymmetry in these spicules). b Isochela arcuata.

Megascleres.—

(i.) The oxea vary in length from 160 to 220 μ; the stoutest are probably never more than 4.5 μ in diameter. The characteristic end-flexure is only of occasional occurrence, it may, however, be developed quite as highly as in any of the other varieties, as the spicule shown in Text-figure 29 bears witness. The oxea are characterised in comparison with those of the other varieties by a slight elongated subterminal constriction which occurs at both ends. In this respect the spicules resemble those of *Clathrissa arbuscula*. The feature is occasionally observed in the spicules of some of the other varieties of *Crella incrustans* but is never so well marked as in the present one.

(ii.) The principal acanthostyles reach a maximum size of 170 x 9 μ.

(iii.) The dermal acanthostyles vary in length from 60 to 90 μ; the stoutest are 7 or 8 μ in diameter. Very rarely acanthoxea are met with in the dermal skeleton; these are sometimes over 100 μ in length.

Microscleres.—

The chelæ, which vary in length from 13 to 20.5 μ, but are rarely more than 18 μ, show a scarcely appreciable differentiation into two forms.

As already pointed out this variety is probably identical with the typical variety which comes from Port Phillip. But there is nothing in what has been written concerning the latter except the reference to its habit of growing over Pecten shells, which furnishes any warrant for regarding the two as identical. Accordingly, after some hesitation, I have decided to introduce a distinguishing varietal name for the Oyster Bay sponges, perceiving that although such a step may prove to be incorrect, it cannot at any rate give rise to confusion.

Loc.—Oyster Bay, Tasmania, 30 fms. ("Endeavour.")

CRELLA INCRUSTANS, *Carter*, VAR. PERRAMOSA, *var. nov.*

(Plate xxiv., and fig. 30.)

Sponge ramose, erect, stipitate; with long and relatively slender cylindrical branches which multiply dichotomously and occasionally anastomose. Oscula? The main skeleton is reticulate, though connecting fibres are relatively few in number. The fibres are not densely echinated and contain a stout compact core of oxea mingled with a moderate number of acanthostyles. Dermal skeleton? Megascleres, maximum sizes:—(i.) Oxea, 195 x 7.5 μ; (ii.) principal acanthostyles, 160 x 12 μ; (iii.) dermal acanthostyles about 100? x 7 μ. Isochelæ arcuatæ, 13 to 25 μ long; imperfectly distinguishable into two kinds, a larger and a smaller.

This variety is represented by a single specimen 520 mm. in height (Plate xxiv.). The branches are cylindrical, except in places where they broaden out prior to bifurcation. The specimen is preserved in a dry state, and so affords no information concerning the oscula or the arrangement of the dermal skeleton. The main skeleton bears a considerable resemblance to that of the variety *digitata*, but differs owing to the rather frequent occurrence of transverse connecting fibres. The main fibres are sinuous, and interosculate to form a loose pseudo-reticulation. They contain a compact core of spicules 20 to 80 μ in stoutness which as a rule is almost entirely formed of oxea; occasionally, however, acanthostyles—both principal and accessory—become the predominating elements of the core. Echinating acanthostyles are only of moderate abundance; the fibres are sometimes lacking in them for quite considerable distances, and even when most abundantly developed these spicules stand, on an average, probably not less than 20 μ apart.

Megascleres.—

(i.) The oxea vary in length from 160 to 190 μ; the stoutest occasionally reach a diameter of 7 μ. A greater proportion of them than in any of the other varieties herein described, display the characteristic end-peculiarity—perhaps 20 per cent. of them being thus affected.

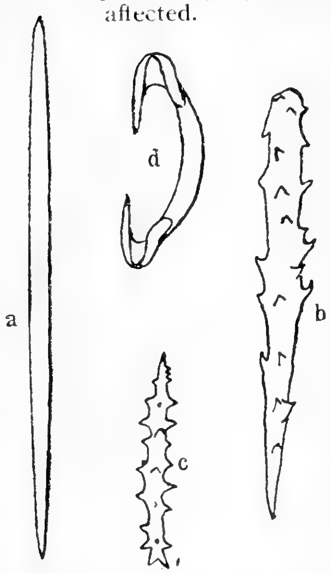

Fig. 30—*C. incrustans* var. *perramosa*. a Oxea. b Principal acanthostyle. c Dermal acanthostyle. d Isochela arcuata of the larger kind.

(ii.) The principal acanthostyles attain a maximum size of 160 x 12 μ.

(iii.) The dermal acanthostyles, owing to the damaged state of the dermal layer, are not with certainty determinable in respect to their maximum size. Referring only to those which exhibit the characteristic curvature of form, it may be said that the length varies from 60 to about 100 μ, and that the usual size is about 80 x 7 μ.

Microscleres.—

The chelæ vary in length from 13 to 25 μ. There is an appreciable difference of form between the larger and smaller; the former are similar to that shown in the accompanying text-figure, the latter bear a closer resemblance to those which are found in the preceding and two following varieties.

Loc.—Coast of New South Wales, Shoalhaven Bight, 15-45 fms. ("Endeavour.")

CRELLA INCRUSTANS, *Carter*, *var.* ARENACEA, *Carter*.

(Plate xxiii., fig. 3, and fig. 31.)

1885. *Plumohalichondria arenacea*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 367.

1896. *Plumohalichondria arenacea*, Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 43.

1901. *Plumohalichondria australis* (pars), Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 90, pl. xl., fig. 14b.

Clathria australis, Whitelegge, *Loc. cit.*, p. 90.

[1888. Not *Clathria australis*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 222.]

Sessile to substipitate; sometimes rather massive, but usually growing in the form of a thick erect plate which may either remain simple or become variously modified by proliferation, e.g., by partial or complete bifurcation into parallel plates, by the development of variously disposed lamellar outgrowths, or by the formation of lobes. Oscula small, mostly marginally situated. Both surfaces of the plate or plates traversed, immediately beneath the dermal membrane, by sub-parallel longitudinal canals which terminate in the oscula. Fibres very densely echinated; the coring spicules chiefly acanthostyles. Foreign bodies, chiefly sand grains, occur in variable amount in the fibres, and occasionally also in the ground substance. Interstitial megascleres, consisting chiefly of accessory acanthostyles, are extremely abundant. Dermal skeleton reticulate, without admixture of oxea. Megascleres, maximum sizes:—(i.) Oxea, 200 x 6 μ; principal acanthostyles, 160 x 11 μ; dermal acanthostyles, 100-110 x 8-9 μ. Isochelæ arcuatæ, not distinguishable into two groups, 12 to 18 μ long.

Introductory Remarks.—The sponges described by Whitelegge under the name of *Plumohalichondria australis*, Lendenfeld, are separable into two varieties—the one, corresponding to those which he identified with *Clathria australis*, Lendenfeld; the other, to those which he regarded as representing three of Lendenfeld's species, viz., *Echinonema levis*, *E. rubra* and *Clathria macropora*. In the case of none of the four species mentioned, does Lendenfeld's description agree with that of Whitelegge, since for each of them the coring spicules were stated to be styli, whereas in *Plumohalichondria australis*, Whitelegge, they are oxea. What were the sponges which Lendenfeld had before him, will probably never be known with certainty, but after taking all the evidence into account, I am inclined to believe that Whitelegge's identifications of *E. levis* and *E. rubra* are correct, those of *C. australis* and *C. macropora* wrong. The two former as well as Whitelegge's *C. macropora* I will describe as *Crella incrustans*, var. *levis*: Lendenfeld's *C. australis* and *C. macropora* are unknown to me. Whitelegge's *C. australis*, the subject of the following description, I regard as identical with Carter's *Plumohalichondria arenacea*. *Clathria australis*, Lendenfeld, would appear to resemble this last-mentioned only in external form; for according to its description, the skeleton is reticulate, the main fibres are entirely filled with (stylote) spicules, the connecting fibres are without spicules and echinating acanthostyles are rare; its locality is Port Phillip. In Whitelegge's *Clathia australis* on the other hand, the skeleton is dendritic, the fibres are in part loaded with sand particles, and are so densely echinated that even where the fibres are free from inclusions, the relatively few coring spicules (oxea and acanthostyles) are usually hidden from view; moreover, the specimen which Whitelegge regarded as the type-specimen was obtained (according to the information supplied by the Museum Register) from Port Jackson.

Crella incrustans var. *arenacea* bears a certain amount of resemblance, so far as habit of growth is concerned, with the variety *mammillata*, R. and D. The chiefly marginal location of its oscula and, in correlation with this, the arrangement of the main excurrent canals, as well as the presence of foreign particles in the skeleton, will, however, afford a ready means of distinguishing it from the latter. As an example of the sponge in one of its simpler forms of growth, the specimen figured by Whitelegge will serve, though a much more regularly flabellate form is sometimes attained. The specimen figured herein (Plate xxiii., fig. 3) shows to how great an extent this simplicity of form may be departed from. The specimens which I have examined are the same as those which formed the subject of Whitelegge's description together with several which have since been added to the Museum Collection. With three exceptions they are beach-worn dry specimens collected in the vicinity of Port Jackson. The exceptions are from the southern coast of Australia; two from Port Phillip, the other was obtained by the "Endeavour" off the coast of South Australia, and is well preserved in alcohol. So far as the difference in their state of preservation enables one to judge, there is no essential difference between the Port Jackson and the southern specimens, although it should be mentioned that whereas the latter are simply leaf-shaped, the former are without exception lobed or otherwise proliferate.

Description.—The original specimen, according to Carter's description, was irregularly club-shaped and lobed, with a contracted base; and measured about 230 mm. in height, by 60 mm. in diameter in its widest part. Dendy, who had a number of specimens before him, describes the external form in general terms as "massive to flabellate." The two Port Phillip specimens which I have seen are simply leaf-shaped and substipitate, the larger being 150 mm. in height, 85 mm. in greatest breadth and 15 to 25 mm. thick. The "Endeavour" specimen is similarly shaped, but has the margin of the plate or frond, throughout about one-half its circumference, produced outwards on one side so as to form a wide flange; it measures 150 mm. in height, 100 mm. in breadth and 10 to 15 mm. in thickness. The specimens from the New South Wales coast—all of which, it should however be mentioned, were derived from very shallow water—are almost invariably of irregular growth owing to the proliferation in various ways of the original or primary frond. In spirits, the surface is even and glabrous, the consistency firm, tough, compressible and resilient, and the colour light greyish-brown. The rather thick dermal membrane is semi-translucent and enables one to discern the outlines of the more superficial exhalant canals lying close beneath. These canals, which occur on both sides of the sponge, are roofed by little more than dermal membrane only. They run upwards in a slightly radiating fashion from the base of the sponge usually to the margin, and terminate in small oscula $\frac{1}{3}$ to 1 mm. in diameter. Their number increases by occasional branching as they ascend, so that the distance separating them remains about the same throughout. In the dry state, the dermal membrane forms a dense whitish incrustation, and through shrinkage, often conforms more or less to the inequalities beneath. The partitions between the canals then appear on the surface as faint ridges. Where the incrustation is more or less denuded the surface presents the appearance shown in Whitelegge's figure;[1] the ridges are, however, sometimes much more, sometimes much less strongly pronounced. The texture is extremely dense and compact, and the sponge when dry is particularly hard and tough. The main skeleton consists of stout sinuous ascending fibres, repeatedly branching and anastomosing. There are no true connecting fibres, although the intercrossing of the longitudinal fibres often produces the appearance of such. The echinating acanthostyles are so densely crowded on the fibres that the coring spicules are usually concealed from view, but when discernible they prove to be chiefly acanthostyles.

Fig. 31—*C. incrustans* var. *arenacea*. Modifications of the opposite extremities of the oxea.

1 Whitelegge—*Loc. cit.*, pl. xi., fig. 14b.

Foreign bodies, chiefly large sand grains, occur at usually irregular intervals in the fibres, and sometimes in small patches in the ground substance. Different specimens exhibit considerable differences in regard to the amount of foreign material included. The ground substance is densely strewn with megascleres which consist almost entirely of accessory acanthostyles. The dermal skeleton is for the greater part a well-defined reticulation of acanthostyles with polygonal (usually five or six-sided) meshes, but in places (particularly on the margin of the sponge) the spicules become so closely packed that the insterstices of the meshwork are almost, if not entirely obliterated. Oxea are absent from the dermal skeleton.

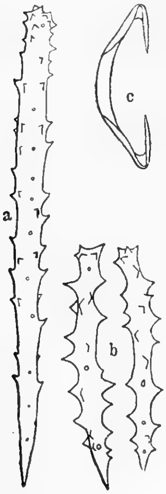

Fig. 32—*C. incrustans* var. *arenacea*. a Principal acanthostyle. b Dermal acanthostyles. c Isochela arcuata.

Megascleres.—

(i.) The oxea vary in length from about 160 to 200 μ; the stoutest are 7 or (rarely) 8 μ in diameter.

(ii.) The principal acanthostyles reach a maximum size of 160 x 10-11 μ.

(iii.) The dermal acanthostyles vary in length from 65 to 110 μ, or even slightly longer; they are usually between 75 and 100 μ in length; acanthoxea occur among them as rarities. The longest are usually straight spicules with slightly recurved spines and more closely resemble the *principal* acanthostyles than is usually the case. The stoutest are about 8-9 μ in diameter.

Microscleres.—

The chelæ, which are about 12 to 18 μ long, show no appreciable separation into two groups.

Locs.—Port Phillip, Victoria (*Carter*, *Dendy*, Austr. Mus. Coll.); southern coast of South Australia, eleven miles N.N.W. of Cape Martin, 21 fms. ("Endeavour"); eastern coast of New South Wales (Austr. Mus. Coll.).

CRELLA INCRUSTANS, *Carter, var.* LEVIS, *Lendenfeld.*

(Figs. 33, 34.)

1888. *Echinonema levis*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 220.

Echinonema rubra, Lendenfeld, *Loc. cit.*, p. 221.

1901. *Plumohalichondria australis* (*pars*), Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 90, pl. xl., figs. 14, 14a.

(*Echinonema lævis*), Whitelegge, *Loc. cit.*, p. 91, p. 212.

(*Clathria macropora*), Whitelegge, *Loc. cit.*, p. 91.

[1888 ? Not *Clathria macropora*, Lendenfeld, Cat. Sponges Austr. Mus., 1888.]

Form variable, ranging from sub-massive and plate-like to clumsily ramose. Oscula small, distantly scattered, often situated (singly) on the apices of conical prominences. A distinctive feature is the arrangement of the subdermal oscular canals; these become conspicuous only in the vicinity of the oscula, each of which forms a common arifice for several canals running more or less radiatingly towards it. Texture dense. Fibres cored by oxea and acanthostyles, and moderately densely echinated by the latter. Dermal skeleton reticulate. Megascleres, maximum sizes:—(i.) Oxea, 190 x 6 μ; (ii.) principal acanthostyles, 180 x 8 μ; dermal acanthostyles, 100 x 6 μ. Isochelæ arcuatæ, 16 to 22 μ long.

Introductory Remarks.—The original descriptions state that the coring spicules of the fibres are styli; but with this exception, the descriptions accord fairly well on the whole with requirements, and there can scarcely be the slightest doubt that the sponges under consideration are identical with those to which Lendenfeld referred. The variety is well represented in the Museum Collection, and among the specimens are quite a number bearing labels in Lendenfeld's writing. The specific name *rubra*, however, occurs in connection with only one of these and, even so, in association with the generic name *Clathrissa*. But Whitelegge has already pointed out that a co-type specimen of *E. rubra* in the British Museum is of the same species as *E. levis*, and the original descriptions also point to the identity of the two. Moreover, one is led to conclude that Lendenfeld himself subsequently recognised their identity, since, included among the specimens labelled by him *E. levis*, there are some which, like the original specimens of *E. rubra* retain in alcohol a bright scarlet colour. It is pretty certain, therefore, that *E. rubra* is correctly a synonym of *E. levis*.

On the other hand, the identification of *Clathria macropora*, Ldf., with this species is slightly beyond reason, and one can only assume, for the present, that the "type" specimens of

C. macropora referred to by Whitelegge are mislabelled. The chief reasons for the rejection of *C. macropora* as a synonym of *E. levis* are two in number:—(i.) Lendenfeld perceived the specific identity of the different specimens of *E. levis* on the one hand and of those of *E. rubra* on the other, throughout their many variations; and it is therefore most unlikely that he would assign other examples of the same species to a different genus. (ii.) Lendenfeld says of *C. macropora* that "the oscula are very conspicuous and scattered over the whole surface" and "are on an average 5 mm. wide and fairly abundant." The inference to be drawn from Whitelegge's remarks in this connection, viz., that Lendenfeld may have mistaken for oscula holes produced by a boring Isopod, is highly improbable, and the more so since, as Whitelegge himself points out, *E. levis* sometimes exhibits holes of the same kind—but Lendenfeld was evidently not deceived by these. Oscular canals, the peculiar arrangement of which has been referred to in the diagnosis, are not discernible in specimens which have been denuded of dermal covering, and in their case accordingly, the most important feature for their identification is absent. This is the condition of many of the specimens before me which I assign to the present variety; although a number of these depart very considerably in form from such of the specimens as are with certainty identifiable, the occurrence of seemingly intermediate forms nevertheless renders it pretty certain that they all belong to the one variety. Moreover, Lendenfeld's account of the external form covers all these cases.

Fig. 33—*C. incrustans* var. *levis*. Modifications of opposite extremities of the oxea.

Description.—The sponge consists of a compressed trunk-like or (rarely) more cylindrical and stalk-like basal portion from which arise few or many short branches which are typically massive and irregular (Whitelegge, Plate xi., fig. 14) but may vary from cylindrical to much compressed or even frond-like In some cases the trunk may grow to a considerable size—even assuming the form of a broad, erect plate—whilst the "branches" may be reduced to the proportions of marginal lobes, or may be wholly absent (Whitelegge, Plate xi., fig. 14a). In consistency the sponge is hard and tough, resembling in this respect the variety *arenacea*.

The fibres do not to any appreciable extent form a pseudo-reticulation, as in the preceding varieties, but as a rule run side by side in close parallelism, and are sometimes fused several together for considerable distances, forming what might be termed "compound" columns. The acanthostyles are much less densely crowded on the fibres than in the variety *arenacea*, and as a consequence the coring spicules are always visible and show themselves to consist both of oxea and acanthostyles, the former predominating. The ground substance is densely strewn with acanthostyles and oxea, of which the former are in the greater abundance. Owing to the close arrangement of the fibres and the multitude of spicules, the skeleton is much more compact and dense than in any other variety herein described with the possible exception of *arenacea*. The dermal skeleton resembles that of the last-mentioned variety.

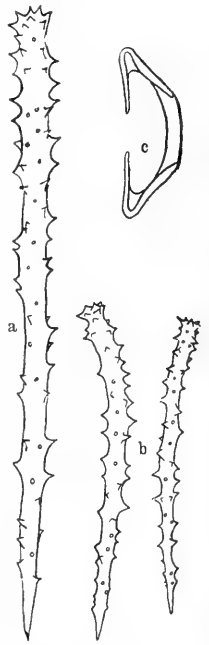

Fig. 34—*C. incrustans* var. *levis*. a Principal acanthostylus. b Dermal acanthostyli. c Isochela arcuata.

Megascleres.—

(i.) The oxea vary in length from 160 to 200 μ; the stoutest are 6 μ in diameter.

(ii.) The principal acanthostyles attain a maximum size of 180 x 8 μ.

(iii.) The dermal acanthostyles are rarely less than 80 μ long, and commonly exceed 100 μ; their greatest length is about 120 μ and the greatest diameter 5 or (rarely) 6 μ.

Microscleres.—

The chelæ, which vary in length from 13 to 18 μ, show no appreciable separation into two groups.

Loc.—Port Jackson (Austr. Mus. Coll.).

CRELLA INCRUSTANS, *Carter*, *var.* PUMILA, *Lendenfeld*.

1888. *Clathrissa pumila*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 218.

Sponge encrusting, thin; surface uneven or irregularly conulated. Oscula small, scattered. Main skeleton consisting of ascending columns of acanthostyles and descending columns of oxea. Acanthostyles of the dermal skeleton scattered without order. Megascleres, maximum sizes:—(i.) Oxea, 170 x 5.5 μ; (ii.) principal acanthostyles, 145 x 10 μ; (iii.) dermal acanthostyles, 80 x 5.5 μ. Isochelæ arcuatæ, of a single kind, 12 to 16 μ long.

Introductory Remarks.—Lendenfeld described the outward appearance of the typical variety of his *Clathrissa pumila* in the following terms:—"Small, incrusting, conulated sponges, of a light rose colour in the fresh state and grey when preserved in spirit. The conuli are on an average 2 mm. high and 4 mm. apart. Small oscula .8 mm. wide are scattered irregularly over the surface." His complete description of the variety *rubra* is exceedingly brief:—"Massive or incrusting sponges with small conuli 1 mm. high which are very close together. The largest specimens attain a height of 20 mm. The colour of the living sponge is bright scarlet. The skeleton is similar to that of the species." It will be observed that, so far as the description informs us, the variety is distinguished only by the slightly lesser height of its conuli, and by the deeper shade of its colour—neither of which differences possesses in itself any importance. An examination of the type-specimens, however, renders it exceedingly probable that Lendenfeld's descriptions have reference to two quite distinct varieties. The type specimens of *E. pumila* and its variety are separately represented each by a bunch of stout seaweed roots that are almost completely over-grown with encrusting sponges of quite a number of different kinds. It was necessary to examine several of these before it could be said with certainty which were the actual examples of the species, and as a result it has been found that there are among them two varieties which accord very well with the descriptions so far as external features are concerned; that is to say, one of them appears to be invariably of encrusting habit, whilst the other may assume a massive form, becoming cake-shaped. In regard to their inner structure, however, they do not comply with the descriptions inasmuch as their skeletons are not similar, and there is a notable difference in the size of their megascleres; furthermore the variety which agrees in outward features with *C. pumila* var. *rubra* happens to be that one of the two which accords with the typical *C. pumila* in internal features. One must conclude, therefore, either that Lendenfeld did not examine the structure of the skeleton in his two varieties sufficiently closely to detect their difference, and inadvertently ascribed to the typical variety the skeletal features which belong to the variety *rubra*; or that the descriptions are really correct, that his two varieties consequently were merely different growth stages of one and the same variety, and that the sponge which agrees externally but not internally with *C. pumila* is a new variety which Lendenfeld overlooked. The former conclusion is the more probable and the one which I therefore adopt. Both *C. pumila* and *C. pumila* var. *rubra* are capable of being regarded as varieties of *Crella incrustans* since their spicules exhibit all the features characteristic for the species. They may accordingly be named *C. incrustans* var. *pumila*, and *C. incrustans* var. *rubra*, respectively. The following is a description of the the former.

Description.[1]—The sponge, as far as known; is encrusting, forming a layer (usually of about 1 mm. thickness) which may spread over a considerable area. The surface is minutely rugged or papillated and, in parts, conulose. The colour is greyish white in spirit; in life, according to Lendenfeld, it is of a rose-tint. Small rounded openings, which may be oscula, occur here and there at wide intervals.

The basal layer of spongin, with which the sponge covers the substratum, is densely echinated with vertically-standing acanthostyles. The main skeleton consists of both ascending and descending spicular columns, which might be termed respectively *principal* and *auxiliary* columns. The principal columns are single or once or (rarely) twice branched fibres running upwards from the base of the sponge, and composed of a spongin-axis with embedded and echinating acanthostyles, and sometimes in addition containing a few coring smooth oxeotes. The auxiliary columns, which proceed downwards from the dermal layer, consist entirely of smooth oxeotes without visible cementing material. As a rule, the ascending and descending columns meet at varying distances from the surface, so that there results in consequence composite columns, in the lower portion of which the spicules are acanthostyles, in the upper portion, oxea. Frequently, however, the auxiliary columns are not encountered by principal columns, and then sometimes reach to the very base of the

1 In many respects this sponge resembles the recently described *Crella incrustans*, var. *Thielei* (Hentschel—Fauna Südwest-Australiens, Bd. 3, p. 345.

sponge; at the surface they are penicillately spread out, forming sub-dermal brushes with the points of the spicules impinging on, but not piercing, the dermal membrane. The principal columns appear never to quite reach the surface but to be invariably capped with a column or a brush of oxea. The interstitial megascleres are almost exclusively acanthostyles: in the upper part of the sponge they are sometimes very numerous, and form a conspicuous feature of the skeleton; but this is not a constant feature, and generally speaking, scattered spicules are of no great abundance. The dermal skeleton consists solely of irregularly and fairly closely scattered accessory acanthostyles.

Megascleres.—

(i.) The oxea vary in length from 130 to 170 μ and are thus shorter than in any other of the known varieties. They are slender spicules, rarely exceeding 4.5 μ and never more than 5.5 μ in diameter.

(ii.) The principal acanthostyles attain a maximum size of 145 x 10 μ.

(iii.) The dermal acanthostyles vary in length from about 60 to 80 μ; the stoutest are less than 6 μ in diameter.

Microscleres.—

The chelæ are of a single kind, similar to those of the variety *levis*, and 12-16 μ long.

Loc.—Port Jackson (Austr. Mus. Coll.).

CRELLA INCRUSTANS, *Carter*, VAR. RUBRA, *Lendenfeld.*

1888. *Clathrissa pumila* var. *rubra*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 219.

Very small, encrusting or cake or dome-shaped sponges with smooth or papillated surface. Main skeleton consisting of branching, ascending, occasionally anastomosing, fairly densely echinated fibres often with a distinct core of oxea, but usually with acanthostyles in addition and sometimes containing acanthostyles alone. There are no descending columns of smooth oxea as in the preceding variety. The dermal skeleton consists of scattered accessory acanthostyles. Megascleres, maximum sizes:—(i.) Oxea, 200 x 5 μ; (ii.) principal acanthostyles, 160 x 8 μ; (iii.) dermal acanthostyles, 80 x 5 μ. Isochelæ arcuatæ, 12 to 16 μ long.

The original description of the external features of this sponge was as follows:—"Massive or incrusting sponges with small conuli about 1 mm. high which are very close together.

The largest specimens attain a height of 20 mm. The colour of the living sponge is bright scarlet." To this it may be added that the surface is sometimes free from conuli, and that the colour in alcohol is brownish-grey. The largest which I have seen is 15 mm. in diameter and 5 mm. in height. Oscula have not been observed.

The diagnosis contains pretty well all which need be said concerning the skeleton. The basal layer of spongin is densely echinated with erect acanthostyles. Columns of oxea, free from echinating acanthostyles, such as are characteristic of the preceding variety, have not been observed. Occasionally the coring oxea at the extreme upper extremity of the fibres spread out penicillately and form a sub-dermal tuft, but as a rule the character of the fibre remains unaltered quite to its point of arrival at the dermal membrane. The interstitial megascleres, which are almost exclusively acanthostyles, are fairly abundant. Oxea external to the fibres are extremely rare except (occasionally) immediately beneath the dermal membrane. The dermal skeleton is similar to that of the variety *pumila*.

Megascleres.—

(i.) The oxea vary in length from about 160 to 200 μ; the stoutest are 5 μ in diameter.

(ii.) The principal acanthostyles attain a maximum size of 160 x 8 μ.

(iii.) The dermal acanthostyles vary in length from about 60 to 80 μ and do not exceed 6 μ in diameter.

Microscleres.—

The chelæ, which resemble those of the variety *levis*, are 12 to 16 μ long.

Loc.—Port Jackson (Austr. Mus. Coll.).

Genus Echinodictyum, *Ridley*.

Echinodictyum elegans, *Lendenfeld*.

(Plate xxiii., fig. 1, and fig. 35.)

1888. *Kalykenteron elegans*, Lendenfeld, Austr. Mus. Cat. Sponges, 1888, p. 216.

Kalykenteron silex, Lendenfeld, *Loc. cit.*, p. 217.

1901. *Thalassodendron typica*, Whitelegge (*non* Lendenfeld), Rec. Austr. Mus., iv., 2, 1901, p. 86.

Sponge lamellar, usually vasiform, subsessile. Surfaces rarely quite even, the outer, and sometimes to a *slight extent the inner, usually raised into few or many mammiform, or more or less irregular elevations. Oscula small, confined to the inner surface (fide Lendenfeld). Skeleton-fibres stout; both main and connecting, almost entirely composed of closely-packed oxeote spicules. Spicules:—(i.) Somewhat angulately curved oxea of very variable proportions, usually with the extremities somewhat blunted, and often slightly monilated; their greatest size varies in different specimens from 410 x 13 μ to 620 x 18 μ; (ii.) sub-cylindrical acanthostyles with distal extremity strongylotely rounded; spines more or less compressed transversely to the length of the spicule, and recurved; at both extremities of the spicule the spines are smaller and more crowded; the maximum size of the spicule varies in different specimens from 105 x 10 μ to 130 x 12.5 μ; (iii?) slender styli of variable diameter up to about 5 μ which are possibly young stages of the first-mentioned.*

The previous accounts of this species are so misleading in regard to the dimensions of the spicules that a re-description which will render further reference to them unnecessary, is desirable. Owing, however, to the imperfect preservation of the available specimens—six in number, all dry, and more or less macerated—an entirely satisfactory description is not at present possible. With regard to external features, the original description of *Kalykenteron elegans*, says:—"A very elegant, conical, cup-shaped sponge attaining a height of 220 mm. The margin of the cup is circular and has a diameter of 120 mm. Both surfaces are very irregular and covered with numerous projections of varying size and shape. The outer surface is somewhat rougher than the inner. The small circular oscula are confined to the latter." Concerning *Kalykenteron silex*, Lendenfeld states:—"The sponge consists of a meandriform lamella which grows up from a small base of attachment; it is somewhat flower-shaped, often caliculate. The whole sponge attains a height of 120 mm. The lamella is pretty uniformly 6 mm. thick and rounded at the margin."

The specimens before me, with the exception of that labelled *Kalykenteron silex* (type), range in form from conical cup-shaped to shallow saucer-shaped, and are attached by a narrow base not prolonged into a stalk. The largest example is the type-specimen (Plate xxiii., fig. 1) which measures 225 mm. in height, and has the cup wall 6 to 10 mm. in thickness. It is now much compressed, but this is probably due to artificial influences; in the others, the cup-margin is circular. The type specimen agrees with one other, in having the outer surface covered with numerous prominences of somewhat irregular shape, but of fairly uniform size, whilst the inner surface is uneven, though devoid of any pronounced inequalities. In the remaining specimens the inner surface is quite free from irregularities of any kind, whilst the outer surface is merely lumpy or provided with rounded tubercular elevations of larger size and relatively lesser number than in the type. Finally in the type specimen (*sic*) of *K. silex*, both surfaces are plain. This last-mentioned is merely a small piece of the original including portion of the margin, which is sinuous; it was evidently taken from a "meandriform lamella" about 6 mm. thick. The "minute circular oscula" confined to the inner surface, which Lendenfeld mentions for *K. elegans*, are not discernible in the present condition of the specimens. The consistency is very hard and firm, and the texture coarse and fibrous. The statement of Whitelegge that the sponge (as represented in a macerated specimen) resembles a "washed-out *Chondropsis*" is meaningless. Lendenfeld's description of the main skeleton is fairly correct, though slight amendments are necessary. He says:—"The skeleton consists of a dense network of exceedingly thick fibres. The main fibres, which extend longitudinally from the base of the sponge to the margin of the cup are .2 mm. thick. The connecting transverse fibres have an average diameter of .07 mm. The meshes of the network are .48 mm. wide. The fibres consist of dense masses of oxea which are all parallel and disposed longitudinally." His description of the skeleton in *K. silex* is very slight, and moreover (if the ostensible type-specimen is, as all the evidence indicates, genuine) inaccurate. It is as follows:—"The skeleton consists of spicule-bundles .2 mm. thick, composed of large and stout styli. There is hardly any spongin discernible. The fibres are echinated by spined styli .09 mm. long and .008 thick." The use of the word "styli" in the latter connection is evidently an error, since Lendenfeld defines the genus *Kalykenteron* as being distinguished in the

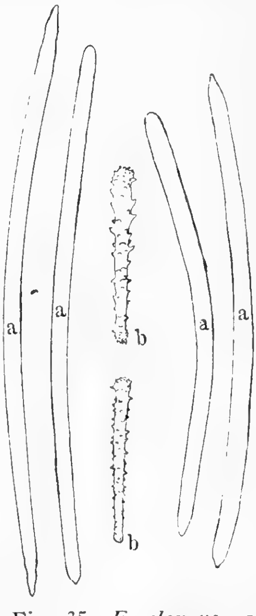

Fig. 35—*E. elegans*. a Oxea (showing various stages in their passage into strongyla). b Acanthostyli.

possession of spined strongyla. It is therefore only necessary to assume that the same word in its first occurrence is mis-written for "oxea," and the description throughout becomes perfectly congruous. In correction of the quoted description of the main skeleton, it is necessary to mention that the main fibres do not, strictly speaking, extend from the base to the margin of the cup; but as they ascend, trend towards and terminate at the lateral surfaces, whilst new directive fibres branching off from these, continually arise to take their place. In specimens in which the surface is even, the skeleton reticulation is very regularly subrectangular, even though the connecting fibres often form interreticula of small extent between the main ones. With increase of surface irregularity however, the reticulation tends to become confused. The measurements which are given for the fibres and mesh, so long as they are regarded as conveying an approximate idea, may be allowed to stand. It is impossible with no better material than the present, to speak with certainty of the dermal skeleton, though the indications render it fairly safe to say that anything of a special nature is absent. The errors of previous descriptions in regard to the dimensions of the spicules are partly due to the fact of their great variability in size. The frequency of occurrence of a spicule of given size decreases rapidly as its length recedes from the average, so that one can never make quite sure of the maximum attainable size. This is more particularly true of the principal spicules. Whenever, in any species such great variability in the size of spicules is found in a single given specimen, it is, generally speaking, fairly safe to assume that considerable variations in their maximum size are likely to occur in different specimens. I have made such an assumption in the present instance. The largest spicules were found in the type specimens of *K. elegans* and *Thalassodendron typica*, Whitelegge, in both of which the oxea vary in length from 150 to 620 μ and may attain a diameter of 18 μ. In the type-specimen of *K. silex*, which departs most widely from these in regard to the size of the spicules, the length of the oxea varies from 130 to 410 μ, whilst the maximum diameter is only 13 μ. Among the slenderest spicules a small proportion of styli are found; but as these are of equal length with the slender oxea and are frequently curved in the same way, it is difficult to say whether they are to be regarded as abnormalities or as representing the auxiliary spicules of other species. It is perhaps significant, however, that they do not attain to more than 5 μ in diameter, and that what appear to be transitional forms between them and the oxea are very rare. Their maximum length, which varies in different specimens concomitantly with that of the other spicules, is about two-thirds to three-fourths of the length of the principal spicules.[1]

This species will probably prove to be identical with *E. bilamellatum*, Lamarck.[2]

Locs.—Lendenfeld records the species from Western Australia, and the type-specimen is labelled to that effect. All the remaining specimens, however, are from the eastern coast, Port Jackson (Austr. Mus. Coll.); Coast of Queensland, seven miles south-south-east of Double Island Point, 32-33 fms. ("Endeavour.")

Genus Rhaphidophlus, *Ehlers*.

1870. *Rhaphidophlus*, Ehlers, "Die Esper'schen Spongien" (Erlangen), 1870, pp. 19, 31.

1870. *Tenacia*, O. Schmidt, "Grundzüge einer Spongien-Fauna des Atlantischen Gebietes," 1870, p. 56.

1875. *Echinonema*, Carter, Ann. Mag. Nat. Hist. (4), xvi., 1875, p. 185.

1888. *Clathriopsamma* (pars), Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 227.

As in Clathria, the main skeleton is a reticulation of well-developed horny fibres cored by (principal) styli and echinated by (typically spined) accessories; and the microscleres are palmate isochelæ and toxa. The distinctive feature is the presence of a dermal skeleton of vertically arranged styli, which are derivatives of, and are typically shorter than, the auxiliary styli. The chelæ are of one or two kinds, and the toxa, which are sometimes of great length, may lose their distinctive character and may either assume the form of indefinitely-shaped trichitoidal spicules or become indistinguishable from ordinary oxea.

The abandonment of the genus *Rhaphidophlus* has been recommended on the ground that the single feature distinguishing it from *Clathria* shows such varying degrees of development in different species that no hard and fast line can be drawn between the two genera. It should, however, be pointed out that, whereas in some species of the *Rhaphidophlus-Clathria* group the dermal skeleton is composed of

1 Whitelegge mentions the occurrence in this species of "straight smooth styli, size .8 to 1 by .0015 mm." As I have failed to find any such, I am of the opinion that the spicules observed by Whitelegge were intrusive.

2 Since writing the above I have seen Hentschel's description of *E. bilamellatum* (Fauna Südwest-Australiens, Bd. iii., 1911, p. 385), and have now no reason to doubt that *E. elegans* is identical with that species.

undifferentiated auxiliary spicules yet in many of the species which have been assigned to *Rhaphidophlus* (including among them—I have reason to believe—the type-species) the dermal spicules are of a special kind. It would seem therefore that the basis for a distinction between the two genera is to be sought for, not to any extent in the degree of development of the dermal skeleton, but rather—in what is essentially of greater systematic importance— in the nature of the spicules composing it. It is quite probable that this distinction also will be found to break down; but in the absence of any well established evidence in proof of this, it seems to me not improper to still employ, tentatively, the name *Rhaphidophlus* for such species as those herein described, viz., *R. typicus*, *R. paucispinus*, and *R. reticulatus*.

It cannot be regarded as other than a fact of considerable significance that in *R. typicus* and in *R. paucispinus* the constitution of the dermal skeleton is precisely the same; yet the difference in the characters of their microscleres show the two species, considered as members of a single genus, to be rather widely separated. Thus, although in *R. typicus* the chelæ have become differentiated into two groups and the individual toxa replaced by toxodragmata, whilst in *R. paucispinus* neither of these changes has occurred; yet in both species we find that the dermal skeleton consists of reticulating lines of upright shorter styli underlain by horizontally disposed longer styli. This type of dermal skeleton would therefore appear to be phylogenetically one of long standing, and on that account to confer on these and related species[1] no slight claim to congeneric distinction. On the other hand, since the vertically disposed or *special dermal* styli as they may be termed, are (as is evident from a study of the two species referred to) nothing more than a section of the auxiliary spicules which have become slightly modified in correlation with their fulfilment of a special function, it follows that species in which the transitional types of dermal skeleton have persisted, may reasonably be expected to occur. This consideration points to a possible difficulty in the way of satisfactorily defining and so justifying the maintenance of *Rhaphidophlus*, but it does not, in itself, provide a sufficient reason why the genus should be rejected.

Among the species, which must be taken into account in devising a suitable definition for the genus, is the interesting

1 By "related species" I do not imply merely those which possess a similar type of dermal skeleton, but would also include any which might afford proof of their derivation therefrom, even though their special dermal styli had become secondarily non-existent.

Clathriopsamma reticulata, Lendenfeld.[1] The character of its microscleres leaves scarcely any room to doubt that this species is lineally related to *R. typicus*; and the disposition of its dermal spicules accordingly indicates that the reticulate arrangement of the latter as described for *R. typicus* and *R. paucispinus* is not to be regarded as an essential generic feature. Of the species whose descriptions indicate that they belong to *Rhaphidophlus* rather than to *Clathria*, I have been able to obtain information of the following in addition to those herein described:—*R. cratitius*, Esper, *R. filifer*, Ridley and Dendy, *R. spinifer*, Lindgren, *R. seriatus*, Thiele, *R. topsenti*, Thiele, *R. erectus*, Thiele, *R. cervicornis*, Thiele, *R. coralliophilus*, Thiele, *Tenacia clathrata*, O. Schmidt, *Clathria jugosa*, Wilson, *Clathria acanthodes*, Hentschel, and possibly also *C.* (*Rhaphidophlus*) *Spiculosa*, Dendy.[2] In the description of *Clathria acanthodes* the interstitial auxiliary spicules have probably been confused with the principal spicules owing to their close resemblance to them. A number of these species are scarcely to be regarded as more than varieties. The peculiar *Rhaphidophlus bispinosus*, Whitelegge,[3] is probably a *Clathria* of the *C. caelata-C. clathrata* series; unfortunately the type-specimen, which was very small, appears to have been lost.

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1 Lendenfeld—Cat. Sponges Austr. Mus., 1888, p. 227. This species is represented in the Australian Museum Collection by a number of specimens, one of which, labelled as the type, is poorly preserved in alcohol. The specimens appear to be incomplete, though they are sufficient to show that the sponge is of ramose habit, but that frequent anastomosis of the branches (which may attain a diameter of 10 mm. or more) often results in the formation of a "reticulate mass." The main skeleton is a loose irregular reticulation of mostly longitudinal fibres which are profusely strewn, rather than cored, with spicules, and for the most part also with foreign bodies, and are echinated by rather abundant acanthostyles. Spicules occur in the ground substance in fair abundance; they comprise auxiliary subtylostyli, extremely long slender oxea (toxa) often occurring in loose dragmata, and numerous palmate isochelæ of two sizes, the smaller of which are chiefly contort. There is a well-developed loosely attached dermal membrane; but, unfortunately, even in the spirit specimen, only the merest damaged tatters of it remain, so that it is impossible to speak with certainty concerning the arrangement of the dermal skeleton. The special dermal spicules, so far as can be judged, stand more or less vertically and appear to be gathered into tufts and ill-defined tracts. The principal styli are characterised by a basal tylosis which has a spinose or rugged surface, and is separated off from the rest of the spicule by a slight constriction; they are straight conical spicules varying in length from about 150 to 320 μ, and attaining a diameter of 12 μ. The auxiliary styli (and subtylostyli) are straight spicules nearly always provided with a distinct spination on the extreme basal end; those which occur interstitially reach a maximum size of 300-320 x 5-5.5 μ, whilst those which constitute the special dermal spicules rarely if ever (apparently) exceed a size of 250 x 4 μ. The accessory acanthostyles are conical spicules with fairly large recurved spines scattered over their whole length; size 60-90 x 8 μ. The larger isochelæ are 12 to 17.5 μ in length and are rarely contort, the smaller are 6 to 9.5 μ long and as a rule contort. The toxa are long and slender, straight or curved spicules without any trace of the mid-flexure so characteristic of toxa, and consequently resemble oxea; they occur singly and in dragmata; the very largest of them are at least 700 x 3 μ in size.

2 Dendy—Ann. Mag. Nat. Hist. (6), iii., 1889, p. 86, Pl. iv., fig. 4.

3 Whitelegge—Mem. Austr. Mus., iv., 10, 1907, p. 503.

RHAPHIDOPHLUS PAUCISPINUS, *Lendenfeld.*

(*a*) TYPICAL FORM.

(Plate xxv., fig. 1; Plate xxvi., fig. 1; and figs. 36, 36a.)

1888. *Thalassodendron paucispina*, Lendenfeld, Austr. Mus. Cat. Sponges, 1888, p. 224.

Thalassodendron rubens, var. *dura* (pars), Lendenfeld, *Loc. cit.*, p. 224.

Thalassodendron rubens, var. *lamella* (pars), Lendenfeld, *Loc. cit.*, p. 224, pl. vii.

1901. *Thalassodendron rubens* (pars), Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 87.

(*T. rubens*, var. *dura; T. rubens*, var. *lamellosa; T. paucispina*), Whitelegge, *Loc. cit.*, p. 87.

(*b*) *Var.* MULTIPORA, *Whitelegge.*

(Plate xxv., fig. 2.)

1907. *Clathria multipora*, Whitelegge, Austr. Mus. Mem., iv., 10, 1907, p. 496, pl. xlv., fig. 23.

General Diagnosis.—Sponge variable in habit, uniflabellar, multiflabellar or ramose; usually attached by a more or less extended disc-like foot, with or without the intervention of a stalk. In all cases the form assumed is the outcome of a more or less distinctly expressed tendency to the restriction of growth to one plane. No oscula. Dermal membrane strongly developed, appearing in the dry sponge as a white pellicle or incrustation. The surface exposed by the removal of the dermal skin is closely dotted with pinhole-like punctures. The main skeleton is a fairly regular, small-meshed reticulation of stout fibres; the main fibres contain a semi-diffuse core, the connecting fibres are short and invariably enclose one or a few spicules. The dermal skeleton is a well-defined reticulation of lines of crowded styli of two sizes, the smaller standing vertically, the larger lying horizontally beneath these and supporting them. Megascleres:—(i) Stouter, usually slightly curved (principal) styli, chiefly confined to the fibres, varying in maximum size in the different forms from 260 x 9 to 350 x 16 μ; (ii.) conical tapering acanthostyli, most densely spined on the basal end, occurring sparsely as echinating spicules and scattered in the ground-substance; length 90-100 μ; (iii.) slenderer, usually straight (auxiliary) styli (or *subtylostyli) of the same length as, or slightly shorter than the principal, occurring horizontally in the dermal membrane* *and scattered in the ground-substance; (iv.) shorter subtylostyli (or styli) of scarcely one-half the length of the preceding, almost entirely restricted to the dermal layer. A larger or smaller proportion of the megascleres (i.), (iii.) and (iv.), are provided with a minute basal spination; this spination is the normal condition of dermal styli and is of least frequent occurrence amongst the principal styli. Microscleres:—(i.) Palmate isochelæ of a single kind varying in maximum length in the different forms of the sponge from 20 to 25 μ; (ii.) angulately curved toxa 60 to 80 μ in length, and 2 to 2.5 μ in diameter.*

Introductory Remarks.—As the result of an examination of the figured specimen of *Thalassodendron rubens* var. *lamella*, and of undoubted specimens of *T. rubens* var. *dura* (= *Clathria rubens*), I find that Lendenfeld has confused the descriptions of these two sponges. The descriptions of their external characters are proper, but those of their skeletal characters should be interchanged. To further add to the confusion, Whitelegge, overlooking the essential points of difference between the two, united them, together with *T. brevispina*, as a single species, *Clathria rubens;* of the five specimens whose spicular characters he has separately described—though not quite accurately—the second (labelled "*Thalassodendron rubens* var. *dura*, No. 343"), as well as the third and fifth, belong to the present species (*vide* Whitelegge, *Loc. cit.*, pp. 86, 87).

Description.—

(*a*) *Typical variety.*

The sponge is frequently—except for the presence of marginal digitations—perfectly lamelliform. More usually, however, growth proceeds by the rapidly-repeated multiplication—always chiefly or entirely in one plane—of ascendant, cylindrical or slightly compressed, anastomosing branches, and results in the formation of a reticulated or fenestrated flabelliform expansion. From this, a more or less continuous lamella may in some cases be secondarily produced, through the gradual obliteration of the interspaces by vertical ingrowth. It is either owing to this latter mode of origin or because an actual separation into branches is not quite fully accomplished, that the surface in lamelliform examples is often, as Lendenfeld states, "slightly grooved." In some instances the sponge shows a marked disposition towards a freely branching habit, but in no observed case is there, as is usual in the variety *multiporus*, an entire absence of anastomosis or of confluence of branches. The specimen of *T. rubens* var. *lamella*, figured by Lendenfeld, will serve as an example of the sponge in its more (secondarily attained) lamelliform condition; whilst the one shown herein (Plate xxv., fig. 1) represents a condition intermediate between the preceding and that which is exhibited by the most ramose examples of the variety. The former specimen, it should be mentioned, is somewhat abnormal on account of its rugged surface, and the number of digitiform

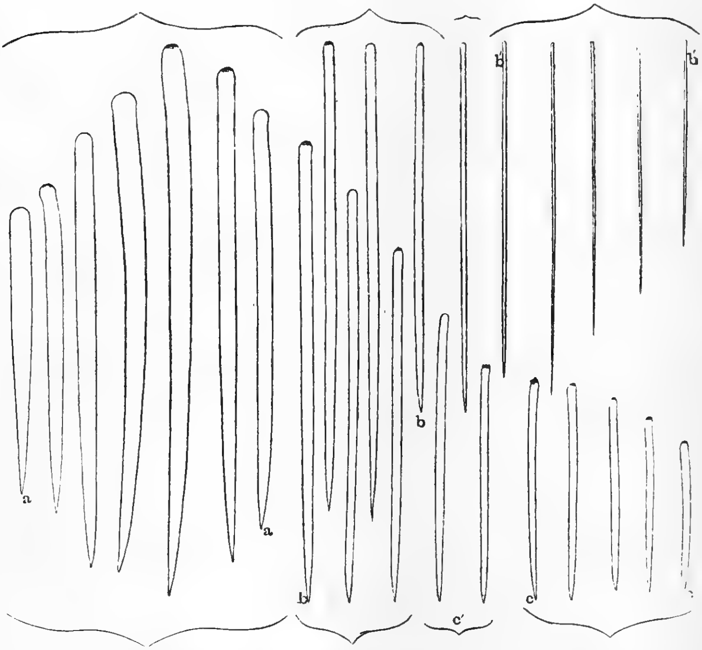

Fig 36—*Rhaphidophlus paucispinus*. a Principal styli. b, b′ Auxiliary styli. c Special dermal styli. c′ Styli intermediate between the auxiliary and dermal.

processes which arise from both its sides. Though some of these processes are probably of adventitious origin, others appear to be branches which have deviated from the plane of growth and so become excluded from participation in the formation of the main body. The maximum of sub-division into separate parts amongst the present specimens is shown by the specimen figured in Plate xxvi.; in this case the primary lamella has broken up into a number of sub-lamellæ, which come to lie in overlapping planes. The sponge, even in those rare cases in which a stalk is formed, is usually attached by a broad, often spreading disk, from which additional upgrowths may arise. These latter are, in all the observed instances, simply digitiform, and they quite frequently become united above with the main body. The consistency in alcohol is firm and tough, and in the dry state rather hard and stiff. In some specimens preserved in alcohol, the colour throughout is purplish red; in others the dermal membrane is milky white, the internal parts light brownish yellow. In dry specimens, as far as known, the colour, except of the dermal incrustation, varies from straw yellow or rusty brown; the darker hue belongs to those in which probably the life-colour was purplish, although the type-specimen of *T. rubens* var. *lamella*, contrary to the implication of the specific name, shows no trace either of red or brown. The sponge grows to a considerable size. The largest specimen measures 265 mm. in height and 380 μ in breadth. The thickness of the lamella, and of branches perpendicular to the plane of growth, varies in different specimens or in different parts of a single specimen from 5 to 10 mm.

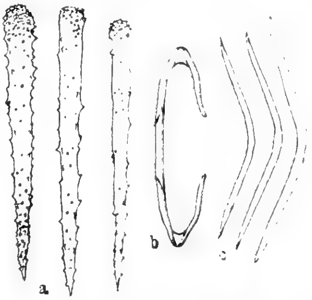

Fig. 36a. *R. pau ispinus.*. a Acanthostyli. b Chela. c Toxa.

The main skeleton is a compact reticulation of strongly developed horny fibre which, even in the distal portions of the sponge, frequently attains a thickness of 160-200 μ. The pattern of the reticulation is subject to a considerable amount of variation, and the same is true with regard to the development of the spicular core and to the size of the smooth megascleres. As a matter of fact, the type-specimen of *T. rubens* var. *lamella* departs to such an extent, in all three respects, from the normal, that some hesitation was at first felt in identifying it with the typical form. As a rule, the reticulation is distinguished by a marked regularity, so that, in section, to the naked eye, it appears quite rectangular. Under the microscope, however, owing to the comparatively small size of the mesh in relation to the thickness of the fibres, the apertures of the reticulation are slightly rounded to sub-circular. In vertical transverse section of a lamella or median longitudinal section of a branch, the main fibres gradually trend outwards to the surface on either side of the middle line in a pinnate manner, dichotomosing repeatedly. The transverse fibres connecting these are often further united by secondary connectives parallel to the main fibres. Towards the surface these secondary connecting fibres frequently become continuous and thus give rise to supplementary main fibres. The main fibres are occupied by a stout core of loosely packed spicules, which usually do not lie parallel to the axis of the fibre, but are inclined outwards from it at a small angle. As the extremity of the fibre is approached the spicules become more plumose in the arrangement, and more and more free from enveloping spongin and finally form a sheaf supporting, and to some extent piercing, the dermal membrane. The connecting fibres are never aspiculous, though they often contain but a single spicule. Acanthostyles occur in relatively small number scattered within the fibres, through the intermediate tissues, and as widely spaced echinating spicules. Smooth megascleres scattered through the ground substance are moderately abundant. This description of the main skeleton, as already pointed out, has reference to the condition which is most typical. In the type-specimen of *T. rubens* var. *lamella*, on the other hand, there is an absence of any marked regularity in the arrangement of the fibre-reticulation, the fibres are only sparsely cored, and the smooth styli of the sponge interior are on the whole notably smaller than in most other examples. Still, the probability is that these differences are nothing more than individual variations, and for the following reasons:— (i.) The sponges are apparently identical in all other essential respects. (ii.) The pattern of the main skeleton reticulation and the degree of development of the spicule-core of the fibres are sufficiently variable in all cases to render them untrustworthy as a basis for separation. (iii.) The size of the smooth styli always varies considerably in any given specimen, and the number of those which attain to the maximum size is also variable and as a rule proportionately small. (iv.) The same cause which accounts for the reduction in the size of the spicules might very well be responsible also for their diminution in number.

The accounts which have hitherto been given of the spicules are most incomplete, and in regard to their measurements entirely misleading. Lendenfeld mentions, in addition to acanthostyles, styli of one kind only, whilst Whitelegge recognises two. There are, however, three kinds which, though connected by intermediate forms, are clearly distinguishable by differences of shape or of situation. Firstly, there are the principal styli, which are predominatingly the spicules of the fibre core, and occur only in relatively small number in the ground substance; secondly, there are the auxiliary styli, which constitute the horizontal spicules of the dermal skeleton, which are, further, the most abundant megascleres of the ground tissues, and which, to a small though rarely appreciable extent, may also invade the fibres; and, thirdly, there are the special dermal styli (much smaller in size than either of the preceding), which are arranged at the surface, but which, like the others, are also to be found in the ground tissues. In the dermal skeleton the auxiliary styli (proper) are disposed horizontally in broad lines (in which they lie roughly parallel) forming a reticulation, the mesh of which averages about 160 μ in diameter. The special dermal styli stand perpendicularly upon the sides of this meshwork, echinating them, as it were. The special dermal styli usually exhibit a small area of spination on the basal extremity; a similar, though more minute, spination is also of occasional to frequent occurrence on the auxiliary spicules; but it is always of more or less rare occurrence in the case of the principal styli. The drawings in the text-figure have been arranged so as to show the very perfect gradation of one spicule form into another.

Megascleres.—

(i.) The principal styli are usually slightly curved. Their maximum size varies in different specimens from 280 x 10.5 to 300 x 11 μ. (In the divergent specimen of *T. rubens* var. *lamella*, spicules larger than 220 x 8 μ are exceedingly rare. A single spicule 280 x 10.5 μ was observed, and several others of intermediate length, in some of which the diameter exceeded 9 μ.)

(ii.) The acanthostyles are rather minutely spined; the spines are recurved and either scattered closely over the whole length of the spicule or are more or less reduced in number on the region extending from the neighbourhood of the very densely spined head towards the middle of their length. They are conical tapering spicules which rarely exceed a size of 95 x 7 μ, though individuals up to 105 x 7.5 μ have been observed.

(iii.) The auxiliary styli (proper) are straight. Those in those in the ground substance vary greatly in diameter, owing to the admixture of immature individuals. The latter are frequently tylostyli, but, as their development proceeds, their basal enlargement is gradually effaced, though traces of it are often retained by full-grown spicules. Those of the dermal skeleton are very uniform in stoutness, and being unmixed with principal styli allow their size, as distinguished from that of the latter, to be readily determined. They may attain to the length of the principal styli, but are usually slightly shorter. Maximum size, 270-295 x 8 μ. (In the abnormal specimen they attain to 280 x 7.5 μ.)

(iv.) The special dermal styli are connected by a perfect gradation of forms with the auxiliary styli. Those which stand perpendicularly to the surface are rarely, if ever, more than 150 x 5 μ in size. The majority of them are provided with a few basal spines which are relatively larger than those of the auxiliary and principal styli. Unlike the corresponding spicules of *R. typicus*, the dermal styli are here usually quite straight.

Microscleres.—

(i) The isochelæ palmatæ reach a maximum length varying in different specimens from 20 to 24 μ, whilst in any given specimen there may be a difference of as much as 6 μ between the longest and the shortest. The shorter length is usually associated with some degree of curvature of the shaft. The palms when viewed from the front are somewhat triangular in outline, with rounded corners; they are longer than broad.

(ii.) The toxa are simply angulately curved, and resemble a bent microxea. Size: 55 x 1.7 μ up to 75 x 2.5 μ. They are relatively few in number, and are sometimes apparently absent.

Loc.—Port Jackson (Austr. Mus. Coll.; ten specimens).

RHAPHIDOPHLUS PAUCISPINUS, *var.* MULTIPORUS, *Whitelegge.*
(Plate xxv., fig. 2.)

This variety differs from the typical form in its elongately branched habit and the somewhat greater size of its megascleres. All the specimens so far obtained are stipitate. The branches are given off in one plane, and may or may not anastomose. The specimen originally figured does not give a correct idea of the usual form of the sponge, owing to the fact that in it the branches, either through growth in a confined space or as a result of drying are bunched together. A specimen obtained by the "Endeavour" (Plate xxv., fig. 2) is peculiar in the wide separation of its branches. Whitelegge's statement of the spicule-dimensions stands in need of correction; their maximum values are as follows:—

Megascleres.—

(i.) Principal styli, 300-360 x 12-16 μ.

(ii.) Acanthostyles, 90-105 x 8-9 μ.

(iii.) Auxiliary styli, 300-360 x 8-10 (rarely more than 9) μ.

(iv.) Special dermal styli, rarely more than 160 x 6 μ.

Microscleres.—

(i.) Chelæ, 19-26 μ long.

(ii.) Toxa, 60-80 x 2-3 μ.

The megascleres exhibit the basal spination more commonly than do those of the typical variety. Practically all the auxiliary and special dermal styli are thus provided, as well as a considerable proportion of the principal styli. The acanthostyles are usually more or less deficient in spines over part of their proximal moiety.

Locs.—Coast of New South Wales off Botany Bay, 20-23 fms. ("Thetis"); Shoalhaven Bight, 15-45 fms. ("Endeavour").

RHAPHIDOPHLUS TYPICUS, *Carter*, et VARR.

(Plate xxvii., Pl. xxviii., figs. 1-4, Pl. xxix., and figs. 38-42.)

(*a*) *Typical Variety.*

1875. *Echinonema typicum*, Carter, Ann. Mag. Nat. Hist. (4), xvi., 1875, p. 195.

1881. *Echinonema typicum*, Carter, *Op. cit.* (5), vii., 1881, p. 378.

1896. *Clathria typica* (pars), Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 32.

[1904. Not *Clathria typica*, Kirkpatrick, Marine Investigations in South Africa, ii., 1904, p. 148.]

(*b*) *Var.* PROXIMUS, *var. nov.*

(*c*) *Var.* GEMINUS, *var. nov.*

(*d*) *Var.* BREVISPINUS, *Lendenfeld.*

1888. *Thalassodendron brevispina*, Lendenfeld, Austr. Mus. Cat. Sponges, 1888, p. 225.

1901. *Thalassodendron brevispina*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 87.

(*e*) *Var.* ANCHORATUS, *Carter.*

1881. *Echinonema anchoratum*, Carter, Ann. Mag. Nat. Hist. (5), vii., p. 379.

1885. *Echinonema flabelliformis*, Carter, *Op. cit.* (5), xvi., 1885, p. 352.

Echinonema pectiniformis, Carter, *Loc. cit.*, p. 353.

1886. *Phakellia ventilabrum*, var. *australiensis*, Carter, *Op. cit.* (5), xviii., 1886, p. 379.

1896. *Clathria typica* (pars), Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), p. 32.

[1888. Not *Echinonema anchoratum*, Lendenfeld, Austr. Mus. Cat. Sponges, 1888, p. 219.]

(*f*) *Var.* OBESUS, *nom. nov.*

1901. *Clathria typica*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 80, p. 117.

(*g*) *Var.* STELLIFER, *var. nov.*

(*h*) *Var.* FAVOSUS, *Whitelegge.*

1907. *Clathria favosa*, Whitelegge, Austr. Mus. Mem., iv., 10, 1907, p. 498.

General Diagnosis.—Sponge, in the different varieties, ramose, lamelliform or sub-massive. Oscula absent? Dermal membrane strongly developed, appearing in the dry sponge as a whitish pellicle or incrustation. Texture, as revealed by the removal of the dermal covering, rather loose and porous. The moderately stout fibre forms a rather wide-meshed reticulation. The main fibres contain a dense spicular core, the connecting fibres, with rare exception, are devoid of axial spicules. Smooth styli are extremely abundant in the ground tissues. Acanthostyles occur not only as more or less deeply imbedded echinating spicules, but also scattered within and between the fibres. They are more abundant on the outer extremeties of the fibres than elsewhere. The dermal skeleton is precisely of the same type as in the preceding species. Megascleres:—In addition to acanthostyles there are three kinds of stylote spicules, principal, auxiliary, and special dermal, occurring in the same relations as in the preceding species. A certain proportion of the last-mentioned exhibit a minute basal spination. (i.) The principal styli are the stoutest spicules; they are, for the most part, slightly curved; they vary in maximum size in the different known varieties from about 200 x 6 μ to about 300 x 13 μ. (ii.) The acanthostyles are distinguished by the absence or marked reduction of spines over a considerable portion of their basal moiety. (iii.) The auxiliary styli are straight or flexed, and are always longer and slenderer than the principal. (iv.) The special dermal styli are usually curved and slightly sub-fusiform; The greatest curvature is in the basal half of their length; in size they are rarely above 130-150 x 4-5 μ. Microscleres:—These are of three kinds:—(i.) Larger palmate isochelæ, 15-20 μ long; (ii.) smaller palmate isochelæ of which a certain proportion are contort, 7-11 μ long; (iii.) hair-like toxa of indefinite length, frequently passing into amorphous forms, occurring both singly and in bundles.

Introductory Remarks.—The intimate relationship to one another of the sponges here regarded as varieties[1] of *Rhaphidophlus typicus*, Carter, is revealed by their possession in common, of a considerable number of well-defined characteristics, of which five may be considered as possessing special value. These are:—(1) The non-occurrences of coring spicules in the connecting fibres; (2) the reduction of spination in the subbasal region of the acanthostyles; (3) the presence of two kinds of chelæ; (4) the torsion of the smaller chelæ; (5) the peculiarities shown by the toxa. This assemblage of characters distinguishes the sponges of the present series from any hitherto described,[2] although it is only in their possession of contort chelæ of a special kind that they stand unique. It is particularly on account of this last-mentioned peculiarity, therefore, that their association under one specific name seems advisable. The occurrence of two kinds of chelæ is implied in Wilson's description[3] of *Clathria* (*Tenacia*) *clathrata*, (O. Schmidt), a species which is evidently very closely related to the present, since it moreover possesses acanthostyles and toxa of a similar kind. *Clathria jugosa*, Wilson, likewise, agrees in regard to the latter two kinds of spicules. Acanthostyles in which the spination is reduced over portion of their basal moiety have also been described for *R. ridleyi*, Lindgren, and *R. filifer*, R. and D., var. *spinifera*, Lindgren, although in *R. filifer* itself the acanthostyles are said to be entirely spined. The spicules of the type-species of *Rhaphidophlus*, *R. cratitius* (Esper), described by Ehlers as "sehr feine haarformige Kieselfaden welche ungleich lang und mannigfach gekrummt sind" are almost undoubtedly identical in nature with the toxa of *R. typicus*, and not sigmata as Ridley and Dendy have suggested.

Although the present species and *R. paucispinus* differ markedly in respect to their microscleres, yet, as regards their megascleres they show a very close agreement. In *R. typicus* we again find principal, auxiliary, and special dermal styli occurring in the same relationships as described for the other, whilst the acanthostyles, besides acting as echinating spicules, are also similarly scattered within the fibres and through the ground tissues. Further, the special dermal styli and, less frequently, the auxiliary spicules, likewise exhibit a minute spination and are similarly connected, the one kind with the other, by a perfect series of intermediate forms. But whereas

1 Hentschel (Fauna Südwest-Australiens, Bd. iii., Lief. 10, 1911) has recently described, under the name of *Clathria typica*, at least one other variety.

2 In speaking thus I assume that the descriptions of other species of *Rhaphidophlus* are correct in detail.

3 Wilson—Bull. U.S. Fish. Comm., xx. (1900), 1902, p. 397.

in *R. paucispinus* the auxiliary spicules approximate in length to the principal styli they are here very much longer. The absolute dimensions of both the principal and auxiliary styli differ to a notable extent in the different varieties, but it is a peculiar circumstance, that their variation in the matter of stoutness proceeds, throughout the series, with a certain degree of concomitance, the range of variability of the auxiliary spicules in this particular being relatively somewhat less than that of the principal spicules. For example, in the variety *favosus*, where the spicules attain their greatest size, the principal styli are 13 μ, the auxiliary 9 to 10 μ in diameter, a difference in stoutness of 3 to 4 μ separating them; whereas at the other end of the series in the variety *anchoratus* the principal styli are 6 μ, the auxiliary, 5 μ in diameter, with a difference of only 1 μ between them. The correlation of the two spicule-forms in this way would seem to imply a kind of genetic relationship between them—an implication which is further heightened by the fact that spicules similar to those within the fibres are also of frequent occurrence scattered amongst the auxiliary spicules in the ground substance, and by the fact, moreover, that in *R. paucispinus* the two spicule-forms agree in the matter of length. The argument that the spicules, here termed auxiliary, are derivatives of the principal spicules, cannot however, be sustained, although instances are not wanting of sponges in which the latter spicules show a tendency to resolve into two forms, *e.g.*, *Ophlitaspongia axinelloides*, Dendy. Their independence is proven in the present species not only by their difference in shape, but also by their different modificational tendencies. Abnormalities of the principal styli appear to be invariably strongylote, whilst those of the auxiliary (and special dermal) styli are oxeote. As in *R. paucispinus*, so also in this species, it is obvious that the dermal styli are simply specialised auxiliary spicules.

Echinonema typicum, Carter, has not yet been sufficiently described to enable one to recognise it with certainty, though Dendy has pointed out its close agreement with other sponges of the present series. Concerning those specimens referred to by Dendy, in which he failed to observe toxa, nothing can be said with certainty, but in view of the fact that toxa are abundant in all the varieties here described, it is highly probable that they represent another species. *Echinonema typicum* was recorded by Carter from South and South-West Australia, and in regard to external form was described as "shrubby, cauliculate, more or less compressed, bunch-like or clustral, consisting of a great number of digital more or less branched stalks spreading upwards from a contracted sessile base; branches cylindrical, round, or slightly compressed, more or less sub-divided, terminating in obtuse round ends."

This description was, it seems, based upon a large number of specimens. Two ramose varieties herein described come from the same region as the type, viz., one from St. Vincent's Gulf, South Australia, the other from Western Australia, but in both cases the specimens representing them are stipitate; moreover, their spicules do not exactly accord with those mentioned by Carter. Under the circumstances, they have been recorded as new. *Echinonema typicum*, Carter, is urgently in need of re-description. The South African sponge identified with it by Kirkpatrick is quite a different species from that to which the present sponges belong, and in certain features departs widely from typical species of the *Clathria-Rhaphidophlus* group. The varieties of *Echinonema anchoratum* described by Lendenfeld appear to be species assignable to *Wilsonella* (*q.v.*).

In order to avoid needless verbal repetition, it is advisable, before proceeding to the description of the several varieties, to render a more particular account of those features which characterise the species as a whole, and are of no diagnostic value so far as the varieties themselves are concerned. It is necessary at this point, to mention that all the specimens at my disposal are in a dry state of preservation, and with the exception of those of the var. *anchoratus*, retain only traces of the dermal layer. Nevertheless, it is doubtful, even if spirit-specimens had been available, whether any additional criteria for the discrimination of the varieties would have been forthcoming, except, perhaps, in three particulars, viz., the width of the mesh of the dermal reticulation, the deportment of the main fibres in their approach to the surface, and the maximum size of the special dermal styli.

The most striking skeletal features are:—(i.) the absence of spicules from almost all the connecting fibres, and their abundance in the main fibres, in which they form a comparatively stout, rather compact core; and (ii.) the profusion of scattered spicules in the tissues between the fibres. In a thin longitudinal section mounted in balsam and viewed with the naked eye, the loosely branched main fibres, on account of their contained spicules and greater stoutness, stand out conspicuously; whilst between them is to be seen only a dim haziness due to the individually imperceptible transverse fibres and scattered spicules. The appearance thus presented is very characteristic and enables one to readily recognise mounted sections of the species without microscopical examination. Where the main fibres lie close together, they are directly joined by short transverse fibres and the intervening meshes are rectangular, but where, owing to their divergence, the main fibres become widely separated, the connecting fibres may form a loose plexus or inter-reticulum between them, and the mesh is of irregular shape. The principal styli are usually slightly curved; the auxiliary styli are usually straight; and the special dermal styli are slightly subfusiform, usually curved, with the curvature restricted to, or most pronounced in, their basal half. The dermal styli are of very nearly the same size in all the varieties, but, owing to the fact that spicules occur of all sizes and shapes intermediate between them and the accessory styli, it is impossible—at any rate in the present specimens, owing to the damaged state of the dermal layer—to determine the exact upper limits of their size. One can therefore only quote the size below which they are usually to be found. The microscleres offer no assistance in the discrimination of varieties. The chelæ may differ slightly in different varieties, but since they are also slightly variable in one and the same, the difficulty of fixing upon their distinctive peculiarities is too great to render them of service. The degree of torsion of the smaller chelæ is usually not more than 90°. The toxa appear to be absolutely identical in form in the different varieties. They are hair-like spicules usually with a central flexure of fairly definite form, but otherwise extremely variable in shape. They would seem to be capable of indefinitely continued growth, and in some cases, at least, attain a length of more than 400 μ. As growth proceeds the arms become irregularly flexuous and twisted in various planes, and in many cases the spicules lose all semblance to toxa. The colour in the living condition of all the varieties previously described is some shade of red; that of the new varieties is unknown. The colour in dry specimens, is some shade of yellow or light brown.

RHAPHIDOPHLUS TYPICUS, *var.* PROXIMUS, *var. nov.*
(Plate xxviii., figs. 3, 4, and fig. 37.)

Of this variety the museum possesses two specimens. Both are stipitate, ramose sponges, with short and relatively stout irregular branches, which divide frequently and often anastomose, and are either restricted entirely to the one plane or come to lie in overlapping planes. The branches are either circular in cross section or compressed in the plane of branching, and measure from 6 to 10 mm. in their lesser diameter. The two specimens are very nearly equal in size; the slightly larger is 90 mm. in height. The texture is denser than in any other of the varieties here described. The main fibres are rarely less than 80 μ in stoutness and often attain to from 120 to 150 μ. Acanthostyles are fairly abundant; those which echinate the fibres are often very deeply implanted in the spongin. The principal and auxiliary styli are usually characterised by a barely appreciable sub-basal constriction. The auxiliary styli are occasionally, the special dermal styli frequently, provided with a minute basal spination. The acanthostyles are stout, with relatively few large spines, and without basal enlargement. The maximum dimensions of the spicules are as follows:—

Megascleres.—
- (i.) Principal styli, 200-230 (rarely 240) x 11-13 μ.
- (ii.) Acanthostyles, 60-75 x 7-8 μ.
- (iii.) Auxiliary styli, 260-280 x 7-9 μ.
- (iv.) Special dermal styli, usually less than 130 (or perhaps 120) x 4.5 μ.

Microscleres.—
- (i.) Larger chelæ, (apparently) rather rare, 15-19 μ long.
- (ii.) Smaller, usually contort, chelæ, 7-12 μ long.
- (iii.) Toxa: observed lengths, 90-260 μ.

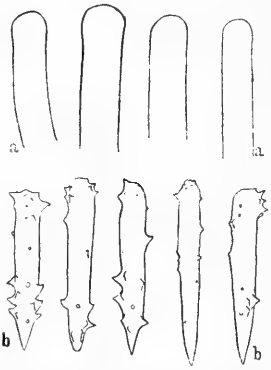

Fig. 37—*R. typicus* var. *proximus*. a Basal extremities of principal styli. b Acanthostyli.

This variety differs from the typical form in regard to the acanthostyles, which, for the latter, have been described as "clavate."

Loc.—Henley Beach, St. Vincent's Gulf, South Australia (Austr. Mus. Coll.).

RHAPHIDOPHLUS TYPICUS, *var.* GEMINUS, *var. nov.*

(Plate xxviii., fig. 4, and fig. 38.)

In regard to external form, there is not much to distinguish this variety from the preceding. The single specimen, which measures 220 mm. in height, is a luxuriantly branched stipitate sponge with rarely anastomosing branches, which divide dichotomously, and extend with more or less overlapping approximately in one plane. A peculiar feature of the sponge, and one which will probably prove to be characteristic is the unevenness of the surface of the branches, due to concave depressions and short obliquely longitudinal undulations. As a consequence the cross-section of a branch varies from point to point in outline and in area. The thickness of the branches perpendicularly to the plane of branching varies from 3 to 6 mm.; in the transverse direction they are of variable breadth, sometimes appearing to a slight extent irregularly moniliform, and almost invariably becoming much expanded prior to bifurcation. The encrusted appearance of portions of the surface of the figured specimen is due to a stoloniferous Alcyonarian.

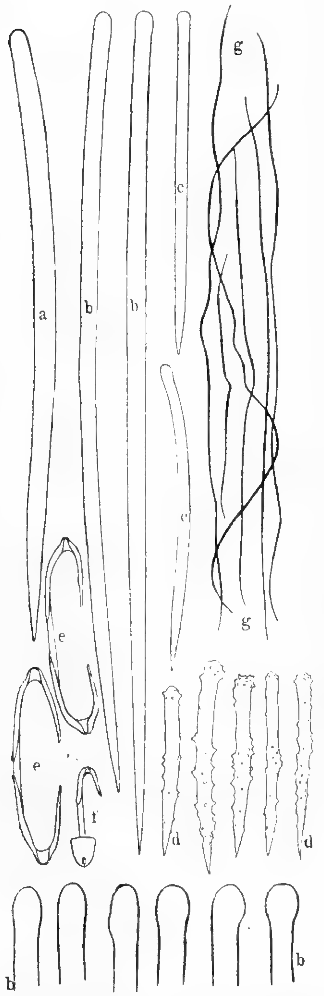

Fig. 38—*R. t.* var. *geminus*. a Principal stylus. b Auxiliary styli. b' Basal extremities of ditto. c Special dermal styli. d Acanthostyli. e Larger chelæ. f Smaller contort chela. g Toxa.

The fibres are of about equal stoutness to those of the preceding variety. Also, the echinating acanthostyles are of approximately equal abundance, and are often deeply imbedded in the spongin. In regard to their spicular characters, however, the two varieties are well distinguished. In the present variety, the megascleres are much slenderer; the auxiliary spicules are much longer, and approach more nearly to the principal styli in point of stoutness; both auxiliary and special dermal spicules are tylostylote or subtylostylote, and appear to be entirely devoid of the characteristic basal spination of other varieties; and finally, the acanthostyles are clavate or subclavate, and have smaller and more numerous spines. The greatest dimensions of the spicules are as follows:—

Megascleres.—

(i.) Principal styli, 220-240 x 7.5-8.2 μ.

(ii.) Acanthostyli, 70-80 (rarely 85) x 5-6 μ.

(iii.) Auxiliary tylostyli, 320-365 x 6.5-7 μ.

(iv.) Dermal tylostyli, usually less than 150 x 4.5 μ.

Microscleres.—

(i.) Larger chelæ, 15-19 μ long. Usually their "palms" as seen in profile, are parallel to the shaft or slightly deflected inwards.

(ii.) Contort chelæ, 7-10 μ.

(iii.) Toxa: observed lengths, 45-370 μ.

This variety agrees with the typical in possessing clavate acanthostyli, but no mention of tylostylote smooth spicules in the latter occurs in Carter's description.

Loc.—Western Australia (Austr. Mus. Coll.).

RHAPHIDOPHLUS TYPICUS, *var.* BREVISPINUS, *Lendenfeld.*

(Fig. 38*a.*)

Whilst the agreement between this variety and the preceding—var. *geminus*—is not so perfect that one can with certainty assert their identity, yet it has been found impossible to establish any wholly satisfactory points of difference. Seeing, however, that the present sponge has already been described as a distinct species and is accordingly already in possession of a name, and since, moreover, it is known only from a locality widely distant from that of the other, no objection can be raised if, for the present, and until more and better material from various localities is available it is retained as an independent variety. The material which I have at my disposal consists of one small imperfect specimen, together with a small piece derived from a British Museum example labelled *Thalassodendron brevispina.* The former is that which formed the basis of Whitelegge's short account. The original description speaks of the sponges of this variety as "large branched

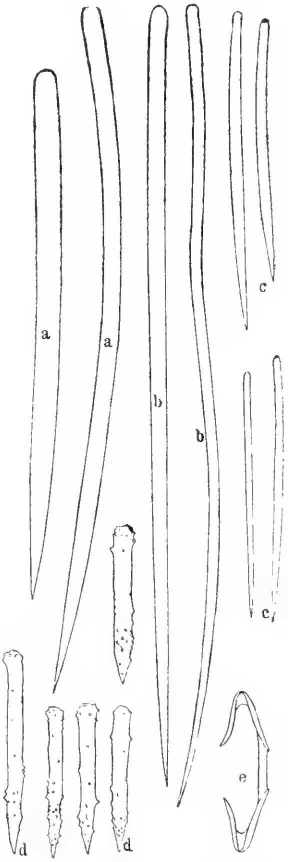

Fig. 38a—*R. t.* var. *brevispinus.* a Principal styli. b Auxiliary styli. c Special dermal styli. d Acanthostyli. e Larger chela.

sponges, with very irregular digitate processes." From the fragmentary material at my disposal all that I am able to say is that they are ramose, and, in some cases at least, stipitate; with branches which exhibit somewhat the same peculiarity as shown by the var. *geminus*, and which attain a thickness of as much as 15 mm. The main fibres are usually between 70 and 150 mm. in stoutness, but may attain to 200 μ. The only tangible differences between this variety and the preceding, are afforded by the spicules. The auxiliary spicules are only slightly enlarged basally, and are somewhat shorter; the special dermal spicules are usually simple styli without tylosis, and quite commonly exhibit a very minute basal spination; the chelæ appear not to display the peculiarity mentioned for the preceding. The maximum size of the spicules is as follows:—

Megascleres.—

(i.) Principal styli, 220-240 x 7-8.5 μ.

(ii.) Acanthostyli, 60-85 x 6-7 μ.

(iii.) Auxiliary subtylostyli, 280-310 x 6-7 μ.

(iv.) Special dermal styli, usually less than 130 x 4.5 μ.

Microscleres.—

(i.) Larger chelæ, 12-16 μ long.

(ii.) Contort chelæ, 7-11 μ long.

(iii.) Toxa: observed lengths, 60-230 μ.

Loc.—Port Jackson (*Lendenfeld*).

RHAPHIDOPHLUS TYPICUS, *var.* ANCHORATUS, *Carter.*

(Plate xxix., and fig. 39.)

This variety is represented by three specimens of thin flabelliform habit. One is regularly ovate in outline with even or crenulated margin, and with shallow grooves on both faces, radiating to the distal border. This specimen exhibits an exact correspondence in habit to Carter's *Echinonema pectiniformis*. The grooves are such as to suggest that neighbouring marginal processes, at first distinct, have subsequently become united by intergrowth, or that superficial demarcation occurs between processes prior to, or without, their actual separation. A second specimen (Plate xxix.) is abundantly provided with cylindrical marginal digitations, and similar processes in lesser number arise from its faces; it is slightly larger than the others, measuring 230 mm. in height. The third differs from either of the preceding in the absence of a stalk; otherwise it more closely resembles the first-mentioned, but is devoid of surface grooves; it is attached to a large water-worn stone by an extensive basal disc. The lamina in all three is from 6 to 8 mm. in thickness. The sponge is very loose-textured; near the surface, adjoining main fibres are often 0.5 to 0.8 mm. apart. The fibres are comparatively slender—probably never exceeding 100 μ in diameter. In the present specimens the dermal membrane is intact, and shows that the dermal skeleton is precisely similar in its formation to that of *R. paucispinus*. The polygonal meshes of the reticulation are very uniform in size and average 120 μ in width.

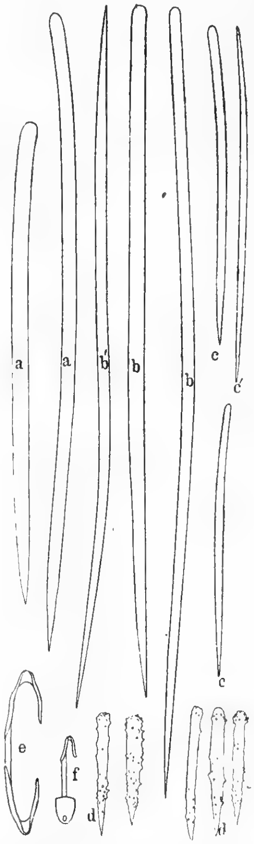

Fig. 39—*R. t.* var. *anchoratus*. a Principal styli. b Auxiliary styli. b' Oxeote modification of ditto. c Special dermal styli. c' Oxeote modification of ditto. d Acanthostyli. e Larger chela. f Smaller contort chela.

The following resumé of its spicular characters (omitting for the moment the actual dimensions of the spicules) shows this variety to be unquestionably distinct from any of the others. The smooth megascleres are slenderer than in all other cases, and are basally neither expanded nor contracted; the principal and auxiliary styli approximate in stoutness and in shape and no longer permit of their ready differentiation; oxeote modifications of the auxiliary and dermal styli are of common occurrence; and acanthostyles are comparatively rare and of small size. On account of the great difficulty in distinguishing between the principal and auxiliary styli, I am unable to give the maximum length of the former; the difficulty is further increased by a certain amount of variability in respect to the stoutness of spicules in different specimens. The dimensions are as follows:—

Megascleres.—

(i.) The stoutest styli are 5.5 μ in diameter in one specimen, 7 μ in a second, and of intermediate stoutness in the third.

(ii.) The longest styli are 290-320 μ in length; 5 μ in maximum diameter in the first specimen, 6.5 in the second.

(iii.) Acanthostyli, 45-56 x 5-6 μ.

(iv.) The special dermal styli are usually less than 130 x 4 μ.

Microscleres.—

(i.) Larger chelæ, 14-18 μ long.

(ii.) Contort chelæ, 8-11 μ.

(iii.) Toxa: observed lengths, 40-415 μ.

Dendy's identification of this variety with those quoted as synonyms is confirmed by an examination which I have made of pieces of their type-specimens.

Loc.—Port Phillip (*Carter; Dendy;* Austr. Mus. Coll.).

RHAPHIDOPHLUS TYPICUS, *var.* OBESUS, *nom. nov.*

(Plate xxviii., fig. 1, and fig. 40.)

The sponges described by Whitelegge under the name of *Clathria typica* agree among themselves and differ from those of the other varieties by virtue of their low stature, and their non-branching stoutly proportioned lamellar, or, at times, submassive habit. They comprise nine specimens, all of which are in a dry, macerated, and dermally denuded condition. The specimen of most symmetrical shape has the form of a thick sessile plate, sub-circular in outline, thinnest along the slightly and irregularly notched margin, and with both surfaces rendered very uneven by incipient outgrowths. This specimen, which is greater in height than any of the others, makes some approach in habit to the variety *anchoratus*, though it is well distinguished from any known example of the latter by virtue of its much more massive proportions. It measures 150 mm. in height and breadth, and varies in thickness from 10 to 15 mm. near the margin, to 25 mm. in the central portion. Although such simplicity of form is rarely attained, the dominant growth-tendency of the sponges of this variety is always in the direction of plate-formation. But almost invariably the primary plate undergoes proliferation in various ways, occasionally by bifurcation, sometimes by means of additional upgrowths from a slightly expanded base, but most usually by means of lamellar outgrowths from the side, which either remain attached to it along vertical lines, or become, distally separated from it as growth proceeds. The external appearance of the sponge is accordingly subject to considerable variation, but in no case is there positive evidence of a tendency to form linear branches or processes. The degree of variability of the spicules is such that doubt might reasonably be held as to whether all these forms really belong to a single variety; and consequently, in the absence of sufficient evidence upon which to base a positive conclusion, but being compelled, one might say, to take cognisance of them, I adopt the pre-

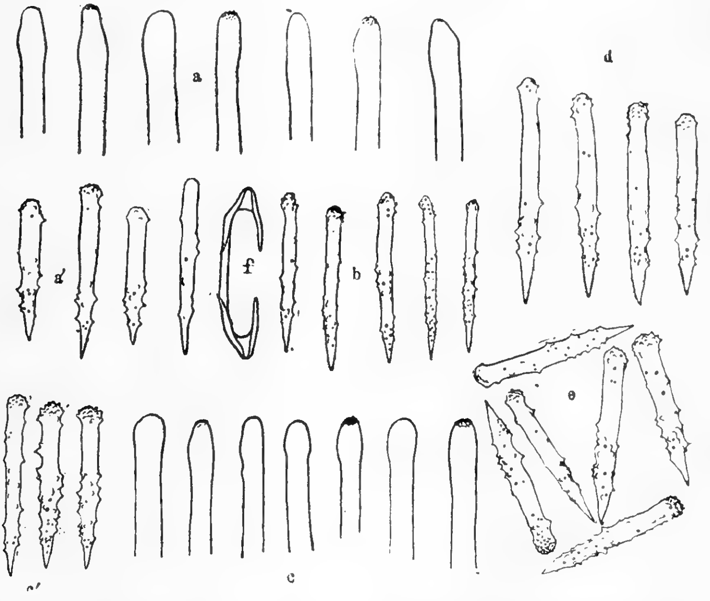

Fig. 40—*R. typicus* var. *obesus*. a Basal ends of auxiliary spicules of a typical specimen. a' Acanthostyles of ditto. b Acanthostyles from a co-typical specimen. c Basal ends of accessory spicules of a non-typical specimen. c' Acanthostyles of ditto. d, e Acanthostyles from two other non-typical specimens. f Larger chela from a typical specimen.

caution of specifying which of them are to be regarded as typical, viz., those which Whitelegge evidently had under consideration when he wrote,[1] "This species has a superficial resemblance to *Clathria australis*, Lendenfeld." One of the characteristics of the sponge to which Whitelegge thus refers and which is described in the present paper (p. 160) as *Crella incrustans* var. *arenacea*, is the presence on the surface of

1 Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 80.

longitudinal grooves; and since grooves of very similar appearance (though of quite different morphological character) occur in a number of specimens of the present series, one feels convinced that it is these latter which Whitelegge would have selected as typical. These grooves, which are of the same nature as those occurring in the var. *anchoratus*, provide an additional feature by which the present variety, in its strictest sense, may be identified; they are well pronounced in the specimen herein figured. Confining our attention to the specimens which agree in this character, the following diagnosis based on the spicules is obtained:—Principal and auxiliary spicules approximating in stoutness, the latter subtylote in the manner shown in the text-figure (fig. *a*), the former without any basal peculiarity. Acanthostyles moderately abundant, seub-clavate (figs. *a'*, *b*), with comparatively small spines; those which echinate the fibres are usually very deeply implanted, and increase considerably in abundance towards the outer end of the main fibres. The dimensions of the spicules are as follows:—

Megascleres.—

(i.) The principal styli attain, in all the specimen, a maximum length of 230 to 240 or (very rarely) 250 μ, but the diameter of the stoutest varies in different specimens from 7 to 9 μ.

(ii.) The greatest length of the acanthostyles lies, in all the specimens, between 70 and 76 μ, but their greatest diameter varies in different specimens from 5.5 to 8 μ. The stoutest were found in the specimen fixed upon as the type.

(iii.) The auxiliary subtylostyli, in the specimen selected as the actual type (Z. 936)[1] and in some others bearing an extremely close external resemblance to it, never exceed a length of 310 μ and very rarely reach beyond 290 μ; in the remaining specimens much higher values were obtained, viz., 340 to 360 μ.

The special dermal styli and the microscleres are, so far as one can judge, of practically similar dimensions, not only in all the specimens here in question, but also in those presently to be considered. The first-mentioned are probably with few exceptions less than 150 μ in length. The larger chelæ vary from 12 to 17 μ in length, whilst the largest contort chelæ appear never to exceed a length of 12 μ. The toxa are no different from those of other varieties.

1 In order to mark the actual specimens investigated so that, if need be, they may be used for future reference, I quote their Register Numbers.

The remaining specimens of the collection—the non-typical specimens—fall into three groups. The first group is represented by a single specimen (Z. 935) which in texture and appearance is quite unlike the typical specimens, and which, on that account, might have been expected to yield tangible points of difference in the spicule characters. Except, however, that the acanthostyles are more spiny (fig. *c'*), and that the tylosis of the auxiliary spicules is more strictly terminal (fig. *c*), there is nothing to distinguish its spicules from those of the type-specimen. These differences are not so great that they might be considered as due to individual variation.

The second group is represented by the specimen (Z. 939) which received particular mention at the outset, on account of its larger size and simpler form. Whilst in this also, the smooth spicules show a correspondence in size with those of the type-specimen, the tylosis of the accessory spicules is much reduced, and, for the majority of them, inappreciable; furthermore, the acanthostyles (fig. *d*) are markedly larger, often 9 μ in diameter, and, though usually between 75 and 85 μ long, may actually attain to 105 μ. This group may, for the present, be regarded as a sub-variety.

In the third group, of which a specimen (Z. 940) bearing a close resemblance in texture and even in general appearance to the large specimen of the second group, may be quoted as an example—the spicule dimensions again accord with those of the type, except that the acanthostyles (fig. *e*) are slightly stouter, 8 to 9.5 μ in diameter, and more abundantly spined, like those of the second group. But in one respect at least, the members of the present group differ from the others of the variety—the auxiliary spicules are simply stylote, *i.e.*, entirely devoid of any trace of basal enlargement; they ought, accordingly, to be regarded for the present as constituting a second sub-variety.

Loc.—Port Jackson and neighbourhood (Austr. Mus. Coll.).

RHAPHIDOPHLUS TYPICUS, *var.* STELLIFER, *var. nov.*

(Plate xxvii., and fig. 41.)

This variety is represented by a single specimen. The sponge is stipitate, flabelliform, with lobate margin, and with a couple of digitiform upgrowths flanking the lamina. It measures 300 mm. in height, 160 mm. in breadth, and about 6 mm. in diameter. Scattered at intervals over the surface are radiate groups of short obscure ridges forming "asterisks" 15 to 20 mm. in diameter. Towards the distal margin, the surface is vertically furrowed, conveying the idea of an incomplete separation into lobes and digitations. Where the dermal incrustation has been abraded the surface is extremely harsh to the touch, owing to the dense crowding of acanthostyles at

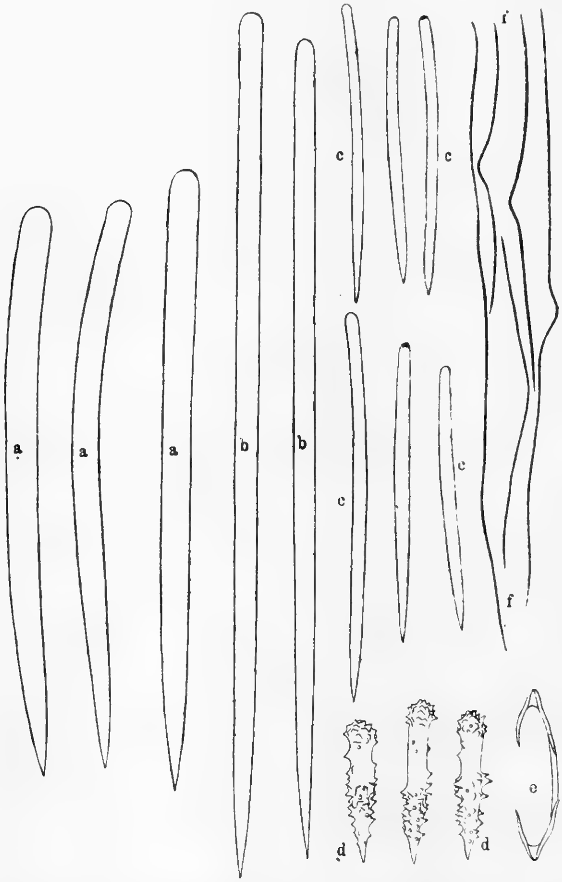

Fig. 41—*R. typicus* var. *stellifer.* a Principal styli. b Auxiliary styli. c Special dermal styli. d Acanthostyli. e Chela. f Toxa.

the ends of the fibres. The main fibres are 80 to 120 μ in diameter. This variety is characterised by the extreme abundance of its acanthostyles, which are closely arranged on all the fibres, and, at the superficial extremities of the latter, so densely packed that the fibre becomes practically a fused mass of acanthostyles. The acanthostyles are stout in proportion to their length and are furnished with large and numerous spines. The principal and auxiliary styli are devoid of any basal enlargement or reduction; the latter are occasionally, the dermal styli usually, basally spined. The greatest dimensions of the spicules are:—

Megascleres.—

(i.) Principal styli, 240 x 12 μ.

(ii.) Accessory styli, 300-330 x 9 μ.

(iii.) Dermal styli, usually less than 130 x 4.5 μ.

(iv.) Acanthostyles, 50-68 μ long, and up to 8.5 μ in diameter.

Microscleres.—

(i.) Larger chelæ, 15-20 μ long.

(ii.) Contort chelæ, attaining to 11 μ in length.

(iii.) Toxa: observed lengths, 55-260 μ.

Loc.—Bass Strait, East Coast of Flinders Island. ("Endeavour.")

RHAPHIDOPHLUS TYPICUS, *var.* FAVOSUS, *Whitelegge.*

(Text-fig. 42.)

This variety, which is so far known only from a few fragmentary specimens, is well distinguished from the others by (i.) its long slender cylindrical branches which do not exceed

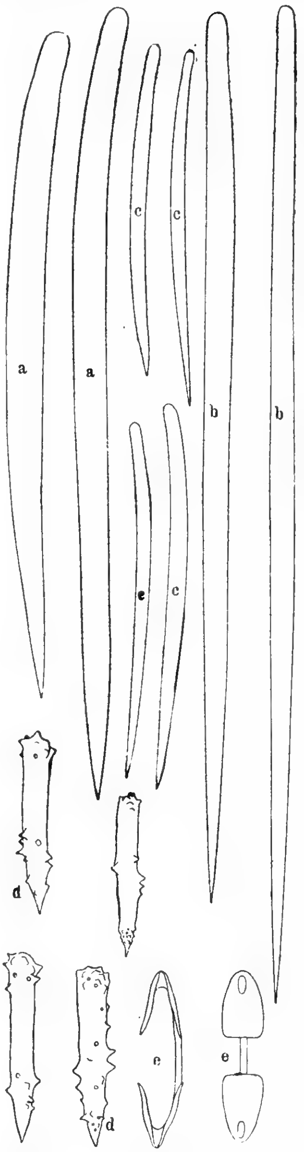

Fig. 42—*R. typicus* var. *favosus.* a Principal styli. b Auxiliary styli. c Special dermal styli. d Acanthostyli. e Chelæ.

7 mm. in diameter; (ii.) by the gauziness of its texture; (iii.) by the slenderness of its fibres, which do not exceed 80 μ in diameter; (iv.) by the large size of its megascleres; (v.) by the "manubriation" of the basal end of the principal styli; and (vi.) by the paucity of numbers of its stout acanthostyles which, when echinating, are only slightly embedded in spongin. The original description says, "surface minutely honeycombed; the cells are from 1-2 mm. in diameter, etc." This statement appears to me entirely misleading, since except for the gauzy looseness of the texture, there is nothing particularly of the kind thus suggested. The maximum dimensions of the spicules, some of which are not quite correctly stated in the previous account, are as follows:—

Megascleres.—

(i.) Principal styli, 300-305 x 13 μ. (Spicules "15 μ" in diameter have not been observed).

(ii.) Auxiliary styli, often basally spined, 350-370 x 7-10 μ.

(iii.) Special dermal styli, usually basally spined, and, as a rule, less than 135 x 5 μ.

(iv.) Acanthostyli, 70-80 x 10 μ.

Microscleres.—

(i.) Larger chelæ, 14-18 μ long, occasionally (though very rarely) contort.

(ii.) Smaller contort chelæ, 8-12 μ.

(iii.) Toxa: observed lengths, 70-255 μ.

Locs.—Off Port Jackson, 49-50 fms. ("Thetis"); Oyster Bay, Tasmania, 60 fms. ("Endeavour.")

Genus Thalassodendron, *Lendenfeld.*

1888. *Thalassodendron*, Lendenfeld. Descr. Cat. Sponges Austr. Mus., 1888, p. 222.

The genus *Thalassodendron* was proposed for "Desmacidonidæ with a supporting skeleton composed of horny fibres partly without spicules in the interior and echinated by scarce, pretty smooth styli." The definition attached no importance to the nature of the coring spicules and regarded as essential a feature which we now know to be lacking in systematic value. As a consequence it happens that the six species described—*T. digitata*, *T. typica*, *T. rubens*, varr. *dura* et *lamella*, *T. paucispina*, *T. brevispina* and *T. viminalis*—fall into several different genera. Thiele[1] has already pointed out that *T. digitata* possesses the requisite characters of his genus

1 Thiele—Kieselschwamme von Ternate, ii., 1903, p. 962.

Echinochalina, and at the same time has fixed upon *T. typica* as the type of *Thalassodendron*. Unfortunately no specimens identifiable with either of these species occur in the present collection of the Australian Museum, and since the description of *T. typica* is insufficient, we are left in doubt as to the precise connotation of the name *Thalassodendron*. Whitelegge[1] has indeed published a short account of a sponge regarded by him as the type-specimen of *T. typica*, but it is so little in agreement with the original description that hesitation might well have been felt in accepting its implication as a final verdict. An examination of this specimen has shown—what is indeed immediately obvious even from external comparison—that it is an example of *Echinodictyum* (*Kalykenteron*) *elegans*, Lendenfeld,[2] a sponge with which Whitelegge was apparently not well acquainted. One can therefore only conclude that the specimen investigated by Whitelegge was mislabelled, as was also the specimen which he at first mistook[3] for *Thalassodendron viminalis*. So far as one can judge from Lendenfeld's description of *T. typica*, *Thalassodendron* may for the present be looked upon as a synonym of *Wilsonella* (*q.v.*).

T. viminalis is an *Ophlitaspongia*.[4] With regard to the remaining species I find, in disagreement with Whitelegge who regarded them as individual variations of a single species, that *T. brevispina* is a variety of *Rhaphidophlus typicus*, Carter; that *T. rubens* var. *lamella* and *T. paucispina* are identical (*Rhaphidophlus paucispinus*); and that *T. rubens* var. *dura* is a *Clathria* (*C. rubens*). Owing to the unsatisfactory nature of the descriptions of these species, a further and more extended account of them has been included in the present paper.

Genus Plectispa, *Lendenfeld.*

1888. *Plectispa*, Lendenfeld, Descr. Cat. Sponges Austr. Mus., 1888, p. 225.

The description which Whitelegge has given of Lendenfeld's three species of *Plectispa*, viz., *P. elegans*, *P. arborea*, and *P. macropora* are so little in agreement with those of Lendenfeld as to render inevitable the conclusion that the specimens invesigated were mislabelled. How completely at variance are the two accounts of these species, will be evident from a comparison of the following summaries of them.

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1 Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 86

2 Lendenfeld—Cat. Sponges Austr. Mus., 1888, p. 216. This species, which is probably identical with *E. bilamellatum*, Lamk., is described herein, p. 171.

3 Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 87; and 5, 1902, p. 214.

4 *O. subhispida*, Carter, var. *viminalis*, Lendf. (*q.v.*)

(*a*) According to Lendenfeld:—

P. elegans. A reticulate mass of regularly cylindrical branches on an average 5 mm. thick; spicules, smooth styli 160 x 6 μ and 70 x 5 μ, the latter echinating. (Loc., Port Jackson.)

P. arborea. Dendritically ramifying, with clearly-defined stem. The styli measure 80 x 4 μ and 50 x 4 μ respectively. (Loc., Port Jackson.)

P. macropora. Small and tender, reticulate, honeycomb-like, incrusting or massive; smooth styli 200 x 4 μ; echinating spined styli 70 x 6 μ. (Loc., Torres Strait.)

(*b*) According to Whitelegge:—

P. elegans. With erect, rarely coalescent branches, generally with distinct peduncle; spicules, styli 100 x 6 μ and 80 x 5 μ respectively. (Loc., Port Jackson and neighbourhood.)

P. arborea. A *Clathria;* reticulately branched in one plane; spicules, styli 180 x 8 μ, subtylostyli 200 x 2 μ, acanthostyles 85 x 6 μ. (Loc., Port Jackson and neighbourhood.)

P. macropora. Forming low densely-branched clumps, with abundant anastomoses of branches. Spicules, smooth styli 100 x 4 μ and 75 x 4 μ respectively. (Loc., neighbourhood of Port Jackson, common.)

A comparison of the descriptions of *P. arborea*, Lendf., and *P. elegans*, Whitelegge, points almost incontestably to the conclusion that they are one and the same. *Clathria (Plectispa) arborea*, Whitelegge, is therefore quite a different sponge from Lendenfeld's species and requires a new specific name, for which I propose *multipes*. *Echinoclathria (Plectispa) macropora*, Whitelegge, is, as mentioned, a common local sponge, and must have been familiar to Lendenfeld. It evidently affords no grounds for its identification with *P. macropora*, Lendf., which, moreover, is recorded from a widely distant locality. Neither does it show sufficient agreement with *P. elegans* to warrant its identification to that species. There is no other course open but to regard it as a new species; it is described in the present paper under the name of *Echinoclathria ramosa*. *P. arborea*, Lendf., is likewise a species of *Echinoclathria*, and there can be little doubt that *P. elegans*, Lendf., belongs to the same genus. The genus *Plectispa* is accordingly left with a single species, *P. macropora*, which may therefore be considered as the type.

According to its description this species possesses the external structural characteristic of *Echinoclathria* but differs from the latter in respect to its echinating spicules, which are spined, and in respect to its coring spicules, which appear to be *auxiliary*. It accordingly possesses the spiculation of *Wilsonella*, of which genus *Plectispa* may therefore be regarded as a synonym. Lendenfeld himself,[1] shortly after his establishment of this genus, recognised the necessity of restricting the name to forms with acanthostyles and thereby tacitly indicated the type-species.

Genus Clathria, *O. Schmidt* (*emend.*).

The main skeleton is a reticulation of well-developed horny fibres which are cored with smooth or, less frequently, partly spined principal styli, and echinated by spined or (rarely) smooth accessory styli. Auxiliary monactinal or (rarely) diactinal megascleres of a single kind, smooth or terminally spined and typically slenderer than the principal styli, occur in the ground and dermal tissues and occasionally also, though rarely in any considerable number, within the fibres themselves; they are usually most abundant in the superficial tissues where they may become so closely aggregated as to constitute a definite dermal skeleton. There are no special dermal styli. Microscleres, when present, are typically isochelæ palmatæ or toxa.

The above emended diagnosis is intended to exclude not only such species as are referable to the genus *Rhaphidophlus*, but also a number of others which might conveniently be united under Carter's genus *Wilsonella* (*vide infra*). At the same time an attempt has also been made to render the definition more precise in regard to the characters of the spicules. It is, for instance, no longer correct to say that the coring styli are smooth; in many species they are basally tipped with spines, whilst in *Clathria clathrata*, Whitelegge,[2] they are provided with moderately large spines over a considerable portion of the basal region and usually, in addition, with extremely minute spines on the remaining portion of their length. Neither is it any longer permissible in the face of such species as *C. transiens*, sp. nov. to speak of the echinating spicules as if they were invariably spined. If the genus *Wilsonella* be accepted in the sense in which I define it, a number of species which up till the present have been included in *Clathria* will need to be removed from the genus,

1 Lendenfeld—Monograph of the Horny Sponges, 1889, p. 99.

2 *Vide infra*, p. 209.

and those which remain will be characterised by the possession of auxiliary megascleres which are almost invariably stylote. It may be questionable whether the retention within the genus of species with diactinal auxiliaries is strictly proper, but so far as I know, there is no urgent reason for their removal, provided that they satisfy the definition in other respects.[1] Allowance must be made also for the fact that many so-called diactinal spicules are only apparently diactinal.

The distribution of the auxiliary megascleres is subject to a certain amount of variation. In general, they are scattered without apparent order through the soft tissues, increase in abundance in the more superficial layers, and are sometimes so crowded at the surface—though possibly never with any distinct regularity of arrangement—that there results in consequence a definite dermal skeleton. It must be allowed, however, that in particular cases, the auxiliary megascleres may play an appreciable part in the formation of the spicular axis of the fibres, or may actually, as in *C. inanchorata*, R. and D.,[2] become almost or even quite entirely restricted to an intra-fibral situation. An instance of such invasion of the fibres by auxiliary megascleres is probably afforded by the genus *Echinochalina*, some species of which, *e.g.*, *E. glabra*,

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1 Hentschel (Fauna Südwest-Australiens, Bd. iii., 1911) has recently without sufficient justification, placed such a species in the genus *Spanioplon*.

2 I have examined the specimen recorded by Whitelegge under the name of *Clathria inanchorata*, R. and D. (Austr. Mus. Mem., iv., 10, 1907, p. 495), and although the dimensions of the spicules do not agree with the "Challenger" description I cannot do otherwise than agree with Whitelegge in regarding them as genuine examples of the species. Not only do they agree perfectly with the "Challenger" specimen in external appearance, but also in regard to the shape of the acanthostyles and the (smaller) toxa. I believe, therefore, that we have in the case of this species an instance of one of the very few inaccuracies to be found in the descriptions of the "Challenger" Monaxonida. The spicules within the fibres (the main fibres only) are of two kinds, viz.: (i.) Stouter, usually curved styli; the stoutest are 24-25 μ in diameter, and their maximum length varies in the different specimens from 480 to 560 μ; and (ii.) slenderer straight subtylostyli (or tylostyli) probably never of greater size than 450 x 13 μ. These spicules I regard as representing respectively the principal and auxiliary stylotes of other species. Both kinds are basally tipped with a very minute spination which is more conspicuous in the auxiliary spicules. Neither principal nor auxiliary spicules appear ever to occur scattered between the fibres, though the former—but rarely or never the latter—occur abundantly as exteriorly directed echinating spicules, along with acanthostyles, on the superficial transverse fibres. The acanthostyles are extremely variable in size. The smallest may be less than 60 μ long; but it is impossible to attach any precise upper limit to their length. The greater number by far are less than 200 μ long, and of the remainder the majority are less than 240 μ; but as the length increases the spicule becomes curved and more and more free from spines and gradually passes into the form of the principal styli. Thus the echinating spicules show a complete transition from accessory spined to principal smooth spicules. The toxa are of two kinds: one, similar in form to that figured in the "Challenger" Report, ranges in length from less than 20 μ to about 120 μ and reaches a diameter of 4 μ; the other is very long and slender, with straight arms inclined at a small angle, and reaches a length, in some cases, of 560 μ, with a diameter of about 2 μ. Chelæ have not been observed. (*Vide* remarks on *C. caelata*.)

convey irresistibly the impression that they have been evolved from forms related to existing species of *Echinoclathria* through the replacement in the fibres of principal by auxiliary megascleres.

The principal and accessory styli in *Clathria* likewise exhibit differences in regard to their mode of distribution. The principal styli, whilst invariably functioning as coring spicules in the main fibres and usually also in the transverse, occur also in many species as interstitial spicules, and in some as supplementary echinating spicules along with the accessory spicules. In the latter case it not infrequently happens that the principal and accessory styli are connected by an unbroken series of intermediate spicule-forms. The accessory styli, which with rare exceptions are spined, are not as a rule exclusively restricted to the office of echinating the fibres, but also occur in limited numbers intrafibrally[1] and interstitially. The particular mode of occurrence of the several spicules is, in all probability, characteristic for any given species and should accordingly be taken account of in any description which aims at completeness. The microscleres of *Clathria* are typically isochelæ palmatæ and toxa, but one or both forms may be absent. It is a question wheher species in which the chelæ are other than of the palmate type should be allowed in the genus. Whilst there can be little doubt that palmate chelæ and arcuate chelæ represent two distinct lines of development, and are likely to serve as valuable aids for the separation of genera, the fact that it is not possible in all cases to say whether a particular chela is more strictly palmate or more strictly arcuate, renders it inadvisable at present to depend upon them solely for the generic separation of species; although eventually no doubt, other characters not hitherto employed in classification will be found to provide a means of deciding in doubtful cases. In connection with the genus *Clathria* (minus *Wilsonella*), however, it is quite possible that no species with intermediate or ambiguous chelæ occur, and accordingly a new genus might well be established for those species which possess chelæ arcuatæ; meanwhile, such species must, I suppose, be allowed in the genus. Kirkpatrick[2] has described two species from South Africa, one of which, *C. mollis* is scarcely capable of being retained in the genus, since not only does it possess auxiliary tornota and isochelæ arcuatæ, but is also characterised by the absence of

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1 The occurrence of acanthostyles in considerable numbers in the fibres is extremely well exemplified in *Clathria Hartmeyeri*, Hentschel (1911).

2 Kirkpatrick—Marine Investigations in South Africa, ii., pp. 248, 249.

principal styli. The other, wrongly identified as *Clathria typica*, Carter, is anomalous, if its description be correct, in possessing sigmata in addition to palmate isochelæ and toxa.

In none of the species of *Clathria* which I have examined have I observed unmistakable oscula.

The following species, of which I have examined the type-specimens, call for remark:—

Clathria (?) *chartacea*, Whitelegge,[1] is an unusual type of sponge for which perhaps a new genus must be established. The skeleton consists of a renieroid reticulation of acanthostyles traversed by multispicular primary lines of spicules in the mid-plane of the sponge-lamina, and by paucispicular secondary lines running off from these to the surface. The spicules forming these lines are of two kinds, viz., acanthostyles similar to those of the intervening meshwork, and smooth styli of a larger size; those of the primary lines are chiefly of the latter kind, whilst those of the secondary lines are chiefly of the former. The terminal spicules of the secondary lines are, however, exclusively of the smooth kind, and project considerably beyond the surface, rendering it hispid. There are no echinating spicules. The meshes of the renieroid reticulation are triangular or quadrangular with sides of a spicule's length usually formed by a single spicule. All the foregoing spicules are distinctly ensheathed in spongin. Slender (auxiliary) styli are sparsely scattered through the tissues, becoming more abundant towards the surface. Microscleres are absent. The species is possibly related to the genus *Suberotelites*, from which it appears to differ mainly in possessing stylote instead of strongyliform accessory spicules.

Clathria pellicula, Whitelegge,[2] which from its description would appear to be a *Microciona*, is really a *Hymeraphia*. The description states that the skeleton is columnar "consisting of whisp-like multispicular fibres, with little or no spongin," which "are made up of irregularly disposed smooth styli or subtylostyli and accompanied by spined styli." It is further stated that "there are but few spicules between the fibres." I have prepared a number of sections from different parts of the type-specimen, but in none can I find columns of principal styli. Of quite frequent occurrence, however, are short strands of auxiliary syli running in various

1 Whitelegge—Austr. Mus. Mem., iv., 10, 1907, p. 497.

2 Whitelegge—The Sponges of Funafuti (Austr. Mus. Mem., iii., 5, 1897, p. 327).

directions—vertically, obliquely and horizontally—through the sponge-body, and it is these, I presume, which Whitelegge refers to as "columns." The principal spicules (tylostyli) which are relatively very few in number stand singly perpendicularly to the base of the sponge with their heads almost in contact with the substratum; they occur in no other situation. The accessory styli (acanthostyli), which also are by no means abundant, are, with the exception of a few scattered individuals, arranged similarly to the principal spicules. The auxiliary megascleres (tylostyli) are relatively very numerous and are divisible into two sizes, viz., those of lesser length forming the dermal tufts, and those of greater length scattered within the tissues and forming the strands already referred to. The species accordingly appears to have a closer relationship to *Rhaphidophlus* than to *Clathria*. The principal tylostyli vary in length from 180 to 440 μ, but only occasionally exceed 360 μ; the stoutest are 8 to 9 μ in diameter. They are characterised by a basal region of spination which may be limited to the surface of the tylosis merely, or may extend—particularly in the case of the shorter spicules—over the greater portion of the length of the spicule. The largest accessory acanthostyles are 120 μ long and rarely exceed 6 μ in diameter The auxiliary tylostyli may attain a size of 480 x 4.5 μ; the dermal tylostyli are apparently never much in excess of 200 μ in length. The slender isochelæ palmate vary in length from 16 to 20 μ; the toxa are not more than 1.5 μ in diameter and range in length from about 200 to 380 μ.

Microciona clathrata, Whitelegge,[1] though peculiar in some respects, is distinctly a *Clathria*. The statement in the original description that "the skeleton consists of stout horny fibres arranged in plumose columns" is a remarkable error which can only be explained by supposing that the description was based upon a section through the terminal portion of a branch in which transverse fibres were not conspicuously developed. The skeleton is an irregular reticulation of stout and densely horny fibres, which, except in newly-formed branches are so strongly developed that the interstices of the meshwork may become reduced almost to the point of obliteration. The sponge is, consequently, exceptionally hard and tough. In the interior of the sponge the fibres are plentifully echinated with large accessory acanthostyles; the superficial fibres are densely echinated both with accessory acanthosyles and principal styli which together hispidate the surface. Amongst

1 Whitelegge—Austr. Mus. Mem., iv., 10, 1907, p. 493. The name *Clathria clathrata* is at present also used for the sponge originally described by O. Schmidt as *Tenacia clathrata*, but as this may be placed in the genus *Rhaphidophlus*, I refrain from changing the name of Whitelegge's species.

these superficial echinating spicules, a transition of forms intermediate between the accessory and principal styli are met with. In this respect the species resembles *C. inanchorata*, R. and D. The arrangement of the principal styli in the inner skeleton is to a great extent independent of that of the fibres. The principal styli are curved spicules of very variable length ranging from less than 200 to upwards of 450 μ long; it is rarely that they exceed a size of 400 x 25 μ; they are typically provided at the base with larger spines for about 20 to 40 μ of their length and beyond that with very minute sparsely scattered spines. The accessory acanthostyles, which also are curved, vary in length from about 100 to 200 μ and the stoutest are about 15 μ in diameter; it is impossible, however, to affix any precise upper limit to their length since they gradually pass into the form of the principal styli; their basal end is closely covered with clavate spines whilst the shaft is provided with sharp-pointed recurved spines. The auxiliary spicules are straight subtylostyli which are basally tipped with a few minute spines. They are plentifully scattered through the tissues and are particularly abundant in the dermal layer where they lie for the most part horizontally; they are 150 to 240 μ in length and may reach a diameter of 8 μ. Palmate chelæ, 7 to 10 μ long. Slender tricurvate toxa, 80-150 μ long.

Somewhat related to *Clathria clathrata*, though of quite different habit, is the sponge which Whitelegge[1] regarded as *Echinonema anchoratum*, var. *lamellosa*, Lendenfeld, and for which I now propose the name *Clathria spicata*. Whitelegge's description is misleading in several respects. The species is known from a single dry specimen of flabelliform shape. The surface which is bare of any traces of a dermal investment is ornamented by minute discontinuous longitudinal ridgings with frequent transverse connections; and is dotted with numerous small rounded holes which probably represent the openings leading into the incurrent canals. The skeleton reticulation is very irregular and the connecting fibres are destitute of a spicular core. The coring spicules, which include both accessory and auxiliary spicules in addition to the principal, are for the most part disposed plumosely in a rather disorderly manner and often project beyond the spongin-sheath. Fascicles of spicules also occur independently of the fibres. The accessory acanthostyles echinating the fibres of the interior may reach a length of 120 μ or more, but

1 Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 82.

are usually less than 100 μ. The superficial fibres are echinated by spicules showing all gradations of form between the shortest accessory and the longest principal spicules. In this species therefore, as in the preceding, there is no line of separation between these two classes of spicules, so that it is impossible to assign any upper limit to the length of the former or lower limit to the length of the latter. Both kinds are typically curved, with the greatest curvature in the basal moiety. The principal spicules may attain a size of 410 x 12 μ; they are conical tylostyli in which the surface of the tylosis is rugged or obscurely spined; in the larger individuals the shaft is, with rare exceptions, free from inequalities. The auxiliary spicules are subtylostyli usually basally tipped with a minute spination; they vary in length from 130 (or less) to about 340 μ, and the stoutest are 4.5 μ in diameter. The isochelæ are fairly abundant and reach a length of 13 μ. Very slender toxa, with straight arms and only a slight median flexure, are rare; they reach a maximum length of at least 260 μ. The slender hair-like spicules mentioned by Whitelegge are incipient auxiliary spicules. The locality of the specimen, according to its label, is Western Australia. The *Echinonema anchoratum* var. *lamellosa*, Lendenfeld, which from its description is possibly a species of *Wilsonella*, was recorded from Port Chalmers, New Zealand.

Whitelegge has, accordingly, described in all nine new species of *Clathria*, viz., *C. tenuifibra*, *C. multipes*,[1] nom. nov., *C. striata*, *C. calopora*, *C. arcuophora*, *C. clathrata* (as *Microciona*), *C. diechinata*, nom. nov., *C. tenebrata* (as *Rhaphidophlus*), and *C. bispinosa*[2] (as *Rhaphidophlus*).

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1 In the remarks on the genus *Plectispa*, Lendf., it was pointed out that the *Clathria (Plectispa) arborea*, Whitelegge, is distinct from Lendenfeld's species of that name. Since the specific named *arborea* is based on a mistaken identification and is, moreover, quite inappropriate, its retention is undesirable, and I therefore propose for this sponge the name *multipes* in reference to its habit of forming a number of attachment-stalks. A sponge in the British Museum bearing the manuscript name "*Thalassodendron reticulata*, Lendenfeld" (a small portion of which is included in Prof. Dendy's loan to the Australian Museum), is, as Whitelegge has already stated, identical with this species. A fuller description than that which has been given is desirable, but the material in hand is not sufficiently well-preserved for the purpose. I may merely mention that Whitelegge has overlooked the presence of very slender palmate isochelæ 6-7 μ long; that the principal styli are straight or slightly curved subfusiform spicules which may attain a size of 192 x 12 μ; and that the cylindrical auxiliary subtylostyli vary in length from 170 μ or less to 250 μ and may attain a diameter of 4.5 μ.

2 A doubt may be said to exist concerning this species, since the type-specimen and slides have apparently been lost. Judging from its description, the species is remarkable in that the accessory acanthostyles have become differentiated into two groups. The probability is, however, that the slender forms mentioned are only early developmental stages. If this is so, the species is almost certainly another of the series to which belong *C. inanchorata*, *C. caelata*, *C. clathrata*, and *C. spicata*.

CLATHRIA CÆLATA, *sp. nov.*

(Plate xxxiii., fig. 4; and fig. 43.)

Sponge erect, stipitate; with a tendency, more or less well expressed towards a restriction of growth to one plane, but otherwise variable in habit. Surface characteristically ornamented by close-set processes with deep intervening sulci. Dermal membrane exceeding thin, or apparently absent. Main skeleton a close reticulation of well-developed horny fibres; the main fibres with longitudinally and divergingly disposed skeletal spicules, the connecting fibres vacant. The echinating spicules range in form, gradationally, from small straight (accessory) acanthostyles to large curved smooth principal styli; those of intermediate and larger size are mostly to be found on the outer aspect of the superficial fibres. Auxiliary spicules in moderate number occur both within the fibres and scattered between. Megascleres:—(i.) Smooth principal styli, 140-320 x 10 μ; (ii.) entirely spined acanthostyli, about 110 x 5.5 μ; (iii.) auxiliary subtylostyli, 375 x 5 μ. Microscleres:—Toxa of two sizes; the shorter, abundant, rarely exceeding 90 μ; the longer, very rare, attaining to at least 275 μ in length.

This species—represented by six specimens—is an erect stipitate sponge, somewhat variable in habit, but of very characteristic external aspect owing to the extreme inequality of its surface. The inequality, which is such that the surface might be described as deeply sulcated or sculptured, is due to the close apposition over its entire extent (including the stalk) of short erect processes of variable shape but fairly uniform height. The appearance of the sponge, viewed at a distance, is suggestive of that of certain corals of the genus *Madrepora*.

In its simplest form the sponge is probably ramose, with short repeatedly divided branches disposed in one plane and more or less inter-united by means of their laterally situated processes. An approach to a formation of this kind is shown in some parts of several of the present specimens; but, in general they are irregularly flabellate and more or less proliferous. The largest specimen is 125 mm. in height (exclusive of the stalk), 100 mm. broad, and 7 to 15 mm. thick.

The texture is fibrous; the consistency tough, compressible, resilient. The colour (in alcohol) varies from honey-yellow to deep brown; the darker colour is due to the presence of pigmented cells. In some specimens an exceedingly thin dermal membrane is visible on the less exposed parts.

The main skeleton is an irregular small-meshed reticulation of well-developed pale horny fibres, the stoutest of which may attain a diameter of 100 μ. The main fibres are provided with a somewhat meagre, discrete, semi-plumose spicular core which comprises both *principal* (stylote) and *auxiliary* (subtylostylote) megascleres; the connecting fibres are destitute of contained spicules, but, like the main fibres, are rather scantily echinated by slender *accessory* acanthostyles. The principal styli of the main fibres are, in general, set more or less obliquely to the direction of the fibre, sometimes at such an angle that they become, in effect, echinating spicules. On the outer aspect of the superficial transverse fibres, echinating principal styli occur in considerable number; in this situation they stand quite perpendicularly to the fibre. Between the principal and accessory spicules, however, it is impossible to draw a hard and fast line of separation, since—although the transition between them is fairly abrupt—the one form graduates into the other. The interstitial spicules are auxiliary subtylostyli and toxa, together with occasional principal and accessory styli; the toxa are fairly plentiful in the deeper parts, but become particularly abundant in the immediate neighbourhood of the surface. The dermal membrane contains a few horizontally-disposed auxiliary spicules and numerous scattered toxa. Chelæ are absent.

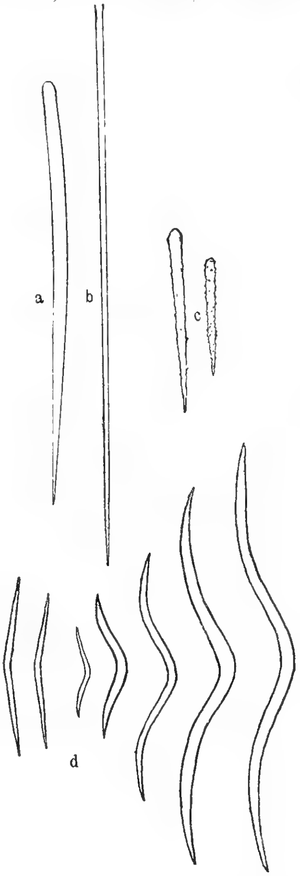

Fig. 43—*Clathria caelata.* a Principal style. b Auxiliary style. c Acanthostyles. d Toxa.

Megascleres.—

(i.) The principal styli are sub-conical and slightly curved spicules, occasionally exhibiting a faint sub-basal constriction, and attaining a maximum size of 320 x 10 μ. Although the smallest of them are indistinguishable from the largest accessory styli; the lower limit of their length may be fixed at about 120 μ, since neither do individuals of lesser length than this exhibit the curvature of form typical of the principal spicules; nor individuals of greater length, the minute spination typical of the accessory. Their only inequality of surface is an obscure ruggedness which, in the case of the shorter spicules, may affect the entire surface, but which becomes less and less distinct and more restricted to the basal region as the length of the spicule increases, and finally disappears; spicules of greater length than 180 μ are, with rare exceptions, quite smooth.

(ii.) The accessory acanthostyles are straight sub-conical spicules, frequently with a slight basal enlargement (subtylote) and with a minutely spined or, less frequently, merely rugged surface. Their length varies from about 40 to 120 μ, but seldom exceeds 95 μ; they are rarely more than 5 μ in diameter.

(iii.) The auxiliary spicules are straight subtylostyli (or tylostyli) varying in length from 190 to 390 μ, and in diameter up to 5 μ. They sometimes show an obscure spination of the extreme basal end.

Microscleres: Toxa of two kinds.—

(i.) Shorter, typically tricurvate forms, with well-arched median flexure; rarely, angulately bent and with straight arms. They range from less than 20 μ to upwards of 100 μ (rarely more than 90 μ) in length, and up to 3 μ in diameter.

(ii.) Extremely rare, long slender forms,[1] with fairly straight arms, ranging in length from 150 μ or less to at least 275 μ, and in diameter up to 1.5 μ. The shortest make some approach in form to the first-mentioned and indicate that the two forms are modifications of a single original form.

Locs.—Tasmania (Austr. Mus. Coll.); forty miles west from Kingston, South Australia, 30 fms.; fifteen miles east-north-east from Cape Barren, Tasmania, 53 fms. ("Endeavour").

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1 Owing to their rarity these toxa were at first overlooked, and have consequently been omitted from the text-figure. Their presence would have remained unsuspected had not the existence of similar spicules in the closely allied *C. inanchorta* prompted me to undertake a special search for them.

In regard to skeletal structure and the incomplete differentiation of principal and accessory spicules, this species agrees with *C. inanchorata* (p. 206), *C. clathrata* (p. 209), *C. spicata* (p. 210), and *C. costifera*, sp. nov., and is perhaps sufficiently closely related to the first-mentioned to be regarded as a variety of it. It is strange that, although four of these species have been previously described, their peculiarity in spiculation has hitherto been overlooked. The five species constitute a well-marked group characterised, as regards skeletal features, not merely by (i.) the imperfect differentiation of the principal and accessory megascleres, and (ii.) the participation of the former in the echination of the fibres—for these features are found also in otherwise quite different species—but also (iii.) by the peculiar mode of disposition (obliquity relatively to the axis of the fibre) of the principal spicules of the main fibres, more particularly towards their outer extremities, and the consequent "semi-plumose" or "spicate" character of these fibres; (iv.) by the absence of axial spicules from the connecting fibres; and (v.) by the relatively dense echination of the superficial transverse fibres, *chiefly or entirely on their outer aspect.* Another character which appears to be of common occurrence, is the inclusion of auxiliary megascleres amongst the intrafibral spicules; this, however, is not shown by *C. clathrata.* To the same group, in all probability, *Clathria coppingeri*, Ridley,[1] *Rhaphidophlus bispinosus*, Whitelegge,[2] and *Ophlitaspongia membranacea*, Thiele,[3] also belong. This group of species might be called, after one of its species, the *spicata*-group—a name which also calls to mind one of its characteristic features

CLATHRIA COSTIFERA, *sp. nov.*

(Plate xxxi., fig. 2; and fig. 44.)

Sponge flabelliform, moderately thin, stipitate, with radially corrugated surface. The dermal membrane, owing to the abundance of its contained (auxiliary) spicules, forms a whitish encrustation in the dry state. The main skeleton is a close reticulation of well-developed horny fibres. The fibral spicules (principal styli)—which are absent from the connecting fibres—are arranged in a disorderly fashion and, particularly in the more superficial parts of the sponge, often project far beyond, or are situated upon, the fibre, in the manner of echinating spicules. A gradational series of spicules of intermediate

1 Ridley—Report Zool. Coll. of the "Alert," 1884, p. 445, pl. xl., figs. F, F′; Pl. xlii., figs. i, i′.

2 Whitelegge—Austr. Mus. Mem., iv., 10, 1907, p. 503.

3 Thiele—Fauna Chilensis; Zool. Jahrb. Suppl. vi., Bd. iii., Heft 3, 1905, p. 450, figs. 67a-e, 105.

form connects the accessory with the principal styli. Megascleres:—(i.) Smooth principal styli; maximum size, 300 x 10 μ; (ii.) acanthostyles, minutely spined, seldom exceeding 90 x 6 μ; (iii.) auxiliary subtylostyli; maximum size, 380 x 6 μ. Microscleres:—Flexuous hair-like spicules (modified toxa), fairly abundant; maximum length, at least 250 μ.

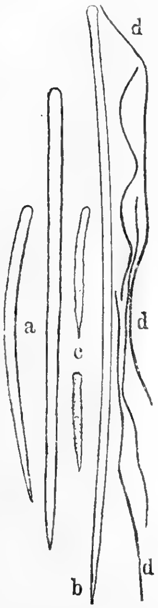

Fig. 44—*C. costifera.* a Principal styles. b Auxiliary subtylostyle. c Acanthostyles. d Trichitoidal microscleres (modified toxa).

This species is represented in the collection by a single dry washed-out specimen, of leaf-like form. The lamina is elliptical in outline, and measures 300 mm. in breadth, by 200 mm. in height; the stalk is short, stout, and proximally swollen. Both surfaces of the lamina are elegantly ridged and furrowed, over their entire extent, along lines which radiate curvately from the junction of stalk and lamina. The grooves are 2 to 5 mm. in width; the intervening "ridges," which are much compressed (septiform) and somewhat jagged, measure 1 to 4 mm. in height. Between the ridges the lamina is comparatively thin and, in the present condition of the sponge, perforated by frequent rounded openings up to 2 mm. in diameter. The consistency is firm and tough; the texture fibrous.

The main skeleton is a close-meshed network of strongly-developed horny fibres, the stoutest of which attain a diameter of about 100 μ; the connecting fibres are free from contained spicules. Echinating acanthostlyes are scarce. In the central region of the sponge, *i.e.*, in the lamina proper, the reticulation is irregular and confused; intrafibral spicules are here comparatively few in number, and the distinction between main and connecting fibres is often obscure. In the surface "ridges," on the other hand, the main fibres run in close and fairly regular sub-parallelism, and, owing to their contained spicules, stand out rather conspicuously in comparison with the short aspiculous transverse fibres. The fibral spicules, though almost exclusively *principal* styli, may yet at times include a considerable proportion of *auxiliary* tylostyli. Between the fibres, more particularly in the central region of the sponge-lamina, megascleres occur in great profusion; they consist chiefly of *auxiliary* spicules, which are often clustered in short strands. In other respects the main skeleton agrees with that of the preceding species, *C. cælata*; that is to say, the *principal* styli of the fibres are arranged more or less semi-plumosely and frequently assume the attitude of echinating spicules; the superficial transverse fibres are closely echinated on their outer aspect by both *accessory* and *principal* styli; and, finally, the *principal* and *accessory* megascleres are connected by a series of spicules of intermediate form. The passage between the two kinds of megascleres is, however, more abrupt than in *C. cælata*, and transitional forms are rarely met with except amongst the spicules which echinate the superficial fibres. In two respects the species differs markedly from *C. cælata*; firstly, in the absence of tricurvate toxa; and, secondly, in the presence of a well-developed dermal skeleton in the form of a thin layer of closely packed horizontally-disposed auxiliary subtylostyli, which in the dry state forms a whitish incrustation similar in appearance to that shown by species of *Rhaphidophlus*.

Megascleres.—

(i.) The principal styli are curved or (less frequently) straight subconical smooth spicules, varying in length from about 120 to 300 μ and in diameter up to 10 μ; the stoutest are usually those of intermediate length, say from 220 to 250 μ. The shortest often exhibit a slight degree of ruggedness or other surface inequality, which rarely extends for more than a short distance from the basal extremity and is seldom met with in individuals of greater length than 160 μ. A certain proportion show a slight basal knob marked off by a faint constriction; this is of relatively larger size in smaller and slenderer individuals, which are then subtylostyli sometimes scarcely distinguishable from the shorter auxiliary spicules.

(ii.) The accessory acanthostyles are straight or slightly curved subconical spicules occasionally with a slight basal knob. In length, they range from 40 μ to 120 μ though usually less than 90 μ. Individuals above 100 μ long are comparatively rare, and are intermediate in form between the accessory spicules *proper* and the principal spicules. The accessory spicules proper are minutely spined over their whole length or, like those of intermediate form, are merely rugged.

(iii.) The auxiliary subtylostyli (or, less frequently, simple styli) are straight or curved spicules, varying in length from less than 160 μ to 380 μ and in diameter up to 6 μ.

Microscleres.—

These are of one kind only, viz., long very slender, hair-like sinuous spicules of indefinite form, which are undoubtedly modified toxa. They are scattered singly and are moderately abundant, and may attain a length of (at least) 260 μ.

Loc.—East coast of Flinders Island, Bass Strait ("Endeavour").

CLATHRIA RUBENS, *Lendenfeld.*

(Plate xxxii., fig. 1, and fig. 45.)

1888. *Thalassodendron rubens*, var. *dura* (pars), Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 223.

Thalassodendron rubens, var. *lamella* (pars), Lendenfeld, *Loc. cit.*

1901. *Clathria rubens* (pars), Whitelegge, Rec. Austr. Mus., iv., 2, pp. 85, 86, pl. xi., fig. 13.

(*Thalassodendron rubens*), Whitelegge, *Loc. cit.*, p. 86.

Sponge profusely ramose, stipitate, branching polytomously with anastomosis. Branches cylindrical except at nodes. "Asterisks" (of radiately-disposed grooves), sometimes associated each with a conical process, occur at intervals over the otherwise even surface. Dermal membrane very thin, indistinct; containing scattered horizontally-lying (auxiliary) spicules. Main skeleton an irregular reticulation of well-developed horny fibres, all of which contain slender axial spicules (principal styli). those in the main fibres arranged in a fairly compact thin core. Principal styli of stouter proportions than those within the fibres, occur sporadically as echinating spicules and are scattered interstitially along with a few (auxiliary) tylostyli. Accessory (echinating and scattered) acanthostyles are somewhat scarce, and spicules occur (although rather rarely) which are intermediate in form between them and the principal styli. Megascleres:—(i.) Principal styli (proper), straight, smooth, subfusiform, rarely 165 x 10 μ; (ii.) accessory acanthostyli (proper), small-spined, rarely 80 x 6 μ; (iii.) auxiliary subtylostyli, 170 x 3.5 μ. Microscleres:—(i.) Scarce isochelæ palmatæ, 8-12 μ long; (ii.) slender toxa of characteristic form, 160 to 260 μ long.

Introductory Remarks.—I have already pointed out (p. 179) that the two sponges (not three as Whitelegge supposed) described by Lendenfeld under the name of *Thalassodendron rubens* and distinguished as varieties *dura* and *lamella* respectively, belong to different species, and that in their original descriptions the two were confused. This I have been enabled to establish owing to the fortunate circumstance that the actual specimen figured by Lendenfeld under the latter name is still in existence. This specimen, strangely enough, is labelled, in Dr. Lendenfeld's handwriting, "*Thalassodendron rubens*, var. *dura*;" and thus it appears certain that the name *dura* was purely a manuscript one used in connection with the latter variety, and that its application to the former, for which it is extremely inappropriate, was due to inadvertence. Luckily, however, there are nomenclatural reasons why this name should be rejected.

Description.—The sponge is profusely ramose and attains to a considerable size. Its chief external characteristics lie in the mode of branching and in the occurrence at irregular intervals over its surface of stellate groove-groups ("asterisks").

The branches, which in their internodal portions are—roughly speaking—cylindrical (6 to 12 mm. in diameter) or only slightly compressed, become at intervals much broadened, forming nodes of more or less triangular shape. The formation of such a node is almost invariably followed by a division of the branch into a number (two to five or more) of secondary branches. The secondary branches arise from the distal side of the nodal region either on the same level or consecutively in close succession; the mode of branching might in either case—though less correctly so in the latter—be described as polytomous. The resultants of any one polytomy, but usually not of successive polytomies, lie in the same plane. Owing to the rapid multiplication of branches in this way, the transverse dimensions of the sponge increase rapidly upwards. The branches are usually crooked, and this, in conjunction with their frequent anastomoses tends to bring about the formation of a tangled and reticulate mass in which the mode of branching may become more or less obscured. The "asterisks"—groups of radiately-disposed, shallow, sharply-incised furrows—occur chiefly on the more compressed parts of the branches; as a rule their centre-points lie on or near the margins of the branches. Quite commonly the central region of the area occupied by such a group is raised up into a conspicuous conical process, to the apex of which the grooves ascend. The number of furrows which arrive at the centre of an asterisk varies from about six to ten; each of these *main* furrows usually results from the confluence of a number of tributary furrows. Often, a single furrow is continuous between the centres of two adjoining asterisks. That some special significance attaches to these furrows is indicated by the occurrence along them of "pores" of distinctly larger size than any to be found elsewhere on the surface. Although

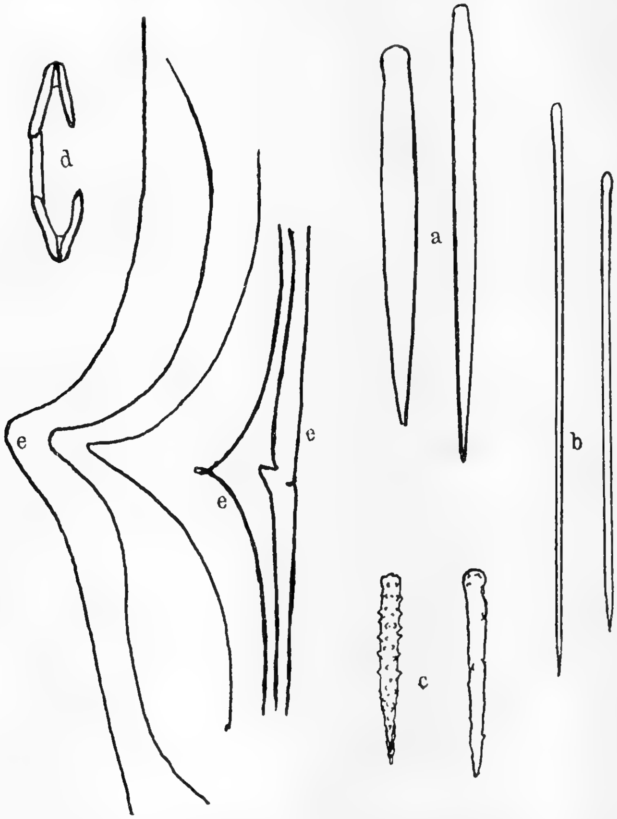

Fig. 45– *Clathria rubens.* a Principal styles. b Auxiliary styles c Acanthostyles. d Chela. e Toxa.

these "pores" are probably exhalant openings, it would appear (from a single specimen rather imperfectly preserved in alcohol) that, in the living condition, they are roofed over by dermal membrane

The largest specimen—that which is figured herein—measures 450 mm. in height and 250 x 130 mm. in its greatest transverse dimensions. The older portions of the sponge are firm and tough, and of compact texture; the younger portions are fine-textured, and, in the dry sponge, of almost silky softness. The colour in alcohol is dark brown; in the dry state it varies from greyish yellow to brown.

As seen under moderately low powers of the microscope, the main skeleton, except in the vicinity of the surface of the sponge, bears a striking resemblance to that of a *Chalinine* sponge. This is mainly due to the comparatively small size and only moderate abundance of the spicules; to the aggregation of the intrafibral spicules into a well-defined axial core; and to the fewness of the echinating acanthostyles. Generally speaking, the skeleton reticulation consists chiefly of closely approximated and frequently inosculating longitudinal main fibres, which contain a somewhat meagre, fairly compact spicular core, and are joined at irregular intervals by short usually unispicular connecting fibres.

In the superficial parts of the sponge-branches, however, the pattern of the skeleton is of a somewhat different character. Thus, the "excurrent" main fibres (*i.e.*, those which run obliquely outwards to the surface of the branches) become somewhat widely separated as the surface is approached, and between them the connecting fibres form an interreticulation or plexus. Moreover, the spicules of these main fibres become reduced in number and more dispersed, whilst those of the connecting fibres increase in number. The distinction between main and connecting fibres consequently tends to become obscure, and the general pattern of the skeleton approaches that which is characteristic rather of *Myxilla*. It is to be noted also that the fibral spicules (principal styli) of this portion of the skeleton are of distinctly stouter proportions than those which core the main fibres of the interior.

Irrespective of this contrast between its inner and outer portions, the skeleton may yet present quite different appearances in different parts of the sponge, owing to disparity in the stoutness of fibres. Thus, in the denser parts—especially in the internodal regions of the branches—the fibres are composed chiefly of spongin and may attain a diameter of 80 μ; whilst in the younger portions of the sponge—especially in the nodal regions of the branches—spongin is much reduced in amount—often to such an extent that it forms but a scarcely perceptible sheath enclosing the spicules—and even the stoutest fibres may be less than 20 μ in diameter. There is in this connection a further difference also, due to the fact that those fibres which are deficient in spongin likewise show a reduction in the number of their axial spicules. In regions of greater density, accordingly, the inner or deeper skeleton is a close reticulation of fairly stout fibres with well-marked differences in spiculation between the main and connecting fibres; whereas, in regions of least density, it is a very loose reticulation of fine fibres, and the main fibres, in point of stoutness and spiculation, are but slightly distinguished from the connecting.

Echinating acanthostyles are irregular in occurrence, and, on the whole, comparatively scarce; they are sometimes completely enclosed within the fibres. Principal and auxiliary spicules, the former in greater number, are somewhat sparingly scattered between the fibres, and with them occur also a few acanthostyles. A notable proportion of the "extrafibral" principal styli are disposed perpendicularly to the fibres in such a way that they appear to echinate the fibres; on careful examination many of these prove to be ensheathed in an exceedingly thin layer of spongin continuous with that of the fibre, but very few indeed are actually imbedded in the fibre. A further point worthy of notice is the fact that the interstitial and quasi-echinating principal styli (like those, already mentioned, which form the superficial fibres) are, in general, much stouter than those which core the longitudinal main fibres.

The dermal membrane contains numerous horizontally disposed scattered auxiliary spicules. These are not so abundant as to give rise to a visible incrustation in the dry state of the sponge.

Megascleres.—

(i.) The principal styli are typically straight subfusiform spicules, often with a slight waist-like sub-basal constriction. They are usually quite smooth, though a very appreciable proportion, particularly among those of intermediate and lesser length, carry a few low spines at or near the basal end. Their maximum size is 160 x 10 μ. Spicules below a length of 120 μ are rare and usually bear a greater or less number of spines scattered over their whole length; amongst these shortest spicules are some which, in form, bridge over the gap between the principal and accessory spicules.

(ii.) The accessory acanthostyles are sub-conical spicules, provided over their whole length with small spines. They vary in length from 55 to over 100 μ; but individuals of greater size than 70 x 6 μ are rather rare, and usually show a reduced spination.

(iii.) The auxiliary spicules are straight subtylostyli, sometimes basally tipped with a minute spination; size 120-170 x 3.5 μ.

Microscleres.—

(i.) Scarce isochelæ palmatæ, 8-12 μ long.

(ii.) Long slender toxa, tolerably plentiful, of characteristic though somewhat variable shape, 160-260 μ in length and, at most, 1.5 μ in diameter.

Loc.—Port Jackson (Austr. Mus. Coll.).

CLATHRIA PARTITA, *sp. nov.*

(Plate xxxii., fig. 3; and fig. 46.)

Sponge stipitate, with few, broad, much compressed, free or coalescent branches spread fanwise in one plane. Branches transversely furrowed. The dry sponge is covered with a whitish incrustation of dermal spicules, beneath which the surface is dotted with pinhole-like "pores." Main skeleton a very irregular reticulation of horny fibres with loosely (and, in the connecting fibres, usually uni- or bi-serially) arranged spicules. Inwardly the fibres are fairly stout, but superficially they become slender and paucispicular, and form a web-like meshwork in which main and connecting fibres are not distinguishable. Echinating spicules scarce, comprising both accessory and principal styli, as well as occasional intermediate forms. Megascleres: (i) Principal styli, smooth, slightly curved, 240 x 9 μ; (ii.) acanthostyles, seldom more than 85 x 6 μ; (iii.) auxiliary styli, smooth, straight, 350 x 4.5 μ. Microscleres: Hair-like toxa about 200 μ long.

The single specimen is a tall flabellate sponge with an elongated cylindrical stalk and a small number of dichotomous much compressed, strap-shaped branches; in shape it bears some resemblance to a deeply incised palmatipartite leaf. The branches usually increase slightly in breadth upwards, thus becoming spathulate; lateral union between them sometimes occurs, and it is possible that in some instances the separated branches may be represented or replaced by a continuous lamina. The specimen measures 400 mm. in total height; the thickness of the branches at right angles to the plane of branching is about 6 mm. The surface is ornamented with shallow furrows and narrow intervening ridges, running, as a rule, transversely to the margins of the branches. They are never a very conspicuous feature and are sometimes obscure. They are most clearly defined towards the lateral borders of the branches, over the edges of which they pass from one surface to the other; traces of them are also to be seen upon the stalk. There is nothing to indicate that the furrows have any special morphological value.

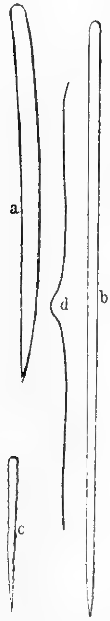

Fig. 46—*C. partita.* a Principal style. b Auxiliary style. c Acanthostyle. d Toxon.

The specimen, which is a dry one, bears the remains of a whitish spicular encrustation. The exposed surface is irregularly, though fairly closely, dotted with roundish pinhole-like (subdermal) "pores." The consistency is firm and tough; the texture, very finely fibrous at the surface, more coarsely so within; the colour, brownish yellow.

In its general pattern the skeleton somewhat resembles that of *C. rubens*, inasmuch as in its superficial parts the fibres are uniformly very slender, with pauci- or, more frequently, uni-serially arranged spicules, and form a reticulation in which the main and connecting fibres lose their distinctiveness, whilst in its more central parts the fibres attain to relatively stout proportions, reaching a diameter of 80 to 120 μ. The two species also agree in the comparative scarcity of their acanthostyles, in the circumstance that these spicules are often entirely enclosed within the fibre-spongin, and in the presence of echinating principal styli and of occasional spicules intermediate in form between them and the accessory styli. The present species, is, however, well distinguished in this respect that the intrafibral spicules, which include an appreciable number of auxiliary, as well as occasional accessory, megascleres, are not collected into an axial strand, but have a loose disorderly arrangement; and, further, the principal styli, which are much larger than in *C. rubens*, show no difference in stoutness between those of the main longitudinal fibres and those which occur extra-fibrally and in the superficial fibres. Except in the main longitudinal fibres, cross sections of which would usually intersect three or four spicules, the coring spicules are most frequently uniserially arranged. Owing to the way in which the connecting fibres inter-reticulate between the main fibres, the skeleton is of a most irregular pattern—particularly in its superficial parts, where the fibres form a web-like meshwork in which as a rule main fibres are not recognisable, and in which the sides of the meshes are usually of but a spicule's length. Echinating principal styli are of fairly common occurrence, and are frequently, as also are occasionally the echinating acanthostyles, surrounded over a greater or less portion of their length by a sheath of spongin. Scattered auxiliary spicules are moderately abundant, other interstitial megascleres comparatively scarce.

A peculiar feature of the skeleton is the occasional occurrence of short slender fibres, attached at one extremity only. These "semi-detached" or "floating" fibres, which appear to be most frequent in the superficial portion of the skeleton, rarely contain more than two or three (almost invariably uniserially arranged) spicules and are often reduced to a single spongin-ensheathed spicule. There is accordingly in this species a transition from echinating spicules to "echinating" fibres.

The dermal skeleton is a layer of crowded auxiliary spicules arranged without order; in the dry condition it forms a whitish encrustation.

Megascleres.—

(i.) Smooth, usually more or less curved, subconical principal styli ranging from about 100 to 280 μ, though seldom exceeding 230 μ, in length; those of intermediate length are the stoutest, attaining to 9 μ in diameter.

(ii.) Straight subconical acanthostyli, with very small spines, or with merely rugged surface, ranging in length from about 50 to 100 μ, though rarely exceeding a size of 80 x 6 μ. Spicules of length in the neighbourhood of 100 μ graduate in form between principal and accessory styli.

(iii.) Straight or sometimes slightly curved auxiliary subtylostyli or styli ranging in length from probably less than 180 μ to 350 μ, with a maximum diameter of 4.5 μ. The shorter are usually indistinguishable from the slenderer principal styli, and so it is impossible to determine the lower limit of their length.

Microscleres.—

Slender hair-like toxa, of which the longest observed was 210 μ in length. They appear to be moderately abundant, but, owing to their tenuity, are visible *in situ* only with great difficulty. Their normal shape is that shown in the text figure, but departures from this, due to flexion and torsion of the arms, are frequent.

No chelæ have been observed, but specimens from which the sarcode has not been removed are needed in order to enable one to say positively that they are absent.

Loc.—Southern coast of Australia ("Endeavour").

It is necessary to point out that, in this species, the occurrence of spicules intermediate in form between the principal and accessory spicules, is extremely rare—so rare, indeed, that in some sections I have failed to observe them. The fact of their presence, however, in this species and in *C. rubens*, is important, since it not only shows that these spicules are not peculiar to the species of the *C. spicata* group (*vide* p. 214), but also suggests that their occurrence may be more widespread than previous descriptions of *Clathria* species would lead one to suppose.

CLATHRIA TRANSIENS, *sp. nov.*

(Plate xxxiii., figs. 1, 2, 3; Plate xxxiv., fig. 2; and figs. 47-48*a*).

Sponge stipitate, ramose or sub-lobate; branches free or inter-uniting, often more or less restricted to one plane, distinguishable into several orders. Surface warty. Dermal membrane exceedingly thin or apparently absent. Surface with closely scattered small sub-dermal pores. Main skeleton a regular sub-rectangular reticulation of moderately stout fibres. Main fibres with a discrete, somewhat paucispicular slightly plumose core of relatively large (principal) styli which at the extremity of the fibre form a spongin-free tuft; transverse fibres of a spicule's length, usually with one or two axial spicules. Echinating accessory styli, fairly abundant. Megascleres.—(i.) Smooth, curved, sub-conical principal styli; maximum size variable, say at least 300 x 11 μ; (ii.) straight conical styli with smooth or (more usually) slightly roughened surface, in size rarely more than 80-90 x 4-5 μ; (iii.) smooth, typically straight, auxiliary tylostyli; maximum size varying from about 280 x 3 to 360 x 6 μ. Microscleres:—(i.) Palmate isochelæ, sometimes rare or absent, 14-26 μ long; (ii.) geniculate toxa with straight or recurved arms, varying in maximum length from about 130 to 170 μ, and in maximum diameter from 1 to 3 μ.

Introductory Remarks.—The four specimens which I assign to this species differ considerably in general habit of growth and also in the sizes of their spicules; but in regard to the conformation of the skeleton and the forms of their spicules, they are practically identical. Consequently, whilst there can be no question of the admissibility of their inclusion in one species, one finds it impossible, with so few specimens, to form any opinion as to whether they ought to be considered as mere "metamps," or as representing two or three independent varieties. For convenience of description I divide them into four *forms*, distinguished as (*a*), (*b*), (*c*) and (*d*) respectively; the first of these is chosen to represent the typical form. A general description will first be given embracing the features common to all, and then each will be described separately with regard to the points in which it differs from the others.

General Description.—The sponge is stipitate and more or less ramose, with branches which, in general, are distinguished into several successive orders of rapidly decreasing length; in some cases, owing to an excessive abbreviation of the branches the habit might be described as sub-lobate. Anastomosis of some of the branches usually occurs. There is, as a rule, a more or less well-expressed tendency on the part of the derivative branches of one and the same branch to confine their outgrowth to a single plane, and this tendency may sometimes affect the entire sponge in a uniform way so that a flabellate arrangement of the branches results. The most characteristic external feature, and one which appears to be constant in occurrence, though variable in degree, is a nodular or warty appearance of the surface, due to the presence everywhere of short, rounded or slightly compressed outgrowths or processes. In appearance and character these processes usually bear a close resemblance to rudimentary branches; and, indeed, it is often difficult to distinguish between what on the one hand should be regarded as incipient branches, and on the other, as processes of larger size than usual. They are thus apparently quite of the nature of *abortive* branches. In some cases they are so closely crowded that the intervals between them are reduced to narrow sulci; in others, they are sometimes widely separated. Occasionally they take the form of short ridges.

The dermal membrane is, at the best, only faintly developed, and is usually indistinct. In the latter case the surface exhibits a minute hispidity, due to the projecting terminal spicules of the main fibres. This hispidity is most pronounced in the typical specimen, in which the spicules are of greatest size. There seems to be an inverse relationship between the degree of hispidity of the surface and the degree of development of the dermal membrane.

The surface is closely though somewhat irregularly dotted with small sub-dermal pores of slightly variable size which are the more clearly distinguishable the less evident is the dermal membrane. These pores appear frequently to be of larger size when situated in the sulcar parts of the surface.

There are apparently no oscula. The consistency in alcohol is firm and fairly tough; specimens which have been dried after initial preservation in alcohol are rather brittle for a species of *Clathria*.

The skeleton is a fairly regular sub-rectangular reticulation consisting of (i.) semi-plumose main fibres which run longitudinally with gradually increasing trend outwards from the axis of the branch to the surface, where they terminate in a tuft of spongin-free spicules; and (ii.) simple connecting fibres of a spicule's length which cross these at right angles and contain, each of them, one or (less frequently) several axial spicules. The pattern of the skeleton might therefore be described as scalariform. On the whole, the fibres are not rich in spongin, and the chief part in the composition of the skeleton is played by the spicules. The directive spicules of the main fibres, *i.e.*, the principal styli, which are very loosely associated and generally number less than five in a cross-section of the fibre, are for the most part disposed obliquely with regard to the axis of the fibre; and consequently their distal or pointed extremities frequently project beyond the spongin. Towards the outer extremity of the fibres, the obliquity of the spicules increases and the amount of spongin in the fibre diminishes; in this portion of their length the fibres present an appearance which recalls that which is characteristic of the *C. spicata* group of species (*vide* p. 214). Accessory styli are rather plentiful, and occur only as echinating spicules. Auxiliary tylostyli are scattered between the fibres, increasing in numbers in the vicinity of the surface; their mode of arrangement in the dermal layer is similar to that described for *C. arcuophora*. Principal styli also occur interstitially in noteworthy number; these lie in close proximity to, and parallel with, the fibres, and frequently point in the direction opposite to that of the spicules within the fibres.

Megascleres.—

(i.) The principal styli are curved sub-conical smooth spicules which not only vary greatly in maximum size in the different forms of the species, but also exhibit a considerable range in size in any given specimen. The smallest are never much larger than the longest accessory spicules, and in one of the forms of the species there appears to be an unbroken continuity in regard both to size and form between the megascleres of the two kinds. The largest spicules are invariably to be found amongst those which form the surface-tufts; but their maximum size, owing to the relative fewness of the spicules which approach it, is not readily determinable. For example, in a preliminary examination of a slide preparation of the spicules of the *typical form*, the largest spicule observed was 360 μ long, though subsequently others up to 430 μ in length were met with; whereas measurements of the spicules *in situ* in the surface-tufts revealed individuals some of which attained to 480 μ.

(ii.) The accessory spicules are characterised by the fact that they seldom exhibit more than a slight roughness of the surface and are frequently quite smooth. They are straight sub-conical styli often with a slight basal knob and a slight sub-basal constriction.

(iii.) The auxiliary spicules are typically straight smooth tylostyli varying in size in the different forms of the species.

Microscleres.—

The general information concerning the microscleres is given in the diagnosis.

Of the species of *Clathria* described in the present paper, *C. transiens* approaches most nearly to *C. arcuophora* in the conformation of its skeleton. It differs, however, from the latter species in this respect, that the main fibres are not distinguishable into an axial series of longitudinal fibres, and a series of secondary fibres running off from these to the lateral surfaces.

Description of the Several Forms.—

(1). Form (*a*); *typical form* (Pl. xxxiii., fig. 1, and figs. 48, 48*a*).

In the single specimen the main branches are very short and much compressed, whilst the secondary branches are reduced to mere lobes. The surface processes are small, often indistinct, and are sometimes elongated into short narrow ridges. Branching is not confined to one plane, although the secondary branches are for the most part marginally situated on the primaries. The habit of the sponge is lobate rather than ramose. It measures 75 mm. in height.

The surface is densely, though minutely, hispid with the projecting points of the principal styli which terminate the fibres. There is no semblance of a dermal membrane. The colour in alcohol is pale yellowish grey.

Megascleres.—

(i.) The principal styli vary in length from (apparently not less than) 130 to 480 μ; their maximum diameter rarely exceeds 17 μ, but may attain to 20 μ.

(ii.) The accessory styli are rarely quite smooth, and often show distinct though very minute spines. They range in length from 60 μ to very rarely more than 85 μ, and in diameter up to about 6 μ; occasional individuals up to 98 μ in length have been observed.

(iii.) The auxiliary tylostyli vary in length from about 130 to 365 μ, and in diameter up to 6 μ. They are comparatively few in number.

Microscleres.—

(i.) Chelæ, tolerably plentiful, 16 to 20 μ long.

(ii.) Toxa, moderately abundant, varying in length from 10 to 150 μ, and in diameter up to 3 μ.

Loc.—North coast of Tasmania, off Devonport ("Endeavour").

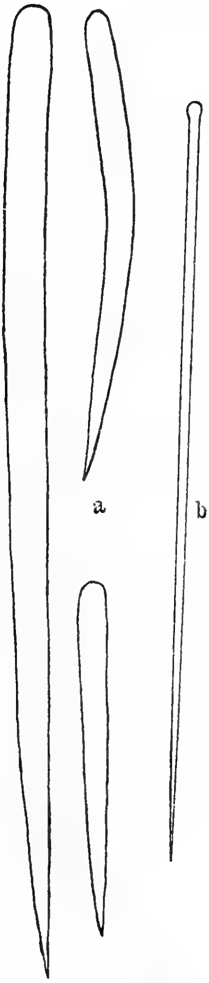

Fig. 47—*C. transiens* (typical form). a Principal styles. b Auxiliary style.

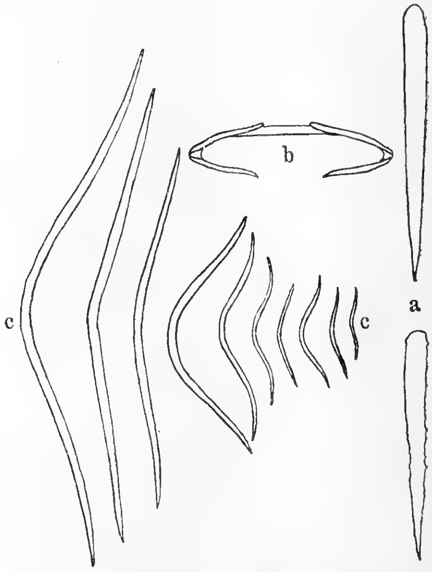

Fig. 47*a*—*Clathria transiens* (typical form). a Accessory styles. b Chela. c Toxa.

(2). Form (*b*). (Pl. xxxiii., fig. 2, and figs. 49, 49*a*).

The branches are sub-cylindrical or but slightly compressed, 5 to 7 mm. in diameter, and lie in a single plane. The main branches divide dichotomously and occasionally anatomose; the secondary branches often extend across the interval between adjoining main branches and effect a connection between them. The sponge is accordingly flabellate, and consists of a reticulation of branches; it measures 120 mm. in height and 130 mm. in breadth. Wart-like prominences of irregular size and shape are scattered over the surface. As in the typical form, there is no appearance of a dermal membrane, and the colour in alcohol is pale yellowish grey; owing to the smaller size of the principal styli, however, the surface is much less distinctly hispid.

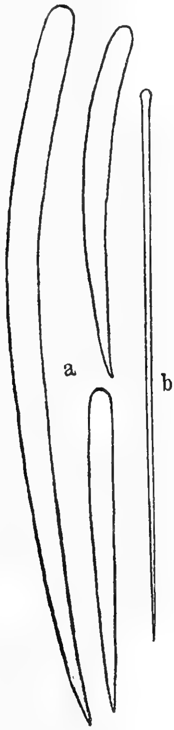

Fig. 48—*C. transiens* (form *b*). a Principal styles. b Auxiliary tylostyle.

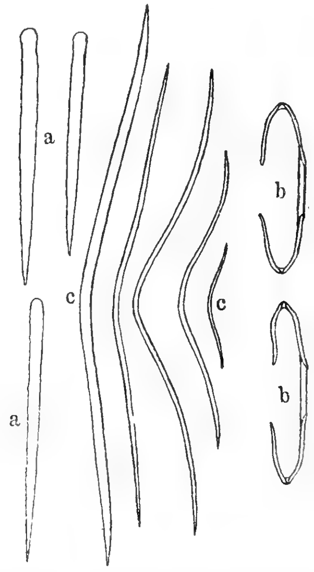

Fig. 48*a*—*Clathria transiens* (form *b*). a Accessory styles. b Chelæ. c Toxa.

Megascleres.—

(i.) The principal styli vary in length from 110 to 430 μ, but very seldom exceed 320 μ; their maximum diameter is 13 μ.

(ii.) The accessory styli are commonly quite smooth, and are never distinctly spined. They range in length from 55 μ to very rarely more than 80 μ, and in diameter up to 5 μ; occasional individuals up to 95 μ in length have been observed.

(iii.) The auxiliary tylostyli vary in length from less than 120 to 355 μ, but only in extremely rare cases exceed 300 μ; maximum diameter, 4.5 μ.

Microscleres.—

(i.) Chelæ, somewhat scarce, 14 to 20 μ long.

(ii.) Toxa, fairly plentiful, 12 to 132 μ in length, and rarely slightly more than 2 μ in diameter.

Loc.—Coast of South Australia, forty miles west of Kingston, 30 fms. ("Endeavour").

(3). Form (*c*). (Pl. xxxiii., fig. 3).

The specimen is a broken one; the largest piece of it—the subject of the figure—measures 210 mm. in length. The primary branches, which appear to have been confined more or less to one plane, are slightly compressed, and measure about 15 mm. broad by 10 mm. thick. The secondary branches usually arise along the lateral borders of the primaries.

The characteristic surface elevations are closely approximated; in the sulci between them are the traces of an extremely thin dermal membrane. The colour in alcohol is light greyish brown.

Megascleres.—

(i.) The principal styli range in length from 120 to 365 μ; the stoutest are 16 μ in diameter.

(ii.) The accessory styli are commonly quite smooth and are never distinctly spined. They vary in length from 50 to 85 μ, and up to 5 μ in diameter.

(iii.) The auxiliary tylostyli vary in length from less than 110 μ to rarely more than 280 μ; the largest observed measured 320 x 4.5 μ. They occur in considerable abundance.

Microscleres.—

(i.) Chelæ, rather scarce, 16 to 19 μ long.

(ii.) Toxa abundant, 25 to 172 μ in length, and up to 2 μ in diameter.

Loc.—Coast of South Australia, forty miles west of Kingston, 30 fms. ("Endeavour").

(4). Form (*d*). (Pl. xxxiv., fig. 2).

The specimen now to be described is perhaps sufficiently distinguished in several respects from the three preceding to permit of its being regarded as representing a variety of the species, or even (if its differences be constant), as representing an independent species. Its chief distinctive characters are: (i.) The absence of chelæ; (ii.) a minute wartiness of the basal ends of the auxiliary tylostyli; and (iii.?) a restricted range of length of the toxa.

The specimen, from which the stalk (save for a small portion) is missing, measures 90 mm. in height. The branches are, for the most part, irregularly cylindrical, and average 7 mm. in diameter. The primary branches, as in the specimen of form (*c*), exhibit a kind of bilaterality expressing itself in a tendency towards a distichous arrangement upon them of the short secondary branches. The characteristic surface-elevations sometimes assume the form of short ridges, but usually they are rounded and somewhat wart-like. There is a distinct but very thin dermal membrane. The colour (in alcohol) is purplish pink; this colour, however, is confined to a thin superficial layer of the sponge, the inner parts being yellowish grey. In life, the specimen was brick-red.[1]

Megascleres.—

(i.) The principal styli vary in length from 100 to 340 μ, and in diameter up to 11 μ. The smallest approximate extremely closely in size and shape to the accessory styli. A fair proportion of them are slightly expanded at the base to form a faint knob.

(ii.) The accessory spicules vary in form from simple styli to tylostyli. Under ordinary powers of the microscope they appear quite smooth; but under higher powers a barely perceptible roughening of portions of the surface, more especially towards the basal extremity, is occasionally to be observed. Their length varies from (rarely so small as) 45 μ to somewhat over 90 μ, but seldom exceeds 80 μ; the stoutest may attain to 4 μ, though a very considerable proportion of them are less than 2 μ in diameter.

(iii.) The auxiliary tylostyli, though normally straight, are very often more or less curved. A peculiarity which appears to be characteristic occurs in connec-

1 The specimen is one of a large number of sponges collected in Port Phillip and presented, together with a list of their colours in life, by the late J. Bracebridge Wilson, M.A.

tion with the basal extremity, which in a large proportion of cases displays either a rugged surface or some kind or other of tubercular deformity. They vary in length from less than 120 up to 180 μ; and in diameter up to (rarely) 3 μ.

Microscleres.—

Chelæ appear to be absent. Toxa, agreeing in shape with those of the preceding forms, but very slender (never quite attaining a diameter of 1 μ), are very scarce. The longest observed was 180 μ in length; the shortest (apparently) are between 50 and 60 μ long, and are of extreme tenuity.

Loc.—Port Phillip, Victoria (Austr. Mus. Coll.).

CLATHRIA ARCUOPHORA, *Whitelegge.*

(Text figs. 49, 49*a*).

1907. *Clathria arcuophora*, Whitelegge, Austr. Mus. Mem. iv., Pt. 10, 1907, p. 500, pl. xlv., fig. 29.

Sponge flabelliform, thin, stipitate. Surface very closely dotted with minute pinhole-like (sub-dermal?) pores. Skeleton arrangement semi-axinelloid. In the middle region of the sponge-lamina (occupying about one-fourth to one-third its thickness) is an irregular reticulation of fairly stout spongin fibres, with a discrete spicular core; and from this mid-region, on either side, stout strands of loosely and somewhat plumosely arranged spicules, held together by a relatively small or even inappreciable amount of spongin, run perpendicularly outwards to the surface in a regularly pinnate fashion. These "secondary" fibres are joined at short intervals by connectives of a spicule's length, each consisting of one to several spicules. Echinating acanthostyli moderately abundant. Megascleres.—(i.) Smooth, curved, sub-conical principal styli, varying in size from 100 x 12 μ to 620 x 25 μ; (ii.) straight, sub-conical acanthostyles with small spines or merely rugged surface, 60-100 x 8 μ; (iii.) straight auxiliary sub-tylostyli, often with minute basal spines, 120 to 360 μ in length, and up to 6.5 μ in diameter. Microscleres.—(i.) Isochelæ palmatæ 20-22 μ long; (ii.) tricurvate bow-shaped toxa, 10 to 135 μ in length, and up to 4 μ in diameter.

Five specimens of this species were obtained, which agree in all respects with the original, except that the lamina, although sometimes slightly subdivided, shows no appearance of having resulted from a coalescence of branches. In some cases, however, a few rope-like thickenings of the lamina, radiating from its junction with the stalk, and calling to mind the main ribs of a palmate foliage leaf, can be traced for a short distance. Scattered over the surface at irregular intervals are (sometimes but faintly perceptible) groups of radiately-arranged short ridges, somewhat resembling the "asterisks" of *Rhaphidophlus typicus* var. *stellifer*, but of smaller size; these do not appear to have any special morphological significance. The largest specimen measures 400 mm. in height, 230 mm. in breadth, and 3 to 5 mm. in thickness.

The original description stands in need of correction in regard to the occurrence of oscula, the dimensions of the spicules and the mode of arrangement of the auxiliary megascleres at the surface.

The surface of the (dry) sponge is everywhere closely dotted with roundish pinhole-like "pores," which are rarely more (and usually much less) than .5 mm. in diameter, and stand, on the average, somewhat less than 1 mm. apart. In the type specimen, but not in the present ones, there are in addition to these pores a number of larger openings up to 2 mm. in diameter; the latter, however, are due merely to the incomplete coalescence of perhaps originally separated parts. Both kinds of openings appear to have been regarded by Whitelegge as oscula; but the latter, as I have just indicated, are purely adventitious, whilst the former are probably of the nature of "subdermal pores."

The corrected measurements of the spicules are as given in the above diagnosis. It is perhaps scarcely correct to say that the toxa are of two kinds, since there is no difference in shape between the largest and the smallest; nevertheless individuals of length between 40 μ and 60 μ are rare. The statement that the auxiliary

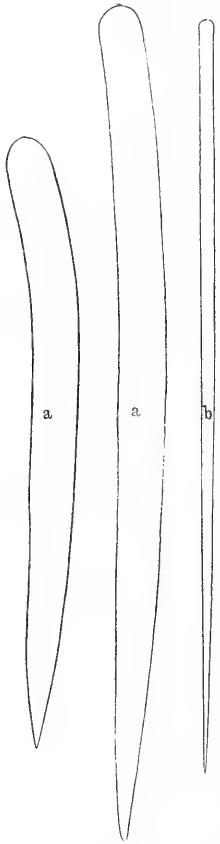

Fig. 49—*C. arcuophora*. a Principal styles. b Auxiliary subtylostyle.

spicules occur in the dermal layer as "radiating tufts" is misleading, since it would imply some degree of regularity in their arrangement and might suggest that the "tufts" are disposed vertically. As a matter of fact these spicules lie more or less horizontally, and although penicillate groups and parallel bundles occur, they are, on the whole, scattered without order. Chelæ and toxa are plentifully distributed throughout the sponge; but in the dermal layer, in which the chelæ are particularly abundant, toxa are rare or absent. An interesting point in connection with the megascleres is the extreme variability of size, not only of the principal, but also of the auxiliary, spicules; although the former may attain to a length of over 600 μ, individuals exceeding 400 μ are comparatively rare.

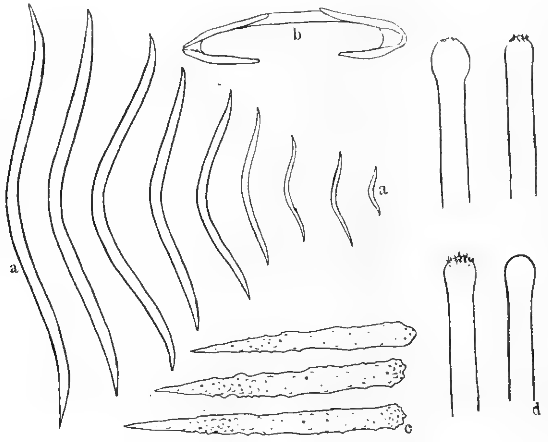

Fig. 49*a*—*Clathria arcuophora.* a Toxa. b Chela. c Acanthostyles. d Basal ends of auxiliary tylostyles.

This species is distinguished from all the preceding species herein described on account of the very conspicuous part which the megascleres play, in comparison with the spongin, in the composition of the skeleton.

Locs.—Coast of New South Wales; Shoalhaven Bight, 15-45 fms. ("Endeavour"); off Barranjoey, 25-28 fms. ("Thetis").

C. arcuophora is of interest on account of the light which it throws on the relationship of *C. frondosa*, Lendenfeld.[1] In the latter, the principal spicules are styli, strongyla and oxea; the accessory spicules are sub-tylotiform; and microscleres are absent. Accordingly it might seem doubtful whether the species should not be placed in *Echinodictyum* rather than in *Clathria*. However, in almost all other respects, including the pinhole-like punctation of the surface, its agreement with *C. arcuophora* is so striking, and its lack of resemblance to typical species of *Echinodictyum* so marked, as not only to put beyond question the propriety of its inclusion in *Clathria*, but also to preclude any likelihood that it forms a connecting link between the two genera.

In *C. frondosa* the more sponginous fibres which ramify in the axial plane of the sponge, are much less strongly developed than in *C. arcuophora*, and the lateral or "secondary" main fibres run, not perpendicularly as in the latter, but obliquely (*i.e.*, upwards and outwards) to the surface. Indeed, in the arrangement of its skeleton, as well as in the form of its principal spicules, *C. frondosa* approaches so closely to species like *Axinella symbiotica*, Whitelegge, and *Phakellia flabellata*, Carter, that, if it were not for its possession of spined accessory spicules, probably no one would hesitate in regarding it as congeneric with these species; even as it is I think that the relationship between them is by no means remote.

Genus Wilsonella, *Carter*.

1885. *Wilsonella*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 366.

1888. *Clathriopsamma* (pars), Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 227.

The main skeleton is a reticulation (in which connecting fibres may be relatively few) of well-developed horny fibres echinated by acanthostyles. Dermal skeleton

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1 *Antherochalina frondosa*, Lendenfeld, "Die Chalineen des australischen Gebietes," Zool. Jahrb., 1886-1887, p. 765, pl. xxii., fig. 43; and Cat. Sponges Austr. Mus., 1888, p. 90; *Clathria frondosa*, Whitelegge, Rec. Austr. Mus., iv., No. 7, 1902, p. 288.

The fact that the Australian Museum specimen labelled (by Lendenfeld) *Antherochalina frondosa* is specifically identical with the British Museum (type?) specimen similarly labelled, together with the fact that the former bears a scarcely less than perfect resemblance to the original figured specimen, fixes the identity of this species beyond the possibility of question, and shows the original description to be most unsatisfactory. A re-description of the species of *Antherochalina*, and indeed of all the species described in "Die Chalineen des Australischen Gebietes"—the types of which are in the British Museum—is urgently needed. Whitelegge's description of the spicules is in some respects misleading, and he has overlooked the presence of scarce slender styli (about 120 to 180 μ in length and up to 4 μ in diameter) which, no doubt, represent auxiliary megascleres. The principal megascleres—styli, strongyla and oxea—are not, as he indicates, separable into three forms. They are curved or less frequently uni-angulate or bi-angulate spicules varying in length from 220 to 340 μ, and in diameter up to 24 μ. The oxea and strongyla (or rather, substrongyla) are usually asymmetrical with regard to opposite extremities.

various. The megascleres are of two kinds only; in addition to acanthostyles there are smooth or terminally spined, typically slender, monactinal, or oxeote or tornote quasi-diactinal, spicules which occur interstitially and dermally and usually also within the fibres as coring spicules. The microscleres (if present) are isochelæ and (or) toxa or sigmata.

I propose to revive the generic name *Wilsonella*, and to include thereunder, provisionally, a somewhat heterogeneous assemblage of species which hitherto have been wrongly assigned to *Clathria*. The single characteristic common to all of these, which distinguishes them from species proper to the latter genus, is a deficiency in spiculation due to the absence of those megascleres apparently, which, in the case of normal Myxillinæ, are termed the *principal*.

The proposal is the outcome of an attempt to secure the removal from *Clathria* of certain species (*e.g.*, *Wilsonella curvichela*, sp. nov.) which are peculiar not only in the lack of principal megascleres but also in the possession of *arcuate* chelæ. Palmate isochelæ, varying but slightly in form, are so characteristic of *Clathria* and related genera, that the occurrence in the species referred to, of strictly arcuate chelæ, is in itself satisfactory proof of their rather wide separation phylogenetically from typical members of the genus. Of the propriety of the removal of such species, therefore, there can be no question; but, unfortunately, owing to the existence of species devoid of microscleres and of species in which the chelæ are of apparently intermediate or ambiguous form, this difference in the character of the chelæ proves to be lacking in practical value for the purpose of generic definition. Consequently, so long as generic distinctions continue to be based solely upon skeletal and spicular characters, the separation from *Clathria* of *W. curvichela* and its allies can be effected only by taking advantage of their peculiarity in the first-mentioned respect—a peculiarity, however, which is also exhibited by a number of unrelated species, including amongst them several with palmate isochelæ; and the question thus arises as to which alternative has most to recommend it, (i.) the association together in a single genus apart from *Clathria* of *all* the species distinguished by the absence of spicules identifiable with principal megascleres, or (ii.) the continued retention of all such species within the genus *Clathria*. So far as I have been able to obtain information of species thus distinguished, it seems to me, inasmuch as each of them differs also in other important respects from typical species of *Clathria*, that the former course (until a more extended knowledge points the way to a better scheme for their disposal) is to be preferred; hence the proposal to unite them under

Carter's genus *Wilsonella*, of which they include the type-species, *W. australiensis*.

The following is a list, together with a resumé of the chief characters, of the hitherto described species known to me which the genus *Wilsonella* (as defined) will include. Of these, *Wilsonella australiensis*, *Clathriopsamma lobosa*, *Clathria pyramida*, *C. alata* and *C. dura* are species with which I have a direct acquaintance.

Wilsonella australiensis Carter,[1] as identified by Dendy and by Whitelegge, is a massive or sub-massive sponge, with or without lobations, often becoming somewhat compressed and flabelliform in outline. The oscula are sometimes as much as 5 mm. in diameter. The skeleton is reticulate; the fibres are charged with abundant foreign particles. The non-accessory megascleres are short slender styli, with a small area of spination at either extremity,[2] and measuring 120-160 μ in length; and 4.5 μ (though in some specimens much less) in maximum diameter. They occur sparsely and sporadically in the fibres, more plentifully in the ground substance, but are not so numerous in either situation as the (accessory) acanthostyles. The microscleres are rather abundant slender isochelæ palmatæ 12 to 16 μ long, and comparatively rare slender tricurvate toxa about 50 to 80 μ long, which often (at any rate in Port Phillip specimens) occur in small clusters.

Clathriopsamma lobosa, Lendenfeld[3] is a synonym of the preceding.

Clathria decumbens, Ridley.[4] According to description, the sponge is massive and sessile, with scattered oscula 1 to 4 mm. in diameter. The coring spicules are slightly fusiform basally spined styli, 150 to 175 x 5.5 μ in size; the largest acanthostyles measure 90 x 8 μ. The chelæ are of two kinds, a larger and a smaller, both palmate, but the latter with a more curved shaft; lengths 21-32 μ, and 11 μ, respectively.

Clathria australis, Lendenfeld,[5] is, according to its description, a *Wilsonella*. The sponge is flabelliform with a thick lamella. The skeleton is a network in which only the main

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1 Carter—Ann. Mag. Nat. Hist. (5), xvi., 1885), p. 366; Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 33; Whitelegge—Rec. Austr. Mus., iv., 2, 1901, p. 84, pl. xi., fig. 12.

2 The spicule is exactly similar to those of *Clathria australiensis* var. *spinulata*, Hentschel (Fauna Südwest-Australiens, iii., 1911, p. 375, fig. 47a, b).

3 Lendenfeld—Cat. Sponges Austr. Mus., 1888, p. 227.

4 Ridley—Rep. Zool. Coll. "Alert," 1884, p. 612, pl. liii., fig. K, pl. liv., figs. g, g'.

5 Lendenfeld—*Loc. cit.*, p. 222. See also p. 161 of the present Report.

fibres are cored. The coring spicules are styli measuring 150 x 6 μ. (Microscleres are not mentioned; nor is there any reference to oscula).

Clathria macropora, Lendenfeld,[1] judging from its description, is very probably a *Wilsonella*. The sponge is "irregular, massive, lobose. The oscula are very conspicuous, and scattered over the whole of the surface; they are on an average 5 mm. wide and fairly abundant. The skeleton consists of a network of mostly longitudinally disposed fibres .13 mm. thick, which contain an axial bundle .07 mm. thick of slender oxea and styli, the former being more numerous. These spicules are .14 mm. long and .4 mm. thick." (The "oxea and styli" are very probably different forms of one and the same spicule. Microscleres are not mentioned).

Clathria pyramida, Lendenfeld.[1] The Australian Museum specimen labelled as the type of this species is of massive form, and has a slightly lumpy surface which is here and there raised up into large mammiform or conical prominences. Oscula are not apparent. The skeleton is composed of coarse fibres (sometimes exceeding 300 μ in thickness), with a stout spicular core (up to 160 μ in diameter), and a thick spongin sheath which appears coarsely stratified and sometimes has a rugged surface. Connecting fibres, which are usually short and stout, and without axial spicules, are of comparatively rare occurrence; so that the skeleton is much more of the dendritic type characteristic of *Crella* than of the reticulate type of *Clathria*. Acanthostyles occur fairly abundantly as echinating spicules, whilst both kinds of megasclere are plentifully scattered through the ground tissues. The smooth styli are straight, slightly fusiform, spicules varying in length from 190 to 240 μ and sometimes attaining a diameter of 7 μ. The acanthostyles are provided with relatively few, fairly large spines; they vary in length from 80 to 140 μ, whilst the stoutest are 9 μ in diameter. The microscleres are stout isochelæ palmatæ[2] in which the shaft is provided with a wing-like expansion along each side. The species might therefore be considered to include *Clathria alata*, Dendy (*vide infra*), as a variety. The chelæ are moderately abundant and vary in length from 20 to 25 μ.

(The "Endeavour" obtained at a depth of 33-40 fathoms, off the north coast of New South Wales, two specimens of a

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1 Lendenfeld—Cat. Sponges Austr. Mus., 1888, p. 221. See also p. 165 of the present Report.

2 The chelæ are identical in form with those figured by Hentschel (*loc. cit.*, p. 376) for the West Australian sponge described by him under the name of *Clathria alata*, Dendy. Hentschel himself draws attention to the probability of an identity between *C. pyramida* and *C. alata*. The West Australian sponge should, I think, receive a varietal name, since the smooth megascleres are tylostylote in their young stages.

digitate sponge,[1] somewhat resembling *Spirastrella alcyonioides* in habit of growth, which agrees exactly with *C. pyramida* in the form of its spicules. The spicules are, however, slightly larger than in the typical form; the smooth styli reach a size of 260 x 8 μ, the acanthostylies a size of 160 x 12 μ, and the chelæ a length of 28 μ. The fibres also are slenderer and much less richly provided with spongin.)

Clathria alata, Dendy.[2] From an examination of a slide presented to the Australian Museum by Prof. Dendy, I find that this species differs from the *C. pyramida* in the following respects. Fibres are more abundantly developed and much less rich in spongin; the coring spicules are much less closely packed, giving somewhat of a "whisp-like" appearance to the fibres; and connecting fibres are relatively fewer in number and much less distinct, so that it requires close inspection to detect that the arrangement of the fibres is not exclusively dendritic. The smooth styli reach a size of about 230 x 4 μ and are usually provided at the basal end with a faint elongated tylosis. The acanthostyles vary in length from about 60 to 140 μ and rarely attain a diameter of 8 μ. Chelæ are extremely abundant; they differ slightly from those of *C. pyramida* in this respect that the distal ends or "lobes" of their alae, as seen in profile, project beyond the posterior border of the shaft; they are also shorter and less robust, never exceeding 22 μ in length.

Clathria elegantula, Ridley and Dendy. Skeleton "a well-defined reticulation of horny fibre," of which the main fibres alone are cored by sybtylostylote spicules, 200 x 3 μ in size. The microscleres are "palmate isochelæ of rather unusual form, with very slender shaft, rather strongly curved and making an unusually wide angle with the front palm;" they are about 20 μ long.

Clathria piniformis, Carter.[3] According to description the sponge is erect, lobo-digitate or flabellate, with corrugated surface. Oscula (?). Oxeote modifications of both the smooth coring styli and the echinating acanthostyles occur; the smooth styli attain a size of 200 x 3 μ. Microscleres are said to be absent, but the presence of chelæ has probably been overlooked.

1 The specimens, which are preserved in a dry state, were inadvertently overlooked in selecting the sponges intended for description, and their discovery came too late to permit of their being figured and described in detail.

2 Dendy—Proc. Roy. Soc. Vict., viii. (n s.), 1896, p. 34.

3 Carter—Ann. Mag. Nat. Hist. (5), xvi., p. 354; Dendy—Proc. Roy. Soc. Vict., 1896, p. 34.

Clathria indica, Dendy.[1] Except in habit of growth this species appears to bear a certain amount of resemblance to the last-mentioned. The spicules are "smooth slender styli (verging upon the tylostylote form) or unequal-ended oxea," which measure about 140 x 3 μ, and "small straight entirely spined styli, gradually and sharply pointed at the apex and frequently narrowing somewhat at the base." There are no microscleres.

Clathria dura, Whitelegge.[2] Sponge ramose; branches compressed, ramifying and usually reticulating in one plane. Oscula marginal. The skeleton is a reticulation of stout, rather densely echinated pale horny fibres, of which both the main and connecting contain a compact spicular core. There is a dermal skeleton of scattered acanthostyles. The coring spicules are slightly curved, fusiform styli, with a tendency to pass into forms resembling tornotoxea, varying in length from 75 to 100 μ, and not more than 4.5 μ in diameter. The acanthostyles are often strongyliform and attain a size of 65 x 8 μ, but rarely exceed 6 μ in diameter. The microscleres are slender isochelæ arcuatæ 16-19 μ long.

Clathria myxilloides, Dendy.[3] According to description this sponge is massive, depressed, cake-like. Oscula (?). The skeleton is a very loose and irregular reticulation of stout, mostly longitudinal, whisp-like fibres. Smooth styli, 300 x 4.2 μ; acanthostyles 130 x 5 μ; microscleres, arcuate isochelæ 25 μ long.

Clathria imperfecta, Dendy.[3] Sponge compressed, cake-like, crumbling. Oscula (?). Skeleton resembling that of the preceding species. Smooth styli 200 x 6.2 μ; acanthostyles 100 x 5 μ. No microscleres.

Thalassodendron typica, Lendenfeld (*vide* p. 203). A subcaliculate or flabelliform sponge, with longitudinally ridged surface. According to description, the skeleton is reticulate, with aspiculous connecting fibres and stout main fibres filled with straight styli 200 x 5 μ in size. The echinating styli are scarce, smooth or slightly spined and attain a size of 70 x 8 μ. Microscleres are not mentioned.

Plectispa macropora, Lendenfeld (*vide* p. 205). Small massive or incrusting honeycomb-like sponges with a reticulate

1 Dendy—Ann. Mag. Nat. Hist. (6), iii., 1889, p. 84, pl. iv., fig. 10.

2 Whitelegge—Rec. Austr. Mus., iv., p. 83; pl. xl., fig. 11. Hentschel has recently described a West Australian sponge under the name of *Clathria dura*, Whitelegge, var. *mollis*, which possesses isochelæ palmatæ and toxa, as well as principal styli. The sponge, which is therefore distinct from the present species, will probably require a new specific name, since the name *Clathria mollis* has already been used by Kirkpatrick for a South African sponge.

3 Dendy—Proc. Roy. Soc. Vict., 1896, p. 35.

skeleton of slender fibres cored by straight or curved styli 200 x 4 μ in size, and pretty abundantly echinated by slightly spined styli 70 x 6 μ in size. Microscleres are not mentioned.

Clathria mollis,[1] Kirkpatrick. A sub-caliculate sponge of soft consistency, with scattered oscula. Skeleton a reticulation of thick soft fibres echinated and sometimes cored by acanthostyles, 130 x 11 μ in maximum size. Foreign bodies present in the fibres and ground substance. Asymmetrical amphitornota, 165 x 5.5 μ, occur in the dermal layer. Microscleres: tridentate isochelæ, sigmata, and [?] toxa.

The last-mentioned species differs from all the preceding in the fact that the non-accessory megascleres are diactinal, but this does not provide sufficient reason for excluding it from the genus, since in a number of the other species a diactinal tendency on the part of these spicules is frequently to be observed.

The sponge described by Carter under the name of *Wilsonella echinonematissima*[2] might perhaps also, for the present, be included amongst the species of *Wilsonella*. It is, however, peculiar in the fact that the acanthostyles are diferentiated into two kinds, a larger and a smaller; the former attain a size of 145 x 8.3 μ. The sponge is massive, with a reticulate skeleton of horny fibres which are echinated by the acanthostyles, and in the deeper parts of the body cored with smooth sub-basally constricted smooth styli, about 210 x 4 μ in size, but which towards the surface become almost exclusively occupied by foreign bodies. Oscula (?). The microsclere is "an equianchorate somewhat bent upon itself, rather obtuse at the ends, *i.e.*, not navicularly shaped," measuring 25 μ in length.

Also it might be well to include provisionally, as *species dubiæ*, under the genus *Wilsonella*, Lendenfeld's three so-called varieties of *Echinonema anchoratum*, Carter. The type-specimens of these three sponges appear to have been lost, and since their descriptions are very brief, it is possible that they may never be re-identified. It is strange that although Carter clearly indicates in his description of *E. anchorata* that the megascleres are styli, Lendenfeld in his description of the "varieties" states that they are oxea; but inasmuch as the latter has described the non-accessory megascleres of his *Echinonema levis* and *E. rubra* as styli, whereas

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1 Kirkpatrick—"Marine Investigations in South Africa," ii., Sponges iii., p. 249, pl. v., fig. 15, pl. vi., figs. 16a-d.

2 Carter—Ann. Mag. Nat. Hist. (5), xvi., 1881, p. 366.

they are actually oxea, it is not beyond possibility that, in the present instance, he has inadvertently written "oxea" when "styli" was intended. In either case, whether their spicules be styli or oxea, the three sponges are, according to their descriptions, capable of being included in the genus *Wilsonella* as I have defined it.

The species of Wilsonella of which I have a first-hand acquaintance, appear to represent perhaps four or five generic types, in accordance with the following division:—(i.) *W. australiensis;* (ii.?) *W. conectens*, sp. nov.; (iii.) *C. pyramida*, *C. alata*; (iv.) *W. curvichela*, sp. nov., *W. oxyphila*, sp. nov.; and (v.?) *C. dura*. Of these the first-mentioned two species are distinguished from the rest by the possession of isochelæ palmatæ of typical form, and of toxa.

In group (iii.) the chelæ, whilst conforming rather to the palmate shape, are peculiar in that they have an alate shaft and undergo in the course of development a considerable change of form.[1] To what extent their peculiarity in the latter respect is important one cannot say, since so little information concerning the growth-stages of chelæ is available; but it seems to be the case that in *Clathria* proper, the youngest visible forms of the chelæ are not materially different (except in the tenuity of their parts) from those which are fully developed. It may be that the chelæ of this group are modified arcuate chelæ; for there is nothing objectionable in the supposition that arcuate chelæ may secondarily come to resemble palmatæ chelæ, and in this connection it may be remarked that the immature forms of the chelæ of *C. pyramida* are much like those of the arcuate chelæ of *Lissodendoryx stipitata*, Lundbeck.[2] Chelæ bearing a close resemblance in both their immature and final stages to those of *C. pyramida*, but lacking in any perceptible modification of the shaft, occur in *Amphilectus ceratosus*, R. and D.[3]; so marked, indeed, is the resemblance between the chelæ of these two species, that the likelihood of its being merely an accidental one is remote.

The species of groups (iv.) and (v.) agree among other respects in possessing arcuate chelæ which, moreover, develop along similar lines. These chelæ commence as a slightly curved rod,[4] upon which the rudiments of the alæ appear before there is any sign of the formation of the front palm.

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1 *Vide* Hentschel—*Loc. cit.*, pp. 376, 377, and figs. 48e, f, g.

2 Lundbeck—Porifera, Danish Ingolf Expedition, ii., 1905, pl. xvii., fig. 2e.

3 Ridley and Dendy—"Challenger" Monaxonida, 1887, p. 125, pl. xix., fig. 10a; Whitelegge, Austr. Mus. Mem., iv., 9, 1906, p. 473.

4 The development of the chelæ of *Ectyodoryx maculatus*, Hentschel (1911), and of the ancoræ of *Iotrochota varidens* and *I. oxeata*, Lundbeck (1905), commences in a similar manner.

C. dura differs from the species of group (iv.) in the strong spiculation of its fibres (both main and connecting) and in its dermal skeleton of acanthostyles; except that its fibres are echinated, it approaches rather closely to *Pseudoclathria compressa*, Carter.[1]

Wilsonella conectens, *sp. nov.*

(Plate xxxii., fig. 2, and fig. 50.)

Sponge a sessile amorphous reticular mass of moderately thin mostly erect lamellæ. Oscula absent (?). No distinct dermal membrane. Skeleton an irregular reticulation of thin fibres with a loose meagre core of smooth slender styli; in the connecting fibres the spicules are usually uniserially arranged. Accessory acanthostyles rare. Spicules similar to the intrafibral styli, are scattered interstitially in moderate abundance. Megascleres:—(i.) Smooth sometimes tornotely-pointed styli or subtylostyli, up to 240 μ in length and at most 4 μ in diameter; (ii.) acanthostyles, obscurely spined or rugged, 70 x 4.5 μ. Microscleres:—(i.) Isochelæ palmatæ, 8 μ long; (ii.) rare toxa, of moderate size, with arms sometimes inclined at right angles.

Two specimens were obtained, both of which are preserved in a dry state. The sponge is a low-spreading reticulate subcellular mass of irregular rumpled lamellæ which as a rule are disposed more or less vertically. An idea of the general external appearance of the sponge is best obtained from the figure (Pl. xxxii., fig. 2). The lamellæ have an uneven surface and are frequently irregularly fenestrate; they average 2 to 3 mm. in thickness. The larger specimen measures 120 mm. in length, 80 mm. in breadth, and 60 mm. in height. The specimens afford no certain evidence of their mode of attachment; but, judging from adhering fragments, it is highly probable that they grew upon branching calcareous bryozoans to which they were attached at many points. The colour in life was bright orange yellow; it is now light brown. The texture is finely fibrous and compact. As regards consistency, the sponge is, in its present state, moderately tough, compressible and resilient.

Owing to the damaged state of the surface nothing can be said concerning the arrangement of the spicules in the dermal layer. The main skeleton is an irregular reticulation of thin fibres, the stoutest of which rarely exceed 50 μ in diameter. Both main and connecting fibres are cored with slender smooth straight styli, and similar spicules, in considerable number,

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1 Carter—Ann. Mag. Nat. Hist. (5), xviii., 1886, p. 450; Dendy—Proc. Roy. Soc. Vict., ix. (n.s.), 1897, p. 259.

are scattered between them. The spicules of the main fibres, which are seldom more, and usually much less than ten in number in a cross section of the fibre, are sometimes collected into a slender compact axial strand, and sometimes spread dispersedly; in the connecting fibres they are arranged uniserially or, less frequently, pauciserially. Acanthostyles are of rather rare occurrence; mostly they echinate the fibres, but a small proportion occur within the fibres and an occasional one is met with interstitially. The meshes of the reticulation are very variable in size and shape; their angles are usually well rounded off, and the apertures of the smallest meshes are consequently oval in outline. The pattern of the skeleton, as seen in section, differs to a great extent according to the direction in which the section has been cut. The minimum degree of irregularity is shown in sections cut perpendicularly to the plane of a lamina and in the direction of growth; in such sections the repeatedly branching main fibres run longitudinally in a very irregular manner and are joined by single transverse fibres or by interreticulations (of lesser or greater extent) of connecting fibres, according as they lie close together or farther apart. The meshes of the reticulation are tympanised by filmy membranes to which the interstitial spicules appear to be entirely confined. Possibly these membranes are capable of being perceived only in sections prepared from dry specimens, such as the present are.

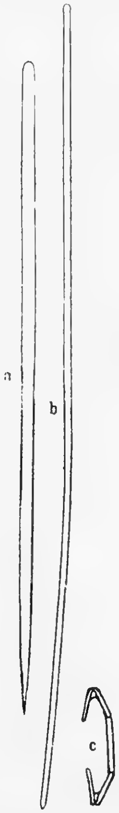

Fig. 50—*W. conectens* a, b Styli, showing the extremes of form exhibited by these spicules. c Chela. (Toxa not figured.)

Megascleres.—

(i.) Smooth, normally straight, cylindrical styli or less frequently subtylostyli, varying in length from about 130 to 250 μ, and in diameter up to 4 μ. They show a barely appreciable degree of differentiation into two orders: those which exceed 200 μ in length are seldom more than 3 and never more than 3.5 μ in diameter, and are usually tornotely pointed; whilst a considerable proportion of those below 180 μ in length may attain a diameter of 4 μ, and commence to taper to a point at a distance from the distal extremity of as much as 15 μ. There is, accordingly, a remote possibility that the spicules belong to two different categories equivalent to the principal and auxiliary spicules of normal Myxillinæ; but inasmuch as the two kinds graduate insensibly the one into the other, and are promiscuously intermingled in the skeleton, whether within the fibres or scattered interstitially—it is impossible to arrive at any other conclusion than that they are but different forms of a single category.

(ii.) Very minutely spined or rugged acanthostyles, 55 to 70 μ in length and at most 4.5 μ in diameter.

Microscleres.—

(i.) Relatively stout isochelæ palmatæ 8 μ long, moderately abundant in the interstitial membranes.

(ii.) Rare toxa;[1] in the few individuals which have been observed, the arms are straight, or slightly reflexed towards their extremities, are inclined at an angle varying from 20° to as much as 90°, and vary in length from 40 to 80 μ, and in diameter up to 3 μ.

Loc.—East coast of Queensland, nine miles east of Fraser Island, 24-26 fms. ("Endeavour").

In many respects *W. conectens* so closely resembles *Clathria angulifera*, Dendy,[2] that there is high probability of a near relationship between the two. In the case of the latter it would seem that the non-accessory megascleres comprise both principal and auxiliary spicules, for according to description, they are of two kinds: (*a*) smooth, straight, gradually sharp-pointed styli (up to about 180 x 4.2 μ in size), *occurring in the fibres*; and (*b*) straight styli or subtylostyli (up to about 250 x 3.5 μ), *occurring in the dermal tufts.* The opinion which I have expressed that the (non-accessory) megascleres of *W. conectens* belong to a single category, is therefore open to question.

WILSONELLA CURVICHELA, *sp. nov.*

(Plate xxxiv., fig. 4; and fig. 51.)

Sponge stipitate with erect compressed branches. Oscula small, marginal. Surface even. Dermal membrane distinct, thin. Main skeleton an irregular reticulation of stout densely echinated fibres; the main fibres

1 Owing to their rarity these spicules were at first overlooked and were thus omitted from the text-figure.

2 Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 32.

only, with a thin core of skeletal styli. Interstitial spicules rare. Megascleres of both kinds (the acanthostyles in lesser number) occur sparsely in the dermal membrane, together with scattered chelæ. Megascleres:—(i.) Skeletal, smooth substyli, 160 x 4 μ; (ii.) accessory acanthostyli, 96 x 8 μ. Microscleres:—Isochelæ arcuatæ 18 to 27 μ long.

The single specimen, preserved in alcohol, consists of a sub-cylindrical stalk (about 80 mm. long by 15 mm. in diameter) from which by two dichotomies there arise four erect slightly compressed branches. The branches are closely appressed and coalescent. Distantly separated oscula, seldom more than 1 mm. in diameter, occur in an irregular series along the edges of the branches. The surface is free from inequalities.[1] There is a very thin but quite distinct dermal membrane. The texture is dense; the consistency, firm and fairly tough; the colour, yellowish-brown. The total height of the specimen is 325 mm.

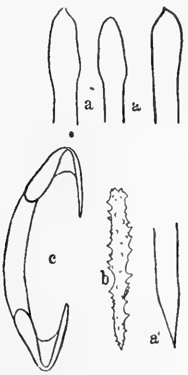

Fig. 51—*W. curvichela*. a Showing basal ends of the styli à Distal extremity of same. b Acanthostyle. c Chela.

The main skeleton is an irregular, relatively small-meshed reticulation of rather stout spongin fibres (sometimes exceeding 200 μ in diameter) somewhat densely echinated by short acanthostyles. In general, the area occupied by the fibres themselves is greater than that of the intervening spaces. A small proportion of the fibres are provided with a slender compact spicular core, but except in this respect there is no evident distinction between main and connecting fibres. A notable feature of the skeleton is the almost entire absence, except in close vicinity to the surface, of interstitial scattered megascleres. The dermal membrane contains scattered megascleres of both kinds (the acanthostyles in lesser number) and fairly numerous chelæ; the last-mentioned, also, are somewhat scarce in the choanosomal tissues.

Megascleres.—

(i.) The (auxiliary) smooth spicules are sharp-pointed cylindrical subtylostyli (or less frequently simple styli) with an elongate tylosis which usually tapers

1 The transverse ridges shown in the figure were produced by an entwining sea-weed.

more or less towards its extremity. Quite commonly the basal extremity of the spicule is either abruptly or acuminately pointed, and the spicule accordingly sometimes passes into an asymmetrical oxea. The length varies from 140 to 170 μ and the maximum diameter is 4 μ.

(ii.) The (accessory) acanthostyles are sub-conical, with moderately large, irregularly scattered, recurved spines. They are rarely less than 60 μ long and attain a size of 96 x 8 μ.

Microscleres.—

The chelæ (isochelæ arcuatæ) vary from about 18 to 27 μ in length; except for a greater curvature of the shaft in the case of the shorter spicules there is no appreciable difference in form between the longest and the shortest. In their earliest stage of development they appear as a slender, slightly curved rod; the alæ are well advanced in development before the rudiment of the front palm makes its appearance. At a certain stage of their growth many bear a rather close resemblance to the longest of the three chelæ shown in text-figure 52a for *Wilsonella oxyphila.*

Loc.—Coast of South Australia; (?) fifteen miles south of St. Francis Island ("Endeavour.")

WILSONELLA OXYPHILA, *sp. nov.*

(Plate xxxiv., fig. 3; and figs. 52, 52*a*.)

Sponge flabellate, simple or proliferous. (?) Oscula small, marginal. Surface even, or with faint radiating grooves, or areolately pitted. Dermal membrane distinct, thin. Main skeleton an irregular reticulation of moderately slender, closely echinated fibres, with a slender core of skeletal spicules. Interstitial spicules scarce. Megascleres of both kinds (the accessory in lesser number) are sparsely scattered in the dermal membrane, together with frequent chelæ. Megascleres:—(i.) Skeletal smooth substyli, 200 x 3 μ; (ii.) accessory acanthostyli and (occasional) acanthoxea, 80 x 4.5 μ. Microscleres:—Isochelæ arcuatæ, approaching the palmate form, 16 to 26 μ long.

Introductory Remarks.—There are two specimens which I assign to this species. In their external appearance there is nothing that would suggest a specific identity, but they agree so perfectly in their spicular characters that one hesitates to separate them even as different varieties. Accordingly I have thought it best, whilst uniting them under a single name, to keep their descriptions separate. The specimen which, on account of its better preservation, I select as typical of the species, is divided longitudinally into two equal portions; one portion has been retained in spirits, the other was removed and preserved in a dry state. As a result of its drying the latter has undergone a remarkable amount of shrinkage, being now scarcely more than one-half its former size.[1] The second specimen is both macerated and dry.

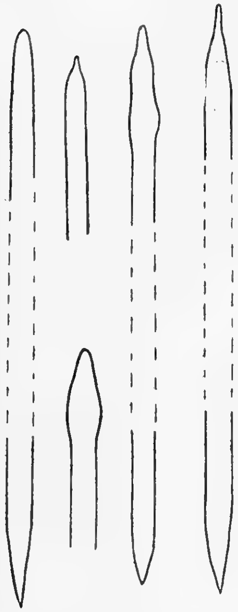

Fig. 52—*W. oxyphila.* Showing variations of the opposite extremities of the smooth megascleres.

Description.—

(*a*) *Typical Specimen.* The specimen, when complete, had the form of an oval leaf-shaped plate, with the narrower end drawn out into a short stalk, and measured 120 mm. in height, 90 mm. in greatest breadth and 8 to 10 mm. in thickness. Both surfaces exhibit a number of obscure, longitudinal, somewhat radiately disposed grooves which become more distinct towards the margin. These grooves are apparently due to the presence of canals lying immediately beneath the thin dermal membrane which have caused the latter to undergo a slight collapse. Owing to the somewhat damaged state of the surface, it is impossible to speak with certainty regarding oscula; it appears that the canals terminate along the margin of the plate in small circular openings.

The main skeleton is a reticulation of slender fibres which are fairly closely echinated by small acanthostyles. The main fibres contain a slender compact spicular core; the connecting fibres interreticulate to a slight extent and are destitute of axial spicules. Owing to the paleness of the spongin, the main fibres, by reason of their axial spicules, stand out rather conspicuously in comparison with the connecting fibres, so that at first glance the skeleton might appear to be dendritic; the false impression is, however, immediately corrected by the presence of echinating spicules on the connecting fibres. Both

[1] The piece was subsequently returned to alcohol and expanded again almost to its original size.

kinds of megascleres, in very small number, are scattered through the ground tissues and dermal membrane. Chelæ are fairly abundant in the dermal membrane, or at least in some portions of it; but are rare in the interior.

Megascleres.—

(i.) The smooth (auxiliary) spicules show all gradations in form between elongately-"headed" subtylostyli and asymmetrical oxea; they are rarely less than 140 μ, and usually between 160 and 170 μ in length, whilst their maximum size is about 200 x 3 μ.

(ii.) The spined accessory spicules are styli and oxea of similar dimensions, the latter occurring in relatively small number. The spines are small, and scattered over the whole length of the spicule. The maximum size is 80 x 5 μ; the length is rarely less than 50 μ and seldom more than 70 μ.

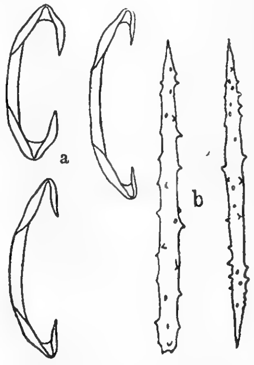

Fig. 52a—*W. oxyphila.* a Chelæ. b Acanthostyli.

Microscleres.—

Isochelæ of slightly variable shape, ranging in length from 20 to 26 μ. As a rule, as seen in profile their form approaches that of palmate isochelæ, but the shaft is slightly curved and makes a rather wide angle with the front palm; a small proportion bear a close resemblance to arcuate isochelæ. Their mode of development, however, indicates that their relationship is rather with the arcuate type of chela. In their earliest developmental stage they appear as a slender, slightly curved rod; the rudiments of the alæ next make their appearance, extending along the shaft at either end for about one-third of its length; and finally the front palm is added. In the case of quite an appreciable number of the chelæ—which otherwise attain to full proportions and indeed are usually somewhat longer than the average—the palm remains relatively small and the spicule then often bears a striking resemblance to incompletely developed chelæ of *Wilsonella curvichela.* The normal form is that of the shortest of the three chelæ shown in the adjoining text figure, though the spicule is usually not so robust.

Loc.—Near Kangaroo Island, South Australia, 17 fms. ("Endeavour").

(*b*). *W. oxyphila*, var.? (Plate xxxiv., fig. 3).

The different appearance presented by the second specimen is partly due to its intense purplish colour, and perhaps partly also to its dry macerated condition. The colour difference is of little consequence since it probably results from the presence of a symbrotic alga similar to that which affects certain other Australian species, notably *Chalina polychotoma*, Carter, *Arenochalina mirabilis* (Lendf.), Whitelegge,[1] and *Echinoclathria ramosa*, sp. nov.

In shape (Pl. xxxiv., fig. 3) it is not materially different from the typical specimen. It consists of a stipitate flabelliform plate (170 mm. in height and about the same in breadth, and 6 to 8 mm. thick) to which are added, mainly on one side, a few lamelliform outgrowths, joined to it along vertical lines.

The washed-out condition of the specimen is most unsatisfactory from many points of view for the purpose of full and accurate description, but in this case it possesses the advantage of permitting the rather characteristic gross structure of the skeleton to be readily perceived. I have not been able to convince myself that the type specimen, if macerated, would show a similar structure. The surface is everywhere irregularly covered with shallow, roughly polygonal or rounded honeycombcell-like pits on an average 2 mm. in diameter, and more or less distinctly arranged in longitudinal series running from the base to the margin of the plate. Where the sponge is thin, the "cells" may completely perforate it; when the

1 From an examination of a section which I have prepared of a fragment of a British Museum specimen labelled "*Arenochalina mirabilis* Lendenfeld, Torres Straits," and a comparison of its skeletal structure with that figured by Lendenfeld (Zool. Jahrb., 1887. taf. xxvii., fig. 28). I feel sure that this specimen is truly representative of Lendenfeld's species. I find, also, that Whitelegge's *Arenochalina mirabilis*, from Port Jackson, is closely allied to, if not identical with, the same species. Lendenfeld's description is accordingly wrong in stating that the megascleres are oxea; they are slightly fusiform subtylostyli with relatively large axial canal. Whether the typical *A. mirabilis* possesses chelæ or not I am unable to say, since, in the fragment referred to, owing to its washed-out condition, interstitial spicules are entirely absent. However, in the Port Jackson sponge there occur scattered anisochelæ palmatæ of simple form, and, since the close relationship of this sponge to Lendenfeld's is beyond doubt, one can therefore say that the genus *Arenochalina* possesses the spiculation of *Mycale*, and that it will probably form one of the sub-genera into which the latter genus will no doubt ultimately be subdivided. The external resemblance of *Arenochalina mirabilis* to *Spongelia elegans* (*c.f.*, Whitelegge—Rec. Austr. Mus., iv., pl. x., fig. 7, and Lendenfeld—Monogr. Horny Sponges, pl. xxxix., fig. 2) is so striking that it almost casts doubt on Lendenfeld's record of the occurrence of the latter species in the same area as the former, viz., at Broken Bay, New South Wales.

sponge is held up before the light, the partition between the rows of "cells" appear as ribs traversing the sponge longitudinally in a slightly radiating fashion. The consistency is fairly soft and slightly brittle.

The fibres are so densely surrounded by pigmented matter that the section required to be decolorised in order to bring them into view. The colour dissolves out in nitric acid as a bright carmine which soon disappears, particularly on warming. The skeleton differs from that of the preceding specimen in its much greater irregularity, but this is probably more apparent than real and due to the fact that the connecting fibres—owing to the dry state of the specimens and the consequent absence of interfibral substance—are no less conspicuous than the connecting fibres. In all other respects the two sponges appear to be identical.

Loc.—Oyster Bay, Tasmania, 30-40 fms. ("Endeavour").

Assuming the descriptions of *Clathria elegantula*, Ridley and Dendy, and *Clathria piniformis*, Carter,[1] to be correct in detail, it might be said that *W. oxyphila* forms a connecting link between them. The three species agree very closely in their characters; but oxeote modifications of the megascleres have not been mentioned for *C elegantula*, nor have chelæ been recorded for *C. piniformis*. It is, however, quite possible that the typical specimen of *W. oxyphila* may prove to belong to Carter's species, and the varietal specimen, to Ridley and Dendy's.

Genus Ophlitaspongia, *Bowerbank*.

In view of the existence of such a species as *Clathria transiens*, sp. nov.—in one of the forms of which, the accessory styli are smooth—the definition of *Ophlitaspongia*, as proposed by Dendy,[2] needs amendment so as to restrict the genus to species whose echinating and coring spicules (if both be present) are similar or, at any rate, not definably different. The amendment will probably necessitate the removal of *O. membranacea*, Thiele (*vide* p. 215), to *Clathria;* but, so far as I know, it affects no other species of the genus. The definition requires also to be modified in such a way as to clearly distinguish the genus from *Echinochalina* (*q.v.*). *Ophlitaspongia* has commonly been spoken of as differing from *Clathria* in the

1 Carter—Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 354; Dendy—Proc. Roy. Soc. Vict. (n.s.), viii., 1896, p. 34.

2 Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 36.

smoothness of its echinating spicules; in its restricted sense, it will be more correct to say of the genus that it differs from *Clathria* in the absence of accessory spicules. The genus is, however, a very generalised one and such species as might be included in it are capable of derivation from a number of different genera.

Owing to such species as *Clathria transiens*, *Echinochalina intermedia*, Whitelegge, *O. tenuis*, Carter, *O. tubulosa*, sp. n., and *O. nidificata*, Kirkpatrick,[1] the task of satisfactorily defining *Ophlitaspongia* is rendered rather difficult. With the exception of *O. nidificata* (for which almost unquestionably a new genus should be established) the species of which I have information seem to require some such definition as the following: "External form various, but never regularly honeycombed. Skeleton a reticulation of usually well-developed horny fibre which is cored or echinated, or both cored and echinated by smooth basical[1] styli (sometimes accompanied by oxeote modifications). The basical styli, which are typically of a single kind, may exhibit some degree of differentiation into two kinds, but there is never any definable difference of form between those which core and those which echinate, the fibres. Monactinal auxiliary spicules, occurring interstitially and in the dermal layer, are typically present. Microscleres, if present, are isochelæ palmatæ and (or) toxa."

In *O. papilla*, Bowbk., the type-species, and in *O. seriata*, Bowbk., the fibres are said to be provided only with echinating spicules. In the species described in the present paper the echinating spicules are relatively few in number and, to some extent, accidental in the occurrence; they are, in fact, precisely analagous to the spicules (of common occurrence in the genus *Clathria*) which in the case of *C. partita* I have referred to as "quasi-echinating" spicules. That such spicules are, in some cases at least, to be regarded as, in a sense, accidental, is evident from the following considerations. (i.) In the species in which these occur, the (principal) spicules are not confined to the fibres only, but also occur in the ground substance; it is quite to be expected, therefore, that some proportion of them should be found to occupy an intermediate situation, *i.e.*, partly within, and partly projecting from the fibre. (ii.) The formation of spicules at the growing-point of the fibre precedes their envelopment by spongin, and since these terminal spicules are often spread penicillately, it follows that outlying

1 Kirkpatrick—Nat. Antarctic Exped., iv., 1908, Tetraxonida, p. 25.
2 *Vide* pp. 137, 138.

individuals may sometimes be left only partially included within the completed fibre. (iii.) Owing to the continued growth in stoutness of a fibre, spicules originally lying externally, but in close proximity to it, might secondarily come to be surrounded at their basal extremity by the fibre-spongin. (iv.) In the superficial regions of the sponge, spicules which appear as if echinating, are often nothing more than the axial spicules of incipient connecting fibres; this occurs most frequently when the connecting fibres are unispicular. (v.) It sometimes happens that the development of a connecting fibre —say, an unispicular fibre—proves abortive, the fibre then appearing as a process from its supporting main fibre; in such a case, if the process were very short, its axial spicule would appear to echinate the main fibre.

In the species of *Ophlitaspongia* described herein, the echinating spicules appear to arise in one or other of the ways indicated.

Dendy[1] has remarked that his *Siphonochalina bispiculata* resembles an *Ophlitaspongia* save in the fact that the spicules are oxea; perhaps this species should be placed in the genus *Diplodemia*, Bowerbank.

Ophlitaspongia confragosa, *sp. nov.*

(Plate xxxv., fig. 2, and fig. 53.)

Sponge small, delicate; of indeterminate habit; probably consisting, in most cases, of compressed upgrowths arising from a thin encrusting base. Oscula indistinguishable, perhaps absent. Skeleton an irregular sub-renieroid reticulation of thin pauci- or uni-spicular spongin-fibres, with meshes the sides of which are usually of not more than a spicule's length. Quasi-echinating spicules are of occasional occurrence. Auxiliary spicules are scattered interstitially—in some parts, sparsely; in others, in dense profusion. Megascleres:—(i.) Straight or (seldom) slightly curved principal styli, cylindrical throughout the greater portion of their length, slightly inflated at the base and gradually tapering to a point, attaining a size of 190 x 12 μ; (ii.) auxiliary subtylostyli with a maximum size of 300 x 5.5 μ. Microscleres:—(i.) Palmate isochelæ 10 μ long; (ii.) bow-shaped toxa, 80 x 3 μ in maximum size.

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1 Dendy—Proc. Roy. Soc. Vict., vii. (n.s.), 1895, p. 246.

The single specimen, preserved in a dry state, is a small sponge of indefinite shape growing dispersedly over the fronds of a foliaceous calcareous Bryozoan. It consists in part of a thin spreading layer closely investing the surface of the fronds, and in part of irregular compressed outgrowths arising along their margins. The lamellar portions of the sponge (which constitute by far the greater portion of its bulk) have an uneven, irregularly undulating surface, and, owing to varying rates of growth at different points, an irregularly lobed and broken margin; they vary from 1 to 3 mm. in thickness, are indefinite in width, and attain, in the present instance, a maximum height of 50 mm. Owing to incomplete coalescence between the marginal lobes as growth proceeds, the lamellæ are frequently fenestrate. There are no certain indications of oscula. The surface is minutely porous. The colour is yellowish-grey; the consistency firm, compressible, slightly brittle; the texture, finely fibrous.

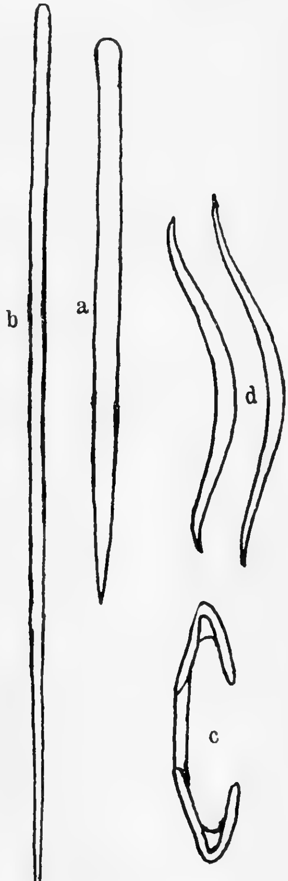

Fig. 53—*O. confragosa*. a Principal styles. b Auxiliary style. c Chela. d Toxa.

The main skeleton is a weblike sub-renieroid irregular reticulation of pale slender horny fibres with pauciserially or uniserially arranged axial spicules (principal styli). The precise formation of the skeleton is difficult of determination; apparently there is a primary reticulation of stouter fibres, the meshes of which are occupied by a secondary interreticulum of mostly unispicular connecting fibres. The outlines of the stouter fibres are vague, and the arrangement of their spicules is disorderly; they seldom exceed 40 μ in diameter. The (usually single) spicules forming the sides of the angular meshes of the interreticulum are probably always surrounded by a layer of spongin; but this is often so thin as to be indiscernible, and in such cases the spicules sometimes appear as if echinating. Quasi-echinating spicules are also of common occurrence on the more superficial fibres; these, in some if not all cases, mark the starting-points of new fibres. Scattered (auxiliary) subtylostyli occur interstitially, in some parts sparsely, in other parts in great abundance.

Megascleres.—

(i.) Principal styli straight, usually slightly expanded at the base, very nearly cylindrical throughout about three-fourths of their length and tapering thence to a sharp point, ranging in length from about 130 to 190 μ, and with a maximum diameter of 12 μ.

(ii.) Straight auxiliary subtylostyli or styli, 130 to 300 μ in length and 6 μ in maximum diameter.

Microscleres.—

(i.) Isochelæ palmatæ, fairly plentiful, 10 μ long.

(ii.) Toxa, comparatively scarce, in shape somewhat resembling the conventional bow of archery; length, 25 to 80 μ; diameter of the stoutest, 3 μ.

Loc.—Coast of New South Wales, Shoalhaven Bight, 15-45 fms. ("Endeavour").

OPHLITASPONGIA SUBHISPIDA, *Carter*.

(Plate xxxvi., fig. 1; and fig. 54.)

1885. *Echinoclathria subhispida*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 356.

Echinoclathria gracilis, Carter, *Loc. cit.*, p. 356.

1896. *Ophlitaspongia subhispida*, Dendy, Proc. Roy. Soc. Vict. (n.s.), viii., 1896, p. 36.

Sponge stipitate, with slender usually somewhat flattened branches which multiply dichotomously or (occasionally) polytomously, and extend, with or without anastomosis, in the same or in overlapping planes. Dermal membrane absent, or, at any rate, indistinct. Oscula not visible. Skeleton a regular scalariform reticulation of strongly developed horny fibres; the main fibres contain a discrete paucispicular core, the transverse fibres are without contained spicules. Principal styli are tolerably abundant in the ground substances and common as echinating *spicules. Scarce auxiliary spicules are scattered interstitially. Megascleres:—(i.) Principal styli, usually more or less curved, sub-fusiform, with a slight sub-basal waist, varying in length from about 50 (seldom less than 80) to 155 μ, and in diameter up to 5.5 μ; (ii.) auxiliary tylostyli, straight or in variable manner curved, 100 (or less) to 250 μ in length, and rarely as much as 1.5 μ in diameter. Microscleres:—Toxa, by no means scarce, 30 to 80 μ in length and never more than 1 μ in diameter.*

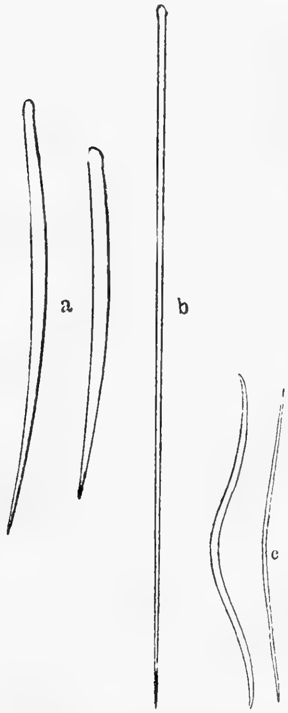

Fig. 54—*O. subhispida*. a Principal styli. b Auxiliary tylostylus. c Toxa.

The external form of this species has already been sufficiently well described, but no adequate account of the skeleton has so far been rendered; also, the information concerning the spicules is incomplete, and, to some extent, misleading. The specimen herein figured measures 100 mm. in height. The skeleton is a very regular reticulation of densely horny fibres, which are of a pale brownish tint and (except in proximity to the sponge-surface) rarely less than 70 or more than 100 μ in diameter; the main fibres contain a meagre wispy core of slender styli, the connecting fibres are vacant. As seen in median longitudinal section of a branch, the main fibres run longitudinally (in subparallelism, and from 80 to 120 μ apart) with a slight outward trend which gradually increases to a curvature as the exterior is approached, and arrive at the surface at an inclination to it varying (in different parts of the sponge) from about 45° to nearly 90°; they are joined at irregular intervals, in a scalariform fashion, by the short, stout transverse fibres. The meshes of the reticulation have their angles rounded off, and are usually elongated in the longitudinal direction; they vary in shape from circular to oblong. Owing to the absence of a dermal membrane, the free extremities of the main fibres give to the surface an appearance of hispidity.

Styli similar to those which core the fibres, *i.e.*, principal styli, occur in moderate number, both as echinating and as interstitial spicules; when interstitial, they are for the most part disposed parallely to the main fibres. Scattered between the fibres also, are a small number of very slender (auxiliary) tylostyli. The echinating spicules appear to be most abundant on the superficial fibres; but the majority of those which occur in that situation are partly or completely invested by a sheath of spongin and are evidently nothing more than the rudiments of developing new fibres. According to Carter's description the echinating spicules are of a different kind to those which core the fibres—but this is not so; for although the former are perhaps, on the average, of smaller size than the latter, yet between the two there is absolutely no difference of shape. Accordingly, it would be incorrect to suppose that *O. subhispida* bears any close relationship to such a sponge as *Clathria transita*, form (*d*), (p. 233), in which the echinating styli, although quite smooth, are quite distinct from the principal spicules.

Loc.—Port Philip, Victoria (*Carter; Dendy;* Austr. Mus. Coll.).

OPHLITASPONGIA SUBHISPIDA, *Carter*, VAR. VIMINALIS, *Lendenfeld.*

(Plate xxxvi., fig. 1, and fig. 55.)

1888. *Thalassodendron viminalis*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 225.

1902. *Thalassodendron viminalis*, Whitelegge, Rec. Austr. Mus. iv., 5, 1902, p. 214.

[1901. Not *Thalassodendron viminalis*, Whitelegge, *Op. cit.*, iv., 2, 1901, p. 87.]

My acquaintance with this sponge is limited to a single dry specimen (the one described by Whitelegge, and herein figured) which in outward form approaches, and in internal characters —except in regard to the size and, to some extent, to the shape of its spicules—exactly resembles *O. subhispida*. Indeed, the differences between the two are not so great that they might not be due to individual variation; but in order to establish this point further material is required.

The description which I have given of the skeleton pattern of *O. subhispida* is here again applicable without qualification. and as regards the external features, Whitelegge's account will suffice. The latter author's description of the skeleton is slightly misleading in one respect, inasmuch as it conveys the impression that the fibres "which curve gracefully outwards and terminate at the surface" are *branches arising from* the stouter main fibres of the "axial plexus" (as for example in *Clathria arcuophora*), whereas, as a matter of fact, they appear rather to be *direct continuations* of those fibres. The description also errs in attempting to fix precise limits to the diameters of the axial, superficial and transverse fibres.

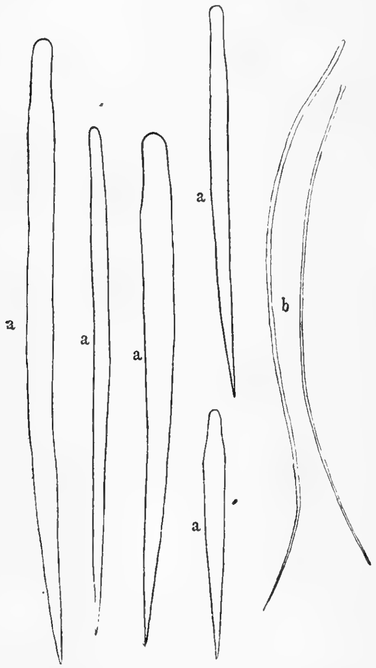

Fig. 55—*Ophlitaspongia subhispida*, var. *viminalis*. a Principal styli (selected) showing in varying degree the basal peculiarity. b Auxiliary tylostyli.

The principal styli vary in length from about 75 to 220 μ, and in diameter up to 8 or (very rarely) 9 μ; generally speaking, they agree in form with those of *O. subhispida* but are somewhat peculiar in the fact that a considerable proportion (usually of the stouter individuals) are wanting in the slight basal swelling or knob characteristic of the latter, and thus have the basal extremity shaped somewhat like the handle of an oar. However, I find that this peculiarity is also occasionally exhibited, though in a less marked degree, by the spicules of *O. subhispida*, and is therefore of doubtful value as a distinctive character of the variety.

The auxiliary spicules are slender, usually curved or flexuous tylostyli which seldom exceed 200 μ in length, and appear to be never more than 1 μ in diameter; the longest observed measured 240 μ. In *O. subhispida* also, it should be noted, the auxiliaries are sometimes flexuous.

The toxa are similar in form to, and (except for a slighter stoutness) of the same dimensions, as those of *O. subhispida*.

Loc.—Coast of New South Wales, Illawarra (Austr. Mus. Coll.).

OPHLITASPONGIA TENUIS, *Carter.*

(Plate xxxv., fig. 1, and fig. 56.)

1885. *Echinoclathria tenuis*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 355.

1886. *Phakellia papyracea*, Carter, *Op. cit.* (5), xviii., 1886, p. 379.

1896. *Ophlitaspongia tenuis*, Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 37.

[Not *Clathria tenuis*, Hentschel, Fauna Südwest-Australiens, Tetraxonida, ii., 1911, p. 377.]

[1887. (?) *Antherochalina tenuispina*, Lendenfeld, Zool. Jahrb. 1887, p. 789.]

Sponge flabelliform, thin, stipitate. Surface even. Oscula apparently absent. No dermal membrane. Skeleton: In young parts of the sponge, spongin being yet but scantily developed, the skeleton appears as a more or less "renieroid" reticulation which, in the mid-region of the lamina, is irregularly isodictyal, but which, in vicinity to the surface (owing to the presence there of outwardly-running paucispicular fibres), becomes generally rectangular; usually, also, longitudinally disposed sheaves of spicules, lying in the mid-region, produce an appearance of axial condensation. Later, there is developed in the mid-region a dense plexus of stout horny fibres which to some extent obscure, and perhaps in part ensheath, the spicules of the "isodictyal" meshwork; with increase of age, also, the lamina thickens, the excurrent fibres are correspondingly prolonged, and the rectangularly-meshed outer layer is consequently of greater width. Auxiliary tylostyli are scattered interstitially in variable number, generally singly, but also in bundles. Quasi-echinating (principal) styli are, as a rule, moderately scarce. Megascleres:—(i.) Curved tapering principal styli, typically more or less fusiform and basally manubriate or sub-basally constricted, showing signs of a slight differentiation into two kinds, ranging in length from about 75 to upwards of 240 µ, and varying in maximum diameter in different specimens from 8 to 12 µ; (ii.) auxiliary tylostyli, straight or flexuous, with a length of from 160 to upwards of 280 µ, and a maximum diameter of 3.5 µ. Microscleres absent.

This species is represented in the Australian Museum collection by eight specimens, the largest of which measures 250 mm. in height by about the same in breadth, and varies in thickness from 2 mm. at the margin, where it is thinnest, to a maximum of 5.5 mm. Smaller specimens are proportionately thinner. The lamina is, frequently, irregularly subdivided in a partite manner, and its margin is sometimes lobate. In most specimens, more or less distinct external indications of intermittent growth are noticeable; Carter no doubt refers to these when he describes the surface (of *Phakellia papyracea*) as "concentrically lineated."

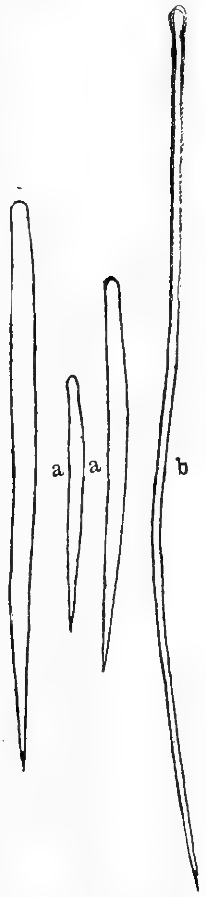

Fig. 56—*O. tenuis.* a Principal styli. b Auxiliary tylostylus. (From a Port Phillip specimen.)

The skeleton is condensed along radiating branched lines, and also, owing to continued development of spongin, greatly increases in density with increase of age; accordingly, sections taken from different portions of the same specimen may differ considerably in the pattern which they reveal. In consequence of the linear condensations of the skeleton, the marginal region of the sponge lamina, if sufficiently thin to be at all translucent, usually shows to the naked eye an appearance of subparallel venation—the "veins" being, on an average, rather less than 1 mm. apart. These veins are found to be due to the presence of abundant longitudinally disposed spicules, mostly arranged in bundles.

In the youngest, or marginal portions of the sponge, before any readily noticeable amount of spongin is developed, the skeleton (except in proximity to the surface) is an irregular "renieroid" reticulation with triangular to polygonal meshes, the sides of which are formed, as a rule, each of a single spicule enveloped in a minimum amount of spongin. Towards the surface, however, excurrent pauciserial spongin-ensheathed lines of somewhat plumosely arranged spicules (secondary fibres) make their appearance, which become more distinct as the surface is approached and terminate each in a few projecting spicules. In longitudinal section, perpendicular to the sponge lamina, these fibres are seen to be arranged pinnately with regard to the mid-line of the section; and since they usually lie closely, and are then connected by short (mostly unispicular) transverse fibres, the skeleton in its superficial portions becomes for the most part rectangular in mesh. Thus, the pattern of the skeleton changes in passing outwards from the mid-plane to the surface, from more or less irregularly "isodictyal" to more or less "scalariform." The isodictyal pattern of the mid-region is, however, in most sections, to some extent obscured or interrupted by the dense spicular aggregations constituting the "veins" above referred to.

In older portions of the sponge, the skeleton presents a quite different aspect, owing mainly to the presence, in the mid-region of the lamina, of a dense plexus of stout horny fibres. These appear to be quite analogous to the *primary* fibres of such species as *Clathria arcuophora* and *C. frondosa*, and accordingly might be so designated, although they are subsequent in order of formation to those which have been termed "*secondary*" or excurrent fibres. In contrast with the latter fibres, which are pale-coloured, the primary fibres are of a deep yellowish tint and are generally aspiculous: as the latter fact indicates, they arise, for the greater part at least, independently of the "isodictyal" spicular meshwork occupying the same region. Apparently, they are earliest developed in connection with the radial venations above referred to—the intermediate belts remaining for some time unaffected; ultimately, however, the plexus which they form extends in the mesial plane continuously. In sections from the marginal region, it is seldom that primary fibres are sufficiently developed to be distinguished; but such sections often show, in the place of these, a yellowish colouration suggestive of diffused spongin.

The different appearance of the skeleton (as seen in longitudinal section perpendicular to the lamina) in the older portions of the sponge, is due also to the increased width (consequent upon the growth in thickness of the lamina, and in length of the secondary fibres) of the rectangularly-meshed superficial layer extending between the mesial or "plexal" region and the surface; and, furthermore, the secondary fibres and their connectives are here provided with a well-developed sheath of spongin. In the older parts of the sponge, therefore, there is nothing in the character of the skeleton to warrant the statement (which Dendy has made) that "The species is interesting because it shows a structure intermediate between the Ectyoninæ and the Axinellidæ, so that it might, with almost equal justice, be placed in either group."

The principal megascleres are slightly differentiated (but are not separable) into two kinds as regards size, though not to any appreciable extent as regards shape. The larger—which are the less numerous—occur chiefly as coring spicules in the excurrent or secondary fibres and as longitudinally directed interstitial spicules in the mesial region of the sponge. Quasi-echinating spicules are most commonly met with in connection with the secondary fibres and their connectives; the frequency of their occurrence varies greatly in different specimens, and in some they are comparatively rare. The auxiliary megascleres (tylostyli) also vary in abundance, though they are never by any means scarce: they are, for the most part, scattered singly and lie parallel to the fibres; but parallel bundles—chiefly confined to the mid-region of the lamina and longitudinally disposed—also occur.

The spicule characters are as follows:—

(i.) The principal megascleres are straight to curved, gradually tapering; styli, of very variable length in any given specimen, and in different specimens differing to some extent in regard to their precise form and maximum size. In the specimen from which the spicules shown in the text figure were drawn, and in a mounted slide prepared from a piece of a British Museum specimen labelled *Echinoclathria tenuis*, they almost invariably exhibit a handle-like basal part (suggestive of the handle of an oar), about 10 to 20 μ in length, which may or may not expand slightly at the end of the spicule to form a faint basal knob. In some specimens obtained by the "Endeavour," on the other hand, the spicules approach very closely in form those of *O. inornata*, sp. nov. (text-fig. 57), and only a small proportion of them are marked by a "handle" which, even so, is usually not well defined. In the first-mentioned specimen, in which these spicules are of slenderer proportions than in any of the others, they range from about 70 to 280 (but are very seldom more than 240) μ in length, and are at most 8 μ in diameter; whilst in the last-mentioned specimens, in which their size is greatest, they range in length from 80 to 310 μ and attain a maximum diameter of 12 μ. The largest spicules are mostly to be found amongst those which project at the surface. Oxeote modifications, which appear to be always of lesser than the medium length, are of occasional occurrence. Usually, amongst the shorter spicules (of length below, say, 130 μ) there are some with a few (seldom more than one or two) spine-like prominences; these (vestigially spined?) spicules appear to occur most frequently in stouter-spiculed specimens, but in any case they are scarce and in the first-mentioned two specimens have not been observed.

(ii.) The auxiliary tylostyli are normally straight, but in some specimens a considerable proportion, perhaps even a majority, are variously flexed. They range in length from less than 160 to (usually) slightly more than 300 μ; their greatest observed length in any specimen was 350 μ.

I have quoted *Antherochalina tenuispina*, Lendenfeld, as a probable synonym of *O. tenuis* on the evidence of a small piece of a British Museum specimen labelled with the name and locality (*viz.*, Western Port, Victoria) of Lendenfeld's species. As the fragment conforms in external features with Lendenfeld's description, I have but little doubt that the name attached to it is the correct one, and would say, therefore, that in respect of its spicular characters *A. tenuispina* has been wrongly described.

In some features of the skeleton *O. tenuis* resembles *Clathria* (?) *chartacea*, Whitelegge (*vide* p. 208)—a species from which, externally, it appears to be indistinguishable.

Locs.—Port Philip, 18-20 fms. (*Carter; Dendy;* Austr. Mus. Coll.); forty miles west of Kingston, South Australia, 30 fms. ("Endeavour").

Ophlitaspongia inornata, *sp. nov.*

(Plate xxxvi., fig. 2, and fig. 57.)

Sponge stipitate, ramose; branches short and crooked, mostly confined to one plane, sometimes anastomosing. No apparent dermal membrane. Oscula doubtfully present. Skeleton: In the older parts of the sponge, the axial region of the branches is occupied by a dense plexus of stout, generally aspiculous, horny fibres, by a profusion of longitudinally-disposed extrafibral spicules (principal styli) arranged in loose bundles and strands, and by single spicules which, though generally scattered without order, appear in places as if arranged reticulately. From the axial region there run outwards and upwards to the surface, fibres with divergingly disposed and frequently echinating spicules which, at the extremity of the fibre, form a projecting tuft; these fibres are joined by transverse and interreticulating paucispicular connecting fibres forming with them rectangular and polygonal *meshes with sides of a spicule's length. All the spicules afore-mentioned are principal styli; auxiliary tylostyli are scattered in moderate number in the ground substance of the interior, but become rather abundant in parts of the outermost layer. In the youngest portions of the sponge the skeleton differs from this mainly in absence of an axial fibre-plexus. Megascleres:—(i.) Principal styli curved, subconical to slightly fusiform, usually with a slight sub-basal waist and slight basal knob, ranging in length from 75 to 220 μ, and in diameter up to 12 μ; (ii.) straight auxiliary tylostyli, 140 to 240 μ in length, 2.5 μ in maximum diameter. Microscleres absent.*

The single (spirit-preserved) specimen, the form of which is sufficiently indicated by the figure (Pl. xxxvi., fig. 2), measures 90 mm. in height, inclusive of the stalk. The colour is yellowish-grey; the consistency moderately firm and tough. Scattered over the surface at fairly close though irregular intervals, are minute rounded openings mostly less than $\frac{1}{3}$ mm. in diameter. These are scarcely discernible on some parts of the surface, very noticeable on others, being most pronounced where apparently maceration has occurred; it is therefore probable that they are subdermal. No dermal membrane, however, is observable; this may be due to imperfect preservation, yet the membrane, if originally present, must have been very thin. Towards the upper extremity of the branches a few larger openings (up to 1 mm. in diameter) occur, which are possibly oscula.

The appearance of the skeleton undergoes a marked change with increase of age owing to the formation in the axial region of the branches of a dense plexus of horny fibres. In this respect the species is quite analogous to *O. tenuis*, to which very probably it is related. The character of the skeleton in the older portions of the sponge is so similar in the two species, that what has been said in regard thereto in the case of *O. tenuis* is also applicable in the present instance, excepting that here the extrafibral spicules of the axial region are more abundant, the reticulation formed by the secondary and their connecting fibres is less regular, the coring spicules of the fibres are arranged in an axinelloid manner, echinating spicules are plentiful, and auxiliary megascleres are rather scarce. The formation of the axial plexus, however, appears to be much longer delayed in the present species, being clearly marked only in the stalk and the basal portions of the branches.

In the upper region of the branches, for a considerable portion of their length, the skeleton is composed chiefly of abundant longitudinally-directed (principal) spicules for the most part arranged in close multispicular fibre-like strands, the appearance and disposition of which is such that, at first sight, they might be mistaken for main skeletal fibres, their resemblance to the latter being heightened by the fact that the spicules composing them are held together by some amount of yellowish sponginous material. In addition to these spicular strands, however, though more or less concealed by them except towards the surface, there is a reticulation of longitudinal (main) and transverse (connecting) slender horny fibres with pauci-serially-arranged coring, and frequent echinating, spicules; the transverse fibres are usually of not more than a spicule's length. Owing to the partial concealment of the primary fibres proper, by the dense array of longitudinal spicules, it is with the strands which these spicules form, rather than with the main fibres, that the transverse fibres appear to reticulate. Finally, there are many irregularly scattered principal and auxiliary spicules, the former in greater abundance. The general appearance of the skeleton in this region of the sponge, as seen in longitudinal section, is not unlike that of *O. tenuis* as seen in a marginal section parallel to the plane of the sponge lamina—the multispicular strands in the present case taking the place of the less closely arranged "linear condensations" or "venations" of the latter species.

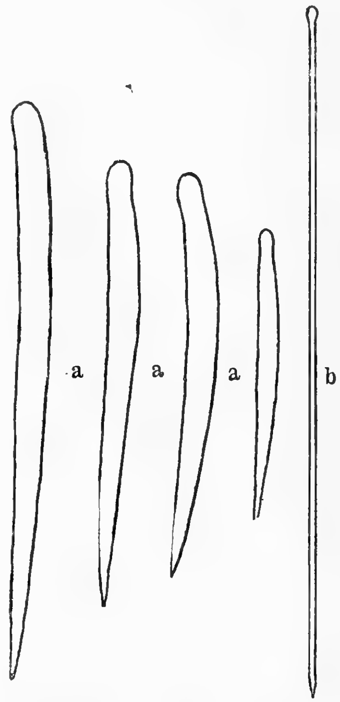

Fig. 57—*O. inornata*. a Principal styli. b Auxiliary tylostylus.

The auxiliary spicules increase in number in the superficial layer, and in some parts of it are very abundant; they lie generally parallel to the surface. Projecting beyond the surface at the extremities of the main fibres are tufts of divergently-arranged principal spicules—the terminal spicules of the fibres; the number of spicules composing such a tuft is, however, frequently greater than that in a cross-section of the fibre.

The form and size of the spicules have been given in the diagnosis.

Loc.—Coast of South Australia, fifteen miles south of St. Francis Island, 30 fms. ("Endeavour").

OPHLITASPONGIA AXINELLOIDES (?), *Dendy*.

(Plate xxxvi., fig. 3, and fig. 58.)

1896. *Ophlitaspongia axinelloides*, Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 39.

Sponge erect, lobose, stipitate; the lobes compressed. Oscula covered by a membrane. Surface even, with a minutely reticulate appearance. Main skeleton composed of moderately stout horny fibres forming an irregular to subrectangular reticulation with meshes of greatly varying size, except superficially, where they are uniformly smaller. Main fibres provided with a meagre core of loosely arranged (principal) spicules, some of which are disposed echinatingly; connecting fibres generally with one or a few spicules uniserially arranged. Superficial skeleton consisting of closely arranged, outwardly projecting tufts of principal spicules. Auxiliary spicules (styli) are scattered interstitially in moderate numbers, together with less numerous principal spicules, and are rather abundant in the oscular membranes where they are arranged radiately. Megascleres:—(i.) The principal spicules are normally styli, straight, subconical to slightly fusiform, but an appreciable proportion (say 1 in 20) are secondarily diactinal (oxea); their length ranges from about 80 to 135 μ, whilst their maximum diameter (which is rarely attained by individuals longer than 120 μ) is 11 μ; (ii.) auxiliary styli, straight, cylindrical, rapidly tapering to a sharp point, 115 to 200 μ in length, and with a maximum diameter of 5 μ.

A single specimen, in the collection of the Australian Museum, agrees so well, on the whole, with *O. axinelloides*, as to render it highly probable that its points of difference from the specimen described by Dendy are purely individual; accordingly I have refrained from bestowing upon it a distinctive name. The specimen (Pl. xxxvi., fig. 3), which measures 115 mm. in height, is incomplete, representing apparently about one-half of the original, and consists of a single much compressed lobe, together with the longitudinally bisected stalk.

It differs from *O. axinelloides* as described, chiefly in regard to the situation of the oscula, in the larger size, and lesser abundance in the fibres, of the principal spicules, and in the much greater development of the superficial ("dermal") skeleton.

On casual inspection, oscula appear to be absent; but along the margin and one side of the lobe are to be noticed, here and there, light-coloured rounded spots, 1.5 mm. or less in diameter, which prove to be concealed oscula-like openings covered only by a thin membranous diaphragm continuous with the (elsewhere very thin and scarcely discernible) dermal membrane.

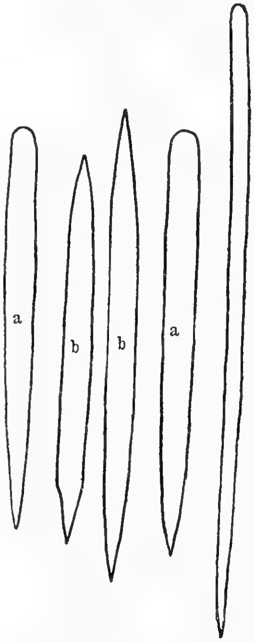

Fig. 58—*O. axinelloides* a Principal styli. b Oxeote modifications of same. Auxiliary stylus (unlettered).

The "oscular membranes" contain numerous radially disposed horizontally-lying auxiliary styli, which are absent from other parts of the dermal layer. A dermal skeleton proper can, therefore, hardly be said to be present. There is, however, a superficial skeleton of a special kind, formed of closely situated tufts of principal spicules; these tufts, to the presence of which is due a minutely reticulate appearance of the surface, are borne upon extremely short fibres, or rather processes, which arise from the superficial transverse fibres.

In the description of *O. axinelloides* the fibres are said to be about 70 μ thick and to be pretty abundantly cored by styli about 100 x 8 μ in size. In the present specimen, the fibres may attain a diameter of 100 μ, and are sparsely cored—the spicules being seldom more than, or even as many as, three in a cross-section of the fibre; moreover, the spicules (*i.e.*, the principal spicules) are, as already indicated in the diagnosis, of notably larger size. Similar spicules in moderate number also occur interstitially; and scattered plentifully among them, as in *O. axinelloides*, are longer and slenderer (auxiliary) styli of variable size. The range in size of the auxiliary styli can be determined with certainty only by measurement of those which lie in the "oscula membranes" (from which principal spicules are always absent), since the shorter individuals are scarcely, it at all, distinguishable from the slenderer principal styli.

Loc.—Port Phillip (Austr. Mus. Coll.).

OPHLITASPONGIA CHALINOIDES, *Carter*.

(Fig. 59.)

1885. *Axinella chalinoides*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 358.

1886. *Axinella chalinoides*, var. *cribrosa*, Carter, *Op. cit.*, (5), xviii., 1886, p. 358.

Sponge stipitate, ramose; branches usually somewhat compressed, about 9 mm. in lesser diameter, multiplying dichotomously or sometimes polytomously, and occasionally uniting by anastomosis. Oscula, chiefly in two rows on opposite sides of the branches, usually more or less concealed by an extension across them of the thin dermal membrane. Skeleton composed of well-developed horny fibres (60 μ in diameter), forming a small-meshed irregular to subrectangular reticulation. Main fibres provided with a meagre core of loosely and somewhat plumosely arranged small (principal) styli; connecting fibres with one or a few spicules uniserially arranged. The terminal spicules of the main fibres project slightly beyond the extremity of the fibre, but there is no special development of superficial tufts of spicules as in O. axinelloides. Quasi-echinating spicules somewhat scarce. Auxiliary spicules (styli) are scattered interstitially in considerable number, accompanied by a few principal styli; they become more abundant close beneath the surface (here lying parallel with the main fibres), and in the dermal membrane, where they lie horizontally. Megascleres:—(i) Principal styli (rarely oxea) straight, cylindrical throughout the greater part of their length, and gradually tapering to a sharp point, 75 to 110 μ in length, and, in different specimens, from 3 to 5.5 μ in maximum diameter; (ii.) auxiliary styli straight or flexed, cylindrical to within a short distance of the pointed end, 120 to 195 μ long, and up to 2.5 μ in diameter.

This species has been written by Dendy[1] as a possible synonym of *O. subhispida*—though there is little in the descriptions of the two that would suggest an identity. However, in the Australian Museum collection of Port Phillip sponges there are five specimens, in external appearance much resembling a *Chalina*, which—if allowance be made for certain differences attributable to differences in condition of preservation—agree so well with the description of *Axinella chalinoides*, var. *cribrosa*, that I feel no hesitation in identifying them as such. These also agree equally well with the typical *A. chalinoides*, save that, concerning the latter, auxiliary megascleres have not been mentioned; but these spicules might easily be overlooked, and I therefore regard it as extremely probable that *A. chalinoides* and its so-called variety are the same.

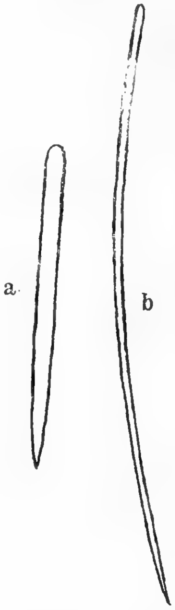

Fig. 59—*O. chalinoides*. a Principal stylus. b Auxiliary stylus.

One of the five specimens, which is dry and dermally denuded, has compressed dichotomous branches and many marginally-situated shallow crateriform oscula, each of which forms the common orifice of several (usually three or four) excurrent canals opening into its base. In the remaining specimens, preserved in alcohol, the branches are either cylindrical or compressed and, owing to rapidly repeated dichotomy, sometimes appear to divide polytomously; and the oscula which are not entirely confined to opposite sides of the branches, are more or less concealed from view by a covering membrane or diaphragm, continuous with the thin though well-defined dermal membrane. The oscula diaphragms may be (apparently) entire, or may have a small central circular aperture; sometimes, owing probably to collapse, they are depressed below the general surface, and are then in a few cases radially wrinkled. Immediately beneath the thin transparent dermal membrane are numerous subdermal spaces or lacunæ, which can be seen to lead by rather large circular pores into the incurrent canals. To these lacunæ and pores is due, probably, a

1 Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 36.

certain uneven and pitted condition of the surface in the dry specimen mentioned above; but when, as in the other specimens, the dermal membrane is intact, the surface is generally free from inequalities.

With regard to the oscula in the specimens examined by him, Carter says concerning *A. chalinoides*, that they are "often accompanied by a stelliform radiation," due to "collapse of the dermal sarcode over subjacent excretory canals" immediately surrounding them; and concerning *A. chalinoides*, var. *cribrosa*, that they are "deeply sunk into the tissue and rendered stelliform by grooves radiating from them to the surface." Although in the case of the present specimens no such appearance is exhibited, the facts concerning them to which I have referred, render it conceivable that this is due merely to difference in condition of preservation.

The arrangement of the fibres is very similar to that of *O. axinelloides*, but the meshes are of more uniform size. Oxeote modifications of the principal megascleres have been observed, but they are rare. The slenderer principal megascleres are scarcely or not at all distinguishable from the shorter auxiliary megascleres.

Loc.—Port Phillip, Victoria (*Carter*; Austr. Mus. Coll.).

Ophlitaspongia tubulosa, *sp. nov.*

(Plate xxxv., fig. 3, and fig. 60.)

Sponge with the habit and texture of Siphonochalina; sessile, with short erect tubes arranged in panpipe-like series. Surface even. Skeleton a tolerably regular reticulation of slender, though tough and dense, horny fibres; the main fibres only, are very sparsely cored with straight stylote and (very rare) oxeote spicules, cylindrical to within a short distance of the pointed extremity, and attaining to a maximum size of 120 x 4 μ. Quasi-echinating spicules of like kind are of occasional occurrence. Scattered interstitially, though chiefly or entirely confined to membranes stretched between the fibres, are (relatively) moderately abundant megascleres of perhaps two kinds, viz.: (i.) Straight styli (and rare oxea) of similar shape to those of the fibres, but usually much longer, and somewhat slenderer, with a maximum size of 220 x 3.5 μ; and (ii.) very slender flexuous styli and oxea attaining a maximum length of about 260 μ. Microscleres absent.

This species is represented by two dry and washed-out specimens. The sponge, which is attached by an encrusting basal disc, consists of a clustered mass of short erect tubes which multiply both by branching and by the upgrowth of new ones from the base. Branching takes place, typically, in such a way as to give rise to an arrangement of the tubes side by side in single, longer or shorter, series. The component tubes of each such series may fuse with each other laterally so as to form a plate with the tube-orifices in a single row along its upper margin, or they are more or less free from one another except at their bases. Anastomosis occurs freely wherever tubes of the same or different series come into contact. The two specimens are approximately equal in size: the slightly larger is 75 mm. high and 100 mm. by 65 mm. broad. The free terminal portions of the tubes in no case exceed 20 mm. in length, and are 6 to 10 mm. in external, and 3 to 5 mm. in internal, diameter. The pseudoscula are of the same diameter as the tubes internally. The texture, as shown by washed-out specimens, is similar to that of a Chalinine sponge. As regards consistency, the sponge is compressible and elastic, and fairly tough. The colour varies, even in different portions of the same specimen, from brownish-yellow to dark-brown.

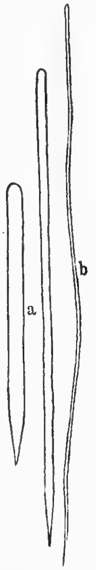

Fig. 60—*O. tubulosa.* a Principal styli—the shorter, intrafibral; the longer, interstitial. b (?) Auxiliary stylus.

The skeleton is a wide-meshed reticulation of densely horny fibres of a deep brownish-yellow colour, of which only the main fibres contain a slender core of pauciserially (or sometimes even uniserially) arranged small spicules. The main fibres may (rarely) attain to 80 μ in stoutness, but are usually less than 60 μ; the diameter of the connecting fibres varies from 10 to about 40 μ. The former are distinguishable into two categories which might be termed, respectively, *primary* and *secondary* (or *excurrent*) main fibres, viz.: (i.) those which ramify over the inner surface of the pseudoscular tubes and form, with the aid of connecting fibres, a strong, irregularly-meshed, supporting reticulation; and (ii.) those which, arising as branches from the preceding, traverse the tube-wall obliquely upwards and outwards to the exterior surface. The last-mentioned, or *secondary* main fibres, rarely branch; but, towards the outer surface, they are supplemented by the interpolation of others which arise from their connecting fibres. Their connecting fibres either may be simple, forming direct transverse connections between them—in which case the reticulation is more or less rectangular—or, less frequently, may branch and interunite, thus forming between them an interreticulation, and rendering the pattern of the skeleton irregular. The fibres are here and there, at very wide intervals, echinated by spicules (similar to those within the fibres) which, as a rule, project but slightly beyond the spongin. The meshes of the reticulation are tympanized by very thin membranes (visible, perhaps, only in washed-out specimens) in which moderately abundant slender spicules lie scattered.

There is no indication, in the present condition of the specimens, of a dermal membrane or of a dermal skeleton. The main fibres terminate abruptly at the surface with their end-spicules projecting slightly beyond the spongin.

Spicules.—Microscleres are absent; the megascleres are, for the purpose of description, separable into three groups:—

(i.) The spicules of the fibres, straight styli, cylindrical to within a short distance of their pointed extremity, ranging in length from 80 to about 120 μ, and rarely slightly more than 4 μ in diameter; occasionally an oxea is found amongst them.

(ii.) Straight or but slightly flexed interstitial spicules, identical in form with the preceding, but mostly much longer, attaining to a length of 220 μ, and not more than 3.5 μ in diameter. Oxeote modifications of these occur more frequently than amongst the fibral spicules but are nevertheless comparatively rare.

(iii.) Variously curved and flexuous, very slender, interstitial spicules, about equal in abundance to those of the second group, frequently exhibiting oxeote modifications, seldom exceeding 1.5 μ in diameter, and of very variable length; the longest observed measured 264 μ.

The identity in form of the spicules of the first two groups and the complete transition between them in the matter of size, permit of no other conclusion than that they are but partially differentiated derivatives of an originally single spicule-form. I regard them as homologous with the *principal* megascleres of other species. Whether the spicules of the third group are merely variants of the same, or whether they are representative of *auxiliary* megascleres, I am unable to decide.

O. tubulosa, regarded as a species of *Ophlitaspongia*, seems to me rather divergent. In a number of respects it bears analogies with *Siphonochalina bispiculata*, Dendy,[1] and is possibly related thereto.

Loc.—South-east coast of Australia ("Endeavour").

Genus Echinoclathria, *Carter*.

External form various; sponge made up of a honeycomb-like mass of anastomosing flattened trabeculæ. Skeleton—except, perhaps, when foreign particules are included in excessive abundance—a reticulation of fibres usually well provided with spongin. Megascleres of two kinds, distinguishable into principal and auxiliary; the former are smooth styli, typically occurring in association with the fibres as coring or echinating spicules; the latter, which vary in form from tylotornota to amphistrongyla, occur interstitially. Microscleres may be present in the form of palmate isochelæ.

The above, which is an adaptation of the original diagnosis proposed by Ridley and Dendy, is designed so as to secure on the one hand the exclusion from the genus of such species as *E. glabra*, R. and D., and on the other the admission into it of the species of Lendenfeld's genus *Aulena*.[2] The modification of the definition in these respects introduces no innovation, for Thiele[3] has already expressed the probably correct opinion (*vide* p. 288) that *E. glabra* belongs to his genus *Echinochalina*, and Dendy,[4] by his inclusion in *Echinoclathria* of a species of *Aulena* has tacitly rejected the latter genus.

Speaking of *Echinoclathria* and *Aulena* in the sense in which they would be understood if maintained as separate genera, it may be said that although each of the species of *Aulena* departs in several noteworthy respects from those of *Echinoclathria*, yet they possess in common no single character of recognised systematic value by which they may be distinguished from the latter, unless it be their habit of including foreign particles in the skeleton. In other words, the separation of the two genera depends ultimately upon the presence or absence of extraneous skeletal elements. Similarly,

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1 Dendy—Proc. Roy. Soc. Vict., vii. (n.s.), 1895, p. 246.

2 Lendenfeld—Monograph of the Horny Sponges, 1888, p. 91.

3 Thiele—Kieselschwamme von Ternate, ii., 1903, p. 962.

4 Dendy—*Echinoclathria arenifera*, Proc. Roy. Soc. Vict., 1896, p. 40.

Echinoclathria is ultimately separable from *Ophlitaspongia* only by virtue of its characteristic honeycomb-like structure; for although the auxiliary spicules of the former are typically quasi-diactinal, yet in *E. carteri*, as in the species of *Ophlitaspongia*, they are stylote. This structural peculiarity of *Echinoclathria* (and of *Aulena*) is, however, theoretically of questionable generic value, inasmuch as it is probably nothing more than the extreme specialisation of a not uncommon mode of growth, and is, in fact, actually attained in other genera in the case of *Plectispa macropora* and certain species of *Echinochalina*. Consequently, whether the proposal might be to merge *Echinoclathria* and *Aulena* in *Ophlitaspongia* or to keep all three genera distinct, no serious objection could in either case be raised, but the more reasonable course seems to be to regard the series of forms which they embrace as constituting two genera, with the line of division falling between *Ophlitaspongia* and *Echinoclathria* rather than between *Echinoclathria* and *Aulena*.

I might here remark that the peculiar genus *Allantophora*, Whitelegge,[1] which its author regarded as intermediate between *Ophlitaspongia* and *Echinoclathria*, offers no justification for its retention amongst the Myxillinæ, and perhaps had better be placed, provisionally, with the Mycalinæ. In its microscleric characters, the genus—which is represented by but a single species—stands unique; but of known forms it perhaps most nearly approaches the equally peculiar *Crambe crambe*, O. Schmidt.[2] Apart from a certain amount of similarity in the formation of their fibres, an argument in favour of a relationship between the two lies in the possibility of an homology between the desmoids of *Crambe* and the microstrongyles of *Allantophora*. I cannot agree with Whitelegge that in *A. plicata*, the so-called echinating spicules are in any way different from those of the fibre-axis.

ECHINOCLATHRIA FAVUS (*Carter*), Ridley and Dendy.

(Fig. 61.)

1885. *Echinoclathria favus*, Carter, Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 292.

1887. *Echinoclathria favus*, Ridley and Dendy, "Challenger" Monaxonida, 1887, p. 160, pl. xxxi., figs. 4, 5, 5a.

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1 Whitelegge—Mem. Austr. Mus., iv., 1907, p. 505.

2 Thiele—Arch. f. Naturg., 1899, p. 87.

Sponge massive or branched, commonly growing upon the shell of a Pecten. The superficial lamellæ present their edges to the exterior, forming cells of irregular, often elongate and meandrine, shape; these cells vary in width, in any given specimen, from about 2 to 6 mm. The main fibres are sparsely cored; the connecting fibres are usually aspiculous. Echinating spicules are not wholly confined, as is usually the case in other species, to the external aspect of the superficial connecting fibres. Auxiliary spicules moderately abundant. Megascleres:—(i.) Principal styli straight, fusiform, with greatest diameter about the middle of their length—size, 75-105 x 5 μ; (ii.) auxiliary strongyla ranging in length from (rarely less than) 135 to 170 μ, and seldom as much as 1.5 μ in diameter. Microscleres:—Isochelæ palmatæ, scarce, of extreme tenuity, 8 to 12.5 μ long.

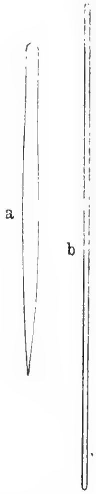

Fig. 61—*E. favus.* a Principal style. b Auxiliary strongyle. (Chela not figured.)

Four specimens of this species were obtained, all of which encrust the shells of living Pectens. They very closely resemble in external appearance the specimen shown in Pl. xxxi., fig. 4, of the "Challenger" Report. There is nothing of importance that I can add to Ridley and Dendy's description except that I have found the auxiliary spicules to be invariably strongyla.

Locs.—Bass Strait, off Moncœur Island, 38 fm. ("Challenger"); off Devonport, Tasmania ("Endeavour").

ECHINOCLATHRIA RAMOSA, *sp. nov.*

(Plate xxx., fig. 3, and fig. 62.)

1901. *Echinoclathria macropora*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, pp. 89, 117.

[Not *Plectispa macropora*, Lendenfeld, Austr. Mus. Cat. Sponges, 1888, p. 226.]

[Not *Echinoclathria macropora*, Whitelegge, Austr. Mus. Mem., iv., 10, 1907, p. 504.]

Shrubby substipitate sponges, with short cylindrical or but slightly compressed branches (averaging about 10 mm. in diameter) which multiply dichotomously and *usually anastomose freely. The superficial lamella present their edges to the exterior. The superficial "cell-apertures" are polygonal or slightly rounded, averaging about 2 mm. in diameter. Main fibres with a pauci-spicular core; connecting fibres usually vacant. Echinating spicules (apparently) confined to the superficial fibres. Auxiliary megascleres rather scarce. Megascleres:—(i.) Principal styli, straight, with a sub-basal waist or constriction, usually slightly fusiform, varying in size in different specimens from 70-95 x 5 μ to 90-120 x 8 μ; (ii.) auxiliary strongyla, with a maximum length of between 140 and 160 μ, and a maximum diameter of between 1.2 and 2 μ. Microscleres:—Isochelæ palmatæ, rare (or absent?).*

Reasons for regarding this species as distinct from Lendenfeld's *Plectispa macropora* are indicated in the remarks on the genus *Plectispa*.

It is a low, generally profusely branched and shrubby sponge with a much abbreviated stalk, the base of which often is extended into a disc-like foot; the first-formed branches sometimes take origin from the disc, and the sponge may then appear as if provided with several stalks. The basal portion of the sponge, just as are the branches, is formed of reticulating lamellæ. Branching takes place by dichotomy which, as a rule, is rapidly repeated. The sponge, as growth proceeds, typically assumes the form of a hemispherical cluster of short freely anastomosing branches; occasionally, owing to a reduction of the tendency towards rapid branching, the branches become more elongated, anastomosis is less frequent and the sponge assumes a more erect and arborescent habit. The largest of a considerable number of specimens measures 150 mm. in height and 200 x 130 mm. in transverse dimensions. The longest unbranched branches met with in any specimen, measured 75 mm. in length. (The species recorded as *E. macropora* by Whitelegge in his report on the "Thetis" sponges, in which the branches sometimes attain a length of over 300 mm., and the sponge a height of 500 mm., is *E. carteri*, R. and D.)

The superficial lamellæ do not, as a rule, stand quite perpendicularly to the general surface, but are directed somewhat obliquely forwards, *i.e.*, in the direction of growth of the branches; their outer edges are usually somewhat jagged. The superficial "cell apertures" are normally hexagonal, but in some specimens, particularly when the branches are compressed, they show a tendency to become elongated in the direction of the branch-axis; they average slightly less than 2 mm., and rarely exceed 2.5 mm., in diameter.

Judging from the rather abundant material at my disposal, it would seem that decrease in the frequency of branching and anastomosis, increase in the length of branches and the assumption of a more erect habit, the tendency of branches to become compressed, of cell-apertures to become elongated, and of the external edges of the superficial lamellæ to become jagged—are concomitant variations.

The sponge is of fibrous texture, and, in the dry state, tough and resilient. Some specimens are of an intense purplish colour owing to the presence of a symbiotic alga; otherwise the colour of the dry sponge varies between yellowish-grey and pale brown.

The skeleton is a compact reticulation of slender horny fibres readily distinguishable into main and connecting. The main fibres, which run (in approximate parallelism) in the direction of growth of the lamellæ, contain a meagre core of (principal) styli; at the outer or growing edge of any lamella, their terminal spicules form a slightly projecting tuft. The connecting fibres to some extent interreticulate irregularly between the main fibres and are usually aspiculous. The echinating styli, which—contrary to the statement of Whitelegge—are in no way different from those within the fibres, appear to be entirely confined to the outer side of the fibres which lie immediately beneath the lateral surfaces of the lamellæ. The auxiliary megascleres are strongyla—not subtylostyli, as previously stated.

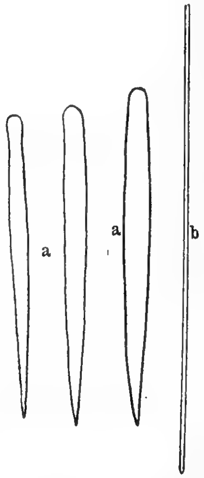

Fig. 62—*E. ramosa* a Principal styles. b Auxiliary strongyle.

In none of the specimens which I have examined have I been able to detect chelæ. Whitelegge, however, has observed "in well-preserved specimens" a few scattered isochelæ 10 μ in length.

A point worthy of special note is the relatively great variability in the maximum size (95 x 5 to 120 x 8 μ) of the principal megascleres; and in reference thereto I might mention that, between specimens which showed the opposite extremes in this particular, I have been unable to discern any difference whatever in external characters

Hab.—Coast of New South Wales, in shallow water (Austr. Mus. Coll.).

ECHINOCLATHRIA ARBOREA, *Lendenfeld.*
(Plate xxix., fig. 2, and fig. 63.)

1888. *Plectispa arborea*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 226.
[Not *Clathria (Plectispa) arborea*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 88.]

1901. *Echinoclathria elegans*, Whitelegge, *Loc. cit.*, p. 90.
[Not *Plectispa elegans*, Lendenfeld, Cat. Sponges Austr. Mus., 1888, p. 226.]

Sponge stipitate, arborescent, branching dichotomously; branches elongated, cylindrical, averaging 7 mm. in diameter, seldom anastomosing. The superficial cell-apertures are not bounded by lamellæ disposed edgewise to the surface: normally, they are circular or oval in outline, and, on the average, are less than 2 mm. in width and about the same distance apart; but in some specimens the trabeculæ are rod-shaped, and the structure is then no longer cellular, but clathrate. Main fibres with a paucispicular core; connecting fibres either with uniserially arranged spicules, or vacant. Echinating spicules most abundant upon, but not restricted to, the superficial fibres. Auxiliary megascleres variable in number, sometimes rather scarce. Megascleres (similar in form to those of E. ramosa):—(i.) Principal styli varying in maximum size in different specimens from 100 x 5.5 to 120 x 7 μ; (ii.) auxiliary strongyles, maximum size, 135 x 1.3 μ. Chelæ (apparently) absent.

Introductory.—I have already pointed out (p. 204) that the sponge identified by Whitelegge as *Plectispa elegans* is certainly not that species, and have indicated the chief reasons for regarding it as identical with Lendenfeld's *Plectispa arborea*. These reasons perhaps require to be more explicitly stated. Concerning *Plectispa arborea*, Lendf., one can draw the conclusion from what Lendenfeld has written, that the species is possessed of a structure in some way analogous to that which is characteristic of *Echinoclathria*—and, more particularly, of such species as *E. ramosa*: for the sponge is described as "dendritically ramifying;" and in the diagnosis of the genus *Plectispa* we are told that the sponges belonging thereto are "elegantly reticulate." The account of its spiculation also, lends support to the opinion that the species belongs to *Echinoclathria*. Consequently, considerable importance attaches to the statement that the sponge has—an unusual feature amongst the species of *Echinoclathria*—a "clearly-defined stem." As to the precise nature of the reticular structure of *P. arborea*, the description omits to inform us: the omission, however, affords reason for supposing that the external appearance of the sponge is, at any rate, not altogether such as would suggest the term "honeycomb-like," inasmuch as Lendenfeld expressly uses this term, apparently in a distinctive way, in connection with another of his three species of *Plectispa* (viz., *P. macropora*). To sum up, we may say that the evidence is greatly in favour of the supposition that *P. arborea* is a species of *Echinoclathria*, peculiar in the possession of a well-defined stem and in the lack (owing probably to the manner of arrangement of the trabeculæ) of an external appearance resembling that of honeycomb. Since it is precisely in these respects that the specimens of Whitelegge's *Echinoclathria elegans* are distinguished from the sponges of the remaining known species of *Echinoclathria*, it is without hesitation that I here further describe them, with the addition of figures, under the name of *E. arborea*, Lendf.

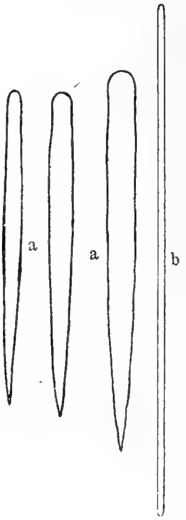

Fig. 63—*E. arborea*. a Principal styles. b Auxiliary strongyle.

Description.—In its skeletal characters generally, including the size and form of the spicules, this species shows no points of difference from *E. ramosa*. Like the latter, also, it is invariably of ramose habit; but the branches are relatively fewer and longer, and the sponge, therefore, is arborescent—not shrub-like. The essential differences between the two species lie in the character of the stalk and the form and disposition of the trabeculæ.

The stalk is peculiar in the fact that it is structurally different from the branches—being almost or, sometimes, even quite solid; its condition in certain cases, however, indicates that the non-trabecular structure is secondary. The foot of the stalk usually spreads out into a disc of attachment: in the specimen described by Lendenfeld, this would seem to have been unusually large—"an extensive basal plate, slightly compressed, and about 8 mm. thick."

The trabeculæ of the branches are normally more or less lamellar, but are relatively much stouter than in other species. Occasionally, in parts of a specimen, or even throughout an entire specimen, they are cylindrical, rod-shaped; and, accordingly, in such cases, the structural character typical of *Echinoclathria* is widely departed from. When the trabeculæ are lamellar, those which are situate at the surface of the sponge are not disposed edgewise to the exterior, as in other species, but are directed tangentially, and form wide "borders" between perfectly rounded (circular or oval) "cell-apertures:" the effect is analogous to that which would be produced in a species (like *E. rotunda*) with large "cells" separated by *vertical* lamellæ, if the outer edge of the lamellæ were to expand into a broad horizontal flange, thus concealing the lamellæ themselves and reducing the size of the "cell-apertures."

Of the half-dozen specimens in the Australian Museum, the largest (shown in Pl. xxix., fig. 2) is that which Whitelegge (*loc. cit.*) mistakenly supposed to be the type of *Plectispa elegans*; it measures 230 mm. in height, and is thus not so tall as the largest of Lendenfeld's specimens, which measured 300 mm. In the dry state, the sponge varies in colour from brownish-grey to dark brown, and is of compressible and elastic consistency; there is some peculiarity in the texture of the sponge which produces a "soft" appearance, suggesting that of felt. Whitelegge's statement that the sponge is "rather brittle when dry," is true only of his "type" specimen, mentioned above; the brittleness in this case appears to be due to decay. Both Lendenfeld and Whitelegge have stated that the echinating styli are shorter than those which core the fibres; I fail, however, to find any difference between them. Also I find that the auxiliary megascleres are invariably strongyla—not subtylostyli, as stated by Whitelegge.

Locs.—The species is known only from two closely situated localities, Port Jackson and Tuggerah Beach.

ECHINOCLATHRIA ROTUNDA, *sp. nov.*

(Plate xxx., fig. 1, and fig. 64.)

Sponge oval or pear-shaped, unbranched, symmetrical. The lamellæ throughout are arranged parallely to the lines of growth of the sponge, and at the surface, accordingly, are disposed edgewise to the exterior; in the inner region of the sponge they are elongated and so form the partition-walls of radially disposed tubes. External "cell-apertures" hexagonal or (occasionally) elongate, on the average about 4 mm. in width. Skeleton consisting of subparallel multi- or pauci-spicular main fibres joined by interreticulating uni- and a-spicular connecting fibres. Echinating styli plentiful, confined to the outer aspect of the fibres. Scattered auxiliary spicules fairly abundant; interstitial principal styli scarce. Megascleres:—(i.) Principal styli, straight, with slight sub-basal waist when fully grown, subfusiform in younger stages, size 80 to 125 x 7.5 μ; (ii.) auxiliary amphistrongyla, or occasionally subtylostrongyla, size 120 to 170 x 2 μ. Microscleres:—Slender isochelæ palmatæ, moderately abundant, 9 to 12 μ long.

This species is represented by two specimens, the larger of which is 100 mm. high, 30 mm. in diameter at the base, and 65 mm. in diameter near its upper extremity where it is broadest. The lamellæ are thin and somewhat parchment-like, and, in keeping with the symmetrical shape of the sponge, display a marked uniformity of arrangement, being so disposed that their planes lie parallel to imaginary lines radiating upward with an outward curvature from the sponge-base to the free periphery. The superficial lamellæ enclose between them usually hexagonal "cells," averaging 4 mm. in diameter; occasionally, however, owing to the incompletion (or non-formation) of intervening lamellæ, several adjoining "cells" may, so to speak, run into one. In the interior of the sponge the lamellæ are relatively long and thus give rise to a tubular structure; in the outer portions of the sponge they are comparatively short and form a more open reticulation.[1]

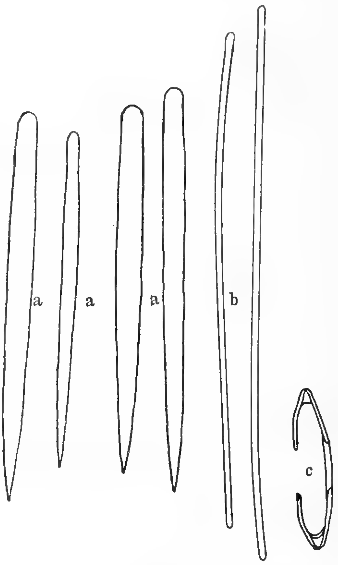

Fig. 64—*Echinoclathria rotunda.* a Principal styles. b Auxiliary strongyles. c Isochela palmata.

With regard to skeletal characters, there is nothing of importance which might be added to what has been mentioned in the diagnosis, except that the fibres within the lamellæ

1 The regularity of the arrangement of the lamellæ in this species enables one to perceive more readily than in the other species herein described, the mode of growth by which the characteristic *Ecihnoclathrian* structure is attained. The formation of new tissue appears to be confined chiefly, if not entirely, to the peripheral region of the sponge, and proceeds in two ways—(i.) by the outward growth, at their outer edge, of the superficial lamellæ; and (ii.) by the formation of new lamellæ. Growth of the first kind increases not only the external dimensions of the sponge, but also, owing to the convexity of its surface, the size of the superficial "cell-apertures." Outward growth of the edge of any given lamella appears to be limited, or, at least, intermittent; and this cessation of growth of now one, now another. of the superficial lamellæ, results in the confluence of adjoining "cells," and thus is also, indirectly, a cause of cell-enlargement. The formation of new lamellæ counteracts this increase in size of the "cell apertures;" each lamella arises, as a tongue- or strap-shaped process, at or near the outer edge of an older superficial lamella—particularly one forming the longer side of an elongated cell—and, growing across the cell aperture, forms at first a narrow septum, dividing it into two. Thereafter, its further increase of size is effected by outward growth along its exterior edge, i.e., in a direction at right angles to its earliest direction of growth.

appear, not to form a tri-dimensional reticulation, as in the preceding species, but, in keeping with the thinness of the lamellæ, to reticulate in a single plane.

Loc.—South coast of Australia; exact locality unknown ("Endeavour").

ECHINOCLATHRIA CARTERI, *Ridley and Dendy.*
(Fig. 65.)

1887. *Echinoclathria carteri*, Ridley and Dendy, "Challenger" Monaxonida, 1887, p. 162, Pl. xxix., figs. 12, 12a; Pl. xxxi., figs. 3, 3a.

1907. *Echinoclathria macropora*, Whitelegge, Austr. Mus. Mem., iv., 10, 1907, p. 504.

[Not *Echinoclathria macropora*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, pp. 89, 117.]

Sponge (unless young) ramose, probably astipitate and basally encrusting; branches cylindrical, growing to a considerable length. Lamellæ thin; superficial lamellæ, as a rule, disposed edgewise to the exterior. Superficial "cell-apertures" rounded or polygonal, 2 to 3 mm. in width. Skeleton a very irregular small-meshed reticulation, apparently in one plane (as in E. rotunda), consisting of pauci- and uni-spicular (or, rarely, aspicular) spongin-fibres, together with a few multispicular fibres poor in spongin. The outlines of the fibres are indistinct, owing to interstitial membranes, and the pattern of the skeleton much obscured by the abundance of irregularly scattered (principal and auxiliary) spicules. Echinating styli plentiful, almost entirely restricted to the exterior aspect of the fibres. Megascleres:—(i.) Principal styli straight, subconical when fully grown, slightly fusiform in their early stages, 95 to about 150 μ in length, and at the most 10 μ in diameter; (ii.) somewhat tornotely pointed, cylindrical, auxiliary styli or subtylostyli, ranging in length from (rarely less than) 120 to 160 μ, and in diameter up to 2.5 μ. Microscleres:—Isochelæ palmatæ, fairly plentiful, 9 to 15 (usually not more than 13) μ long.

In the Australian Museum are some half-dozen specimens of a sponge which I identify as *Echinoclathria carteri.* These agree among themselves, but differ slightly in four respects from the original specimens as described. In the latter, the "anastomosing trabeculæ usually present a flat surface towards the outside," the maximum size of the principal styli is 132 x 9 μ, the auxiliary spicules are basally subtylote and the chelæ attain a length of 15 μ; in the present specimens the superficial trabeculæ (although often disposed obliquely to the surface) present their edges to the exterior, the principal styli (although in some instances rarely exceeding 130 μ in length) are in no case less than 145 x 9 μ in size; only a very small proportion of the auxiliary styli are basally enlarged, and the chelæ are never more than 13 μ long.

These specimens were obtained by the "Thetis" Expedition and were recorded—an inexplicable error—as *Echinoclathria macropora* (= *E. ramosa*, nom. nov.). They differ externally from specimens of the latter species in their relatively few and elongated branches, which in one case reach a length of 400 mm. Owing to incompleteness, none of them affords any clue as to the mode of fixation, whether by means of a stalk or otherwise. A single small specimen (obtained by the "Endeavour") encrusting, and growing between, the lower portions of the branches of a horny coral, agrees perfectly in skeletal characters with the "Thetis" specimens. It would appear, therefore, that this species, like *E. favus*, is of variable habit.

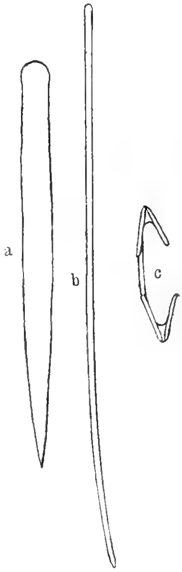

Fig. 65—*E. carteri.* a Principal style. b Auxiliary tornostrongyle. c Isochela palmata.

Locs.—Neighbourhood of Port Jackson, 15 to 52 fms. ("Challenger," "Thetis"); Shoalhaven Bight, 15 to 45 fms. ("Thetis," "Endeavour"); south-east Australia, 120 fms., and Bass Strait, 38 fms. ("Challenger").

ECHINOCLATHRIA GIGANTEA, *Lendenfeld.*

1886. *Halme gigantea*, varr. *macropora*, *intermedia*, et *micropora*, Lendenfeld, Proc. Linn. Soc. New South Wales, x., 1886, p. 847.

1888. *Aulena gigantea*, varr. *macropora*, etc., Cat. Sponges Austr. Mus., 1888, p. 228.

1889. *Aulena gigantea*, varr. *macropora*, etc., Lendenfeld, Monograph of the Horny Sponges, 1889, p. 97, pl. viii., figs. 3, 4, 7, 8, 18, 19; pl. ix., figs. 2-4.

1901. *Aulena gigantea*, var. *micropora*, Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 93, and p. 118.

1907. *Aulena gigantea*, var. *micropora*, Whitelegge, Mem. Austr. Mus., iv., 10, 1907, p. 504.

From examination of numerous specimens of this species, brought together from many localities, I find that its subdivision into three varieties, as proposed by Lendenfeld, cannot be maintained. So far as I am able to judge, the specimens being without exception preserved in a dry state, Lendenfeld's very full account of the external and skeletal structure, is substantially correct; but it falls short in reference to the great variability displayed, not only in the size of the meshes formed by the reticulating lamellæ, but also in the degree of development of the spicules both in point of size and number. Thus, to take first the case of the spicules:

(i.) The styli vary in maximum size in different specimens from 70 x 3 μ to 115 x 7 μ, their range of length (*i.e.*, the difference between the longest and shortest) in any given specimen being about two-fifths of the length of the longest. The greater the size of these spicules, the greater apparently is their relative abundance; in some specimens in which they are of least size, their number is extremely small. In shape they are normally very similar to the styli of *E.* (*Aulena*) *crassa*, as depicted by Lendenfeld (*op. cit.*, pl. viii., figs. 20, 21), but as a rule they are not quite so abruptly pointed as these; always, however, a certain proportion of them approach more or less to the conical form represented by Lendenfeld (*loc. cit.*, pl. viii., fig. 18) as characteristic for the variety *intermedia* (and presumably, therefore, for the species). In none of the specimens that I have examined have I found a preponderance of conically-shaped spicules, and I therefore regard Lendenfeld's figures as misleading to the extent that they convey the impression of a difference between *E. gigantea* and *E. laxa* in the forms of their styli.

(ii.) The auxiliary spicules vary in different specimens from 140 to 195 μ in maximum length, and from 2 to 4 μ in maximum diameter. In some specimens they are rather rare; in others comparatively abundant: also, their number relatively to that of the styli varies greatly. They are, in general, stoutest in the case of specimens in which they are most abundant, and *vice versa;* their stoutness, however, varies, to some extent at least, independently of their length. A peculiar point in connection with these spicules is the fact that whereas in some specimens they are almost exclusively tornostyles, in others they are almost exclusively amphistrongyles; in this respect the species resembles *Echinochalina anomala*, sp. nov. From Lendenfeld's description one would suppose the spicule to be invariably a strongyle; but, as a matter of fact, specimens with strongyles appear to be the exception. So far I have met with no specimen in which there was any approach to equality in number of the two forms of the spicule; but, as in *Echinochalina reticulata* (text-fig. 66), there usually occur in any specimen transitional forms between the tornostyles and strongyles.

In the three varieties (*macropora*, *intermedia* and *micropora*) distinguished by Lendenfeld, the greatest width of the meshes enclosed by the reticulating lamellæ were stated to be 7 mm., 5 mm. and 3 mm. respectively; but, as mentioned above, there is great variability in this respect, and even in single specimens I have found the meshes to vary in width so much as from 4 to 13 mm.

Lendenfeld has described in his Monograph two other species of *Aulena*, *A. laxa* and *A. crassa*. The sponges of the former species, regarded by Lendenfeld as embracing two varieties—the types of which, I suppose, are in the British Museum—will possibly prove to be merely growth-forms of *E. gigantea;* according to the original descriptions of the species, auxiliary megascleres are absent, but in two Australian Museum specimens which Lendenfeld has identified as *A. laxa*, and which presumably are two of those referred to by him under that name in his Catalogue (1888), I find scattered auxiliary strongyla.

Aulena crassa, of which I have examined specimens that come from the type-locality (Port Phillip) and agree very well with the description, is quite distinct from *E. gigantea* and presumably also from *E. arenifera*;[1] its chief distinguishing features are the concealment from external view of its "cell-apertures" by a covering membrane, and its brittleness and friability in the dry state. Its correct name may be accepted for the present as *Echinoclathria crassa*, Lendenfeld (*non* Carter); but the specific name perhaps should be altered, since the *Holopsamma crassa*[2] of Carter, with which Lendenfeld partly identified the species, is evidently more entitled to be identified with and to confer its name upon the sponge now known as *Psammopemma crassum*.

Locs.—The specimens in the Australian Museum Collection were collected from various parts of the New South Wales coast from Jervis Bay on the south to Sandon Bluffs on the north; a number of specimens were obtained by the "Endeavour" at the last-mentioned locality at a depth of 35-40 fms. Specimens are very commonly found upon the beaches after storms. Lendenfeld records the species also from Port Phillip, Victoria, and from Fremantle, Western Australia.

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1 Carter—Ann Mag. Nat. Hist. (5), xvi., 1885, p. 350; Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p 40.

2 Carter—Ann. Mag. Nat. Hist. (5), xv., 1884, p. 211.

ECHINOCHALINA, *Thiele (emend).*

1903. *Echinochalina*, Thiele, Kieselschwamme von Ternate, ii., 1903, p. 961.

Sponge of various habit; in some cases, like Echinoclathria, consisting of a honeycomb-like reticulation of thin lamellæ. Skeleton a reticulation of horny fibres cored by smooth cylindrical spicules—either monactinal or quasi-diactinal—and echinated by smooth conoidal styli. The former spicules represent the auxiliary, the latter the principal, megascleres of other Myxillinæ: no other kind of megasclere is present. Microscleres are typically absent.

The genus *Echinochalina* was introduced by Thiele for a species which he regards as identical with *Ophlitaspongia australiensis*, Ridley. In expressing the opinion that the species should be removed from the genus to which Ridley assigned it, Thiele says, "eher scheint sie mir sich an *Echinodictyum* anzuschliessen, da sie wie diese Gattung Züge von gleichendigen Nadeln enhalt, von denen ungleichendige abstehen; wahrend aber bei *Echinodictyum* die gleichendigen Spicula grosse Amphioxe sind, sind es hier schwache Amphistrongyle und die abstehenden Style sind hier glatt, bei *Echinodictyum* stachlig." Topsent is also of the opinion that *Echinochalina* is related to *Echinodictyum*, for he says,[1] "Il ne se distingue du genre *Echinodictyum* qu'en ce que les spicules qui hérissent les fibres sont de styles lisses, les *Echinochalina* étant, en somme, aux *Echinodictyum* ce que les *Ophlitaspongia* sont aux *Clathria*." Both writers, however, have disregarded certain very important differences in the spiculation of the two genera, which render it highly improbable that they are in any way closely related: as an example of such a difference it may be mentioned that, whereas in *Echinodictyum* there are typicaly three kinds of megascleres, there are in *Echinochalina* only two.

Besides *Echinochalina australiensis*, Thiele includes in his genus *Echinoclathria glabra*, Ridley and Dendy, and *Thalassodendron digitata*, Lendenfeld; Whitelegge has since added a fourth species, *Echinochalina reticulata*, and two others are described in the present paper. Of these *E. glabra* and *E. reticulata* are of special interest, since both in their honeycomb-like external structure and in the forms of their spicules they bear so striking a resemblance to species of *Echinoclathria* that their close relationship to the latter seems indisputable. One can therefore assert with some confidence concerning these two species that they differ from *Echinoclathria* only in the fact that their fibres are cored, not by principal spicules,

1 Topsent—Arch. Zool. Exp., Notes et Revue, 1904, p. xciii.

but by auxiliary; and as the remaining species are very analogous to *E. glabra* and *E. reticulata* in point of spiculation, it is extremely probable that in their case also, the axial spicules of the fibres are auxiliary. The supposed resemblance between *Echinochalina* and *Echinodictyum* is therefore a fictitious one, since in the latter genus it is unquestionably the principal spicules which core the fibres.

ECHINOCHALINA RETICULATA, *Whitelegge*.

(Pl. xxx., fig. 2, and fig. 66.)

Sponge of rounded massive form, consisting of a honeycomb-like reticulation of very thin, almost membranous, lamellæ; the superficial lamellæ, as a rule, present their edges to the exterior. Superficial "cell-apertures" averaging about 8 mm. in diameter. Skeleton (of each lamella) an irregular "bi-dimensional" reticulation of main and connecting fibres. Main fibres with a sparse core of slender cylindrical (auxiliary) megascleres varying in form from tornotely-pointed subtylostyli to amphistrongyla; connecting fibres vacant: all the fibres abundantly echinated by principal styli, conical in shape except for a slight sub-basal constriction. Auxiliary megascleres are abundantly scattered between the fibres. Megascleres, sizes of:—(i.) Principal styli, length 120 to 170 μ, maximum diameter 10 μ; (ii.) auxiliary spicules, length 180 to 230 μ, maximum diameter 4 μ. Microscleres absent.

An examination of the single specimen (the type-specimen, preserved in a dry state) which I have seen of this species, provides nothing of importance that might be added to the original description, except as regards the auxiliary megascleres. These—which are cylindrical, more or less basally expanded (*i.e.*, subtylote), monactinal spicules—are usually tornotely pointed; but in a small proportion of them—between which and the preceding are many individuals of intermediate character—the distal extremity is rounded off like the end of a strongyle. I am unable to support Whitelegge in his statement that these strongylotely-ended spicules, which he erroneously terms tylota, occur chiefly in the dermal layer; rather does it appear to me that they are intermingled with the others promiscuously.

In agreement with the thin membranous character of the lamellæ, the reticulation of fibres which forms the supporting skeleton of any given lamella extends only in two dimensions or, in other words, all the fibres composing it are parallel to the plane of the lamella.

As the original figure does not convey a sufficiently clear idea of the appearance of the sponge, a further figure on a

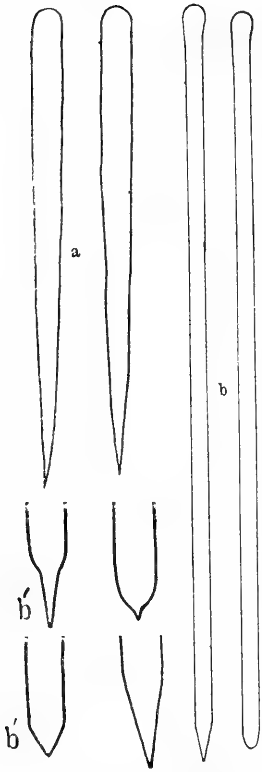

Fig. 66—*E. reticulata.* a Principal styles. b Auxiliary spicules. b' Showing variations of the distal extremity of same.

larger scale is included herein; this will the better enable one to perceive the difference in aspect between the typical form of the species and that described hereunder which for the present I regard as a variety.

Echinochalina reticulata var. (Pl. xxxi., fig. 1).

This variety, represented in the collection by five specimens of various irregularly massive form and comparatively large size—the largest specimen measuring 150 mm. in height, 230 mm. in length, and 180 mm. in breadth—is of much more compact structure than the typical variety, and has spicules of smaller size; the lamellæ, also, appear to be much less regularly interwoven than in the latter.

The meshes enclosed by the reticulating lamellæ average 4 mm. in width, which is only about one-half that of the meshes of the typical variety. The principal styli range from 80 to 130 μ in length, and attain to 8 μ in diameter; the auxiliary spicules are 160 to 200 μ in length, and in diameter not more than 3.5 μ.

Locs.—South-east coast of Australia; east coast of Flinders Island; off Devonport ("Endeavour").

ECHINOCHALINA GLABRA, *Ridley* and *Dendy.*

(Fig. 67.)

1887. *Echinoclathria glabra*, Ridley and Dendy, "Challenger" Monaxonida, 1887, p. 163, pl. xxix., figs. 11, 11a; pl. xxi., fig. 2.

1896. *Echinoclathria glabra*, Dendy, Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 40.

[*Not Echinochalina glabra*, Whitelegge, Austr. Mus. Mem., iv., pt. x., 1907, p. 504.]

Sponge of rounded massive form, consisting of a honeycomb-like reticulation of thin lamellæ; lamellæ interwoven in a somewhat irregular manner, and at the surface indifferently disposed. "Cell-apertures," 3 to 5 mm. in diameter. Skeleton (of each lamella) an irregular "bi-dimensional" reticulation of main and connecting fibres. Main fibres with a sparse core of (auxiliary) subtylostrongyla; connecting fibres vacant: all the fibres rather plentifully echinated by (principal) styli. Auxiliary megascleres are rather abundantly scattered between the fibres. Megascleres:—(i.) Principal styli, sub-conical, slightly fusiform, generally with a well-marked sub-basal constriction, varying in length from about 70 to 110 μ or slightly less, and attaining a maximum diameter of 6 or 7 μ; (ii.) auxiliary subtylostrongyla or (occasionally) amphistrongyla varying in maximum length in different specimens from 200 to 220 μ.

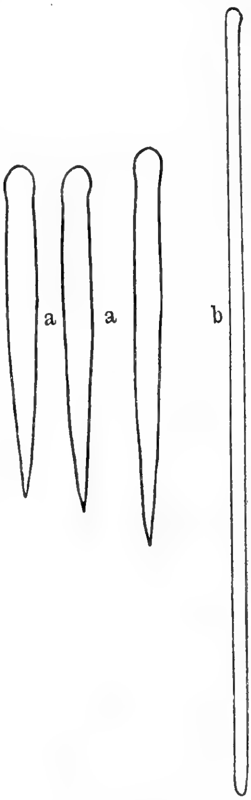

Fig. 67—*E. glabra.* a Principal styles. b Auxiliary tylostrongyle.

Several specimens which I identify as *E. glabra*, agree in all essential respects with Ridley and Dendy's description save that the auxiliary megascleres are not tylota, but subtylostrongyla and simple strongyla, the number of the latter being relatively very small. In this connection, however, the original description is almost undoubtedly wrong, since the spicule, as represented in Ridley and Dendy's figure, shows an enlargement only at one extremity, the other being simply rounded off like that of a strongyle.

In the two specimens which I have examined, and in a mounted section[1] presented to the Australian Museum by Prof. Dendy, the spicules agree in size; the auxiliary vary in

1 This section is not, as Whitelegge *(loc. cit.)* supposed, a portion of the type-specimen, but was cut from a specimen obtained in Port Phillip.

length from 160 to (rarely) 205 μ, and attain a maximum diameter (rarely) of 4 μ, whilst the principal vary in length from 75 to 110 μ, and reach a diameter of 7 μ. In the "Challenger" specimen the maximum dimensions of the spicules were 220 x 3.2 μ and 110 x 6.3 μ, respectively.

The specimens which Whitelegge, in his report on the sponges of the "Thetis" Expedition, recorded as *E. glabra*, prove to belong to a new species described below as *R. anomala*.

Locs.—Off Moncœur Island, Bass Strait, 38 fms. ("Challenger"); Port Phillip (*Dendy*); forty miles west of Kingston, South Australia, 30 fms. ("Endeavour").

ECHINOCHALINA ANOMALA, *sp. nov.*

(Fig. 68.)

1907. *Echinochalina glabra* (err., non Ridley and Dendy), Whitelegge, Mem. Austr. Mus., iv., 10, 1907, p. 507.

External form massive, rounded. Sponge (in the dry macerated condition) somewhat of honeycomb-like structure, being formed of very thin membranous lamellæ which tympanize the (on an average 3 mm. wide) meshes of an irregular reticulation of stout (up to 250 μ in diameter) spiculo-spongin fibre; the lamellæ are themselves crossed only by a few (interreticulating) fibres of lesser stoutness. All the fibres are provided with a stout compact axial strand of (auxiliary) monactinally tapered amphistrongyla and (or) tornostyles, and are echinated—fairly abundantly in the case of the stouter fibres—by subconical (principal) styli, which, as a rule, are disposed more or less perpendicularly to them. Abundant auxiliary spicules are scattered interstitially, together with a few principal spicules. Megascleres, sizes of:—(i.) Principal, 160 to 200 μ in length, 9 to 10 μ in maximum diameter; (ii.) auxiliary, 180 to 240 μ in length, and about 5 μ in maximum diameter. Microscleres absent.

Having had the opportunity of examining undoubted examples of *Echinochalina glabra*, I am able to say that the five specimens recorded and briefly described as such by Whitelegge, belong to another and new species, for which, on account of its structural peculiarity, I propose the name *anomala*. The fact that the species was mistaken for *E. glabra*, is sufficient indication of its external resemblance to species of *Echinoclathria*. Its structure, however, differs from that of *Echinoclathria* (and of *Echinochalina glabra*) in two readily noticeable respects: firstly—along the lines of junction of the reticulating lamellæ there runs (or, to put it in other words, along each of their joined edges the lamellæ are bounded by) a very stout strand of spicules thinly ensheathed by spongin; and, secondly—the lamellæ themselves, which are of membranous thinness, are destitute of any supporting reticulation of main and connecting fibres such as is found in the lamellæ of *Echinoclathria*, but are traversed merely by a very few irregularly interreticulating fibres similar, except in point of stoutness, to those which bound them. Consequently, in the case of dry macerated (and somewhat damaged) specimens such as the present are, the sponge appears as a loose irregular reticulation of stout fibres with meshes (which average about 3 mm. in width) tympanized by thin membrane. In their present condition, indeed, the specimens might easily pass for washed-out examples of some loosely reticulately-fibred *solid* (*i.e.*, not trabecular) sponge—such, for example, as many species of *Mycale*—with extraordinarily well-developed "interstitial membranes."

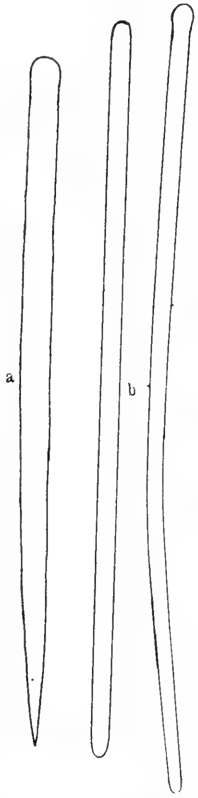

Fig. 68 — *Echinochalina anomala*. a Principal style. b strongylote auxiliary spicules.

Measurement of the spicules in all five specimens gave approximately identical values, the auxiliary spicules attaining a maximum size of 240 x 5 μ, and the principal, 200 x 9 μ (not 160 x 8 μ as stated by Whitelegge).

The auxiliary spicules are not quite cylindrical, but gradually taper from base to apex. At their apical extremity, they are either tornotely pointed (tornostyles) or strongylotely rounded off (amphistrongyles); and, in this connection, it is rather remarkable that whereas in four of the specimens these spicules are almost exclusively amphistrongyles, in the fifth they are almost exclusively tornostyles. The name "tylota" used by Whitelegge in reference to the auxiliary spicules is quite inapplicable, since in no instance do they show any indication of a terminal enlargement, except occasionally at the basal extremity; the distal extremity of the tornostyles is variously modified in the same way as in *E. reticulata* (Fig. 66).

All the specimens are attached, as Whitelegge mentions, to the branches of gorgonaceans, hydrocorallines, or bryozoans, and also grow over and around these branches so as to enclose them. The sponge is without definite shape, but always assumes a more or less rounded contour. The largest specimen, which happens to be of compressed form, measures 110 mm. in height, 75 mm. in breadth, and 25 mm. in thickness.

Loc.—Coast of New South Wales, off Wollongong, 55-56 fms. ("Thetis").

ECHINOCHALINA INTERMEDIA, *Whitelegge*.

(Fig. 69).

1901. *Thalassodendron viminalis* (err., non Lendenfeld, 1888), Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 87.

1902. *Echinoclathria intermedia*, Whitelegge, *Op. cit.*, iv., 5, 1902, p. 214.

Sponge sessile, of clathrate structure and erect massive form; composed of reticulating, erect and transverse, flattened trabeculæ of various size, 5 to 30 mm. long, 4 to 20 mm. wide, and 2 to 4 mm. thick. Skeleton an irregular reticulation of fibres which are comparatively poor in spongin and are mostly provided with a stout, often fairly dense, multispicular axial strand of (auxiliary) cylindrical tornostyles and (scarce) amphistrongyles; the connecting fibres sometimes contain few or no spicules. The fibres are echinated, at all angles of inclination, by comparatively few conical smooth (principal) styli. Auxiliary spicules are scattered interstitially in moderate abundance, together with a few principal spicules. Megascleres, sizes of:—(i.) Principal, 80 to 150 μ in length, 9 μ in maximum diameter; (ii.) auxiliary, 140 to 185 μ in length, 4 μ in maximum diameter. Microscleres absent.

The only available example of this species is that which Whitelegge has described. It is an incomplete dry specimen in a very imperfect state of preservation, and, as such, accords fairly well with Whitelegge's description except in regard to spiculation. I am unable, however, to confirm the statement that numerous small oscula are present, and regard the term "honeycomb-like," used to describe the external structure of the sponge, as misleading, since it tends to call to mind the cellular structure characteristic of *Echinoclathria*. In its present condition the specimen shows no semblance of a dermal membrane, nor of any specialised dermal layer.

The original account of the spicular characters, which is quite misleading, must have been based upon some portion of the specimen in which there were fibres of another sponge.

The locality of the specimen is unknown.

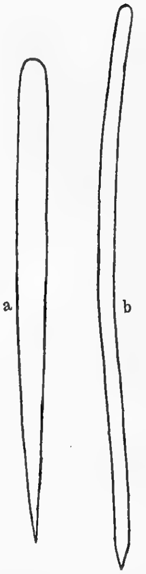

Fig. 69 — *Echinochalina intermedia*. a Principal style. b Auxiliary tornostrongyle.

GENUS CLATHRIODENDRON, *Lendenfeld*.

1888. *Clathriodendron*, Lendenfeld, Descr. Cat. Sponges Austr. Mus., 1888, p. 215.

The three species for the reception of which Lendenfeld founded this genus, led him to propose for it the following definition:—"Desmacidonidæ with exceedingly large tylostylote megasclera scattered in the ground substance. The spongin-fibres of the supporting skeleton contain only a few spicules. Echinating spicules spined styli." In the description of the species we learn further that the arrangement of the fibres is reticular, and that microscleres are absent. The character of the spicules suggests that *Clathriodendron* may be related to *Raspailia*, and, indeed, in his recently described *R. paradoxa*, a somewhat aberrant species of the latter, Hentschel[1] has found reasonable grounds for supposing the two genera to be identical. It transpires, however, that *C. arbuscula* (the first-described of the three species, and, therefore, best entitled to rank as the genotype) whilst exhibiting

1 Hentschel—Die Fauna Südwest-Australiens, Tetraxonida, ii., 1911, p. 383.

points of resemblance to certain species of *Raspailia*, possesses characters sufficiently distinctive to justify the retention of *Clathriodendron* as an independent genus. As regards the two remaining species, I can offer no positive opinion, since in the existing collection of the Australian Museum no specimen occurs which satisfies the description of either; but, accepting Lendenfeld's statement that *C. irregularis* is similar, both in "skeleton and spiculations," to *C. arbuscula*, this one of them we may reckon provisionally as likewise belonging to *Clathriodendron*. As for the other, *C. nigra*,[1] there is reason to suspect that its description is inaccurate, and that its proper place is in the genus *Raspailia*.

I have examined well-preserved spirit-specimens[2] of *C. arbuscula*, and find that the surface of the sponge is perfectly

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1 Included amongst the small pieces of British Museum sponges which Prof. Dendy has placed at the disposal of the Australian Museum, is one labelled *Clathriodendron nigra*, Lendenfeld. It is a small portion of a slender branch, quite black in colour, and in external attributes, accordingly harmonises with the species whose name it carries; moreover, its identification as such is understood to be due to Lendenfeld himself. One is quite at a loss, therefore, on finding that its spicular characters are not in accordance with requirements, to decide whether the specimen is wrongly named or the species wrongly described. In the description of *C. nigra*, the only spicules mentioned are the tylostyli, ".7 mm. long and .017 mm. thick," and the "comparatively very scarce" acanthostyli, ".1 mm. long and .01 mm. thick, with very small spines." In this reputed example of the species, I note, as regards the spicules, the following particulars:—The tylostyli attain a maximum size of 2000 x 25 µ, and the acanthostyli, which are fairly abundant and are provided with moderate-sized spines, have a range in length from 75 to 130 µ, with a maximum stoutness of 12 µ. Large tylostyli project singly beyond the surface of the sponge and are surrounded at their point of emergence each by a divergent tuft of slightly fusiform styli which vary in length from about 300 to 380 µ and attain a maximum stoutness of 9 µ but are seldom of greater size than 345 x 4.5 µ. Finally, slender asymmetrical oxea, 200 to 380 µ in length and at most 4.5 µ in diameter, are sparsely scattered in the ground substance. Owing to the dry, much-shrunken condition of the fragment, I am unable to determine what was the pattern of the skelton; but it appears to have been reticular and devoid of any well-marked "axial condensation," resembling in these respects that of *Clathriodendron* and of *Raspailia paradoxa*, Hentschel.

2 Although I consider it beyond doubt that these specimens are genuine examples (if not the actual type-specimens) of *C. arbuscula*, I think it only right to mention—inasmuch as I have to remark the incorrectness, in some particulars, of Lendenfeld's description of the species—that the documentary proof of their identity is not complete. The specimens are labelled (in Lendenfeld's handwriting) only with the manuscript name, "*Ceraospina arbuscula*," and a reference number; and I find, on consulting the key-list of Lendenfeld's manuscript names (*vide* Whitelegge, Rec. Austr. Mus., iv., 2, 1901, p. 64), that, for this particular name (and number), no synonym is given.

I might here mention that the name "*Ceraospina arbuscula*" also occurs under number 307 of the key-list, and in this instance is stated to be a synonym of *Echinonema anchoratum* var. *ramosa*, Lendenfeld. This information, however, is wrong, and has led to an error on the part of Whitelegge; for the only specimen in the Australian Museum labelled "*Ceraospina arbuscula*, No. 307"—that which Whitelegge (Rec. Austr. Mus., iv., ii., 1901, p. 81) has erroneously (and, I must add, not quite correctly) described under the name of *Echinonema anchoratum* var. *ramosa*—proves to be, in point of spiculation, skeleton pattern and surface conulation, the counterpart of *Clathriodendron arbuscula*. It differs to some extent from the other specimens of this species, however, in habit and texture, and so may be another species; but since it is of small size and is preserved in a dry state, the probability is that these differences are due merely to differences of age and state of preservation.

glabrous, there being an entire absence of the dermal brushes of spicules so characteristic of *Raspailia*, and, indeed, an absence of any dermally situated spicules whatsoever. The skeleton is a well-defined, moderately small-meshed, reticulation of horny fibres, and is without any trace of an "axial condensation." The main or longitudinal fibres, which lie rather widely apart, are sparsely cored with long tylostyles, whilst the connecting fibres are without axial spicules; both main and connecting fibres are fairly plentifully echinated by acanthostyles. Tylostyli, exceeding in number those within the fibres, occur also interstitially, disposed in approximate parallelism with the main fibres; and further, there are scattered between the fibres, though somewhat rare in their occurrence, slender asymmetrical oxea (auxiliary spicules) which lie either singly or in contiguous parallel pairs. The tylostyli, which are usually more or less curved, are rarely less than 500 μ long, and may reach a length of 1 mm.; the stoutest of them have a diameter of 16 to 20 μ. The largest acanthostyles measure about 110 x 8 μ; and the oxea, which are commonly between 270 and 320 μ in length and rarely more than 4.5 μ in diameter, attain a maximum size of 410 x 5.5 μ.

In external features the specimens are in close accord with the original description. Lendenfeld's statement, however, that the "sponge has the shape of a tree," is rather vague, and perhaps does not convey a correct idea of its habit of growth. The actual appearance of the sponge is exceedingly like that of the specimen which Lendenfeld[1] has figured as *Clathrissa arbuscula*, but which, as I have already ventured to assert, does really represent an example of the present species.

Having examined a slide of Carter's *Dictyocylindrus cacticutis*,[2] presented to the Australian Museum by Prof. Dendy, I am in a position to say that this is also a species of *Clathriodendron*, and that it approaches fairly closely both in the size and form of its spicules to *C. arbuscula*, with which it agrees also in habit of growth and in having a conulose surface. The maximum dimensions of the spicules prove to be as follows:—Tylostyli, 975 x 16 μ; acanthostyli, 120 x 10 μ; oxea, 320 x 3 μ. The last-mentioned spicules appear to be extremely rare.

1 Lendenfeld—*Loc. cit.*, pl. v., fig. 2.

2 Carter—Ann. Mag. Nat. Hist. (5), xvi., 1885, p. 354; Dendy—Proc. Roy. Soc. Vict., viii. (n.s.), 1896, p. 48. *Vide* also, Dendy—Rept. Pearl Oyster Fisheries, Gulf of Manaar, etc., 1905, p. 176.

III.—APPENDIX.

Below is given a list of synonyms, as far as I have been able to establish them, of the species of *Ectyoninæ* described by Lendenfeld in his "Catalogue of the Sponges in the Australian Museum" (pp. 214-227), and of the species wrongly identified with (some of) these by Whitelegge. The names are listed in the order in which they appear in the Catalogue, Lendenfeld's species being indicated by the letter "L," Whitelegge's by the letter "W;" along with the synonym of each is a reference to the page herein on which the species is dealt with. Species of which I have seen no specimens are marked by an asterisk.

Myxilla.—

M. jacksoniana, L.	*Lissodendoryx jacksoniana*, L.[1]

Clathriodendron.—

C. arbuscula, L.	*Clathriodendron arbuscula*, L. (p. 295).
**C. irregularis*, L.	? *Clathriodendron irregularis*, L. (p. 296).
C. nigra, L.	? *Raspailia nigra*, L. (p. 296).

Clathrissa.—

C. arbuscula, L.	*Clathrissa arbuscula*, L. (p. 146).
**C. elegans*, L.	? *Clathrissa elegans*, L. (p. 146).
C. pumila, L.	*Crella incrustans*, Carter, var. *pumila*, L. (p. 168).
C. pumila, var. *rubra*, L.	*C. incrustans*, Carter, var. *rubra*, L. (p. 170).

Echinonema.—

**E. anchoratum*, var. *ramosa*, L.	? *Wilsonella ramosa*, L. (p. 243).
**E. anchoratum*, var. *ramosa*, W.	*Clathriodendron arbuscula*, L. (p. 296).
	? *Wilsonella dura*, L., *non* Whtlg. (p. 243).

1 An examination of the type-specimen of *Myxilla jacksoniana* has shown that the chelæ are of the arcuate type, and that the species, therefore, belongs to *Lissodendoryx*.

E. anchoratum, var. *dura*, W.	*Clathria* (?) *indurata*, sp. nov.[2]
**E. anchoratum*, var. *lamellosa*, L.	? *Wilsonella lamellosa*, L. (p. 243).
E. anchoratum, var. *lamellosa*, W.	*Clathria spicata*, sp. nov. (p. 210).
E. levis, L. (and W.)	*Crella incrustans*, Carter, var. *levis*, L. (p. 164).
E. rubra, L. (and W.)	*Crella incrustans*, Carter, var. *levis*, L. (p. 164).
Clathria.—	
**C. macropora*, L.	? *Wilsonella macropora*, L. (p. 240).
C. macropora, W.	*Crella incrustans*, Carter, var. *arenacea*, Carter (p. 161).
C. pyramida, L.	*Wilsonella pyramida*, L. (p. 240).
**C. australis*, L.	? *Wilsonella australis*, L. (p. 239).
C. australis, W.	*Crella incrustans*, Carter, var. *arenacea*, Carter (p. 161).
Thalassodendron.—	
**T. digitata*, L.	? *Echinochalina digitata*, L. (p. 288).
**T. typica*, L.	? *Wilsonella typica*, L. (p. 203).
T. typica, W.	*Echinodictyum elegans*, L. (p. 203).
T. rubens, var. *dura*, L.	*Clathria rubens*, L. (p. 219).

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1 For the sponge which Whitelegge (Rec. Austr. Mus., iv., 2, 1901, p. 81) mistook for Lendenfeld's *Echinonema achoratum* var. *dura*, I now propose the name *Clathria indurata*. Whitelegge's description is substantially correct except in regard to the dimensions of the spicules. His use of the term "honeycomb-like," in reference to the external conformation of the sponge, however, is inappropriate; and the statement that "the texture is . . . minutely porous throughout" is correct only so far as it applies to the surface, which is minutely porous over its entire entent. As a matter of fact, the texture (of dry specimens) is particularly dense and compact; and the consistency, in consequence, is unusually firm and hard. The available specimens (three in number) are destitute of any traces of a specialised dermal skeleton; but the information which they afford in this particular is unreliable, since their preservation is imperfect; and it is possible, therefore, that the species may prove to belong to *Rhaphidophlus*. Indeed, it is to be noted that in certain of its spicular characters, more particularly in regard to its auxiliary megascleres, it exhibits points of resemblance to *Rhaphidophlus typicus;* but toxa are absent, and the chelæ are of only a single kind. Thus, the auxiliary spicules (subtylostyli) are pretty abundant; they exhibit a very considerable range in length; the shortest of them—which are very slender—are curved; and a fair proportion are provided, upon their extreme basal end, with a minute spination; also, the acanthostyles, the spines of which are moderately large, show a tendency towards a reduction of their spination over the sub-basal portion of their length. The principal spicules are without special features, being more or less curved, subconical styli. The dimensions of the megascleres, taking into account their range in length and maximum stoutness, are as follows:—Principal, 120 to 200 x 13 μ; accessory, 55 to 70 x 7.5 μ; auxiliary, 95 to 220 x 5.5 μ. The greatest length of the chelæ is 12 μ. The "ill-defined and hair-like spicules mentioned in Whitelegge's description as being present in small number in the ground substance, were no doubt some of the very slenderest of the auxiliary spicules.

T. rubens, var. *dura*, W.	*Rhaphidophlus paucispinus*, L. (p. 179).
T. rubens, var. *lamella*, L. (and W.)	*Rhaphidophlus paucispinus*, (pp. 179, 219).
T. paucispinus, L. (and W).	*Rhaphidophlus paucispinus* (p. 179).
T. brevispina, L. (and W.)	*Rh. typicus*, Carter, var. *brevispinus*, L. (p. 193).
T. viminalis, L. (and W.)	*Ophlitaspongia subhispida*, Carter, var. *viminalis*, L. (p. 259).

Plectispa.—

**P. elegans*, L.	? *Echinoclathria elegans*, L. (p. 204)
P. elegans, W.	*Echinoclathria arborea*, L. (p. 280).
P. arborea, L.	*Echinoclathria arborea*, L. (p. 280).
P. arborea, W.	*Clathria multipes*, sp. nov. (p. 211).
**P. macropora*, L.	? *Wilsonella macropora* (*bis.*), L. (p. 205).
P. macropora, W.	*Echinoclathria ramosa*, sp. nov. (p. 278).

Clathriopsamma.—

C. lobosa, L. (and W.)	*Wilsonella australiensis*, Carter, (p. 239).
C. reticulata, L.	*Rhaphidophlus reticulatus*, L. (p. 177).

1912.

Commonwealth of Australia.

Department of Trade and Customs.

FISHERIES.

Zoological Results of the Fishing Experiments carried out by the F.I.S. "Endeavour," 1909-10 (H. C. Dannevig, Commonwealth Director of Fisheries).

PART III.

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CONTENTS TO PART III.

IV. A new species of *Asymmetron* from the Great Australian Bight, South Australia.

BY

JANET W. RAFF, B.Sc.,

Government Research Scholar,

Biological Laboratory, Melbourne University.

Plate XXXVII.

A NEW SPECIES OF ASYMMETRON.

I.—Introduction.

The Commonwealth F.I.S. "Endeavour," whilst conducting its operations along the southern coast of Australia, secured specimens of the well-known *Asymmetron bassanum*, and also of another species of the same genus which, on examination, proves to be a new one. The Department of Trade and Customs, to whom the material secured by the "Endeavour" belongs placed these specimens in the hands of Professor W. Baldwin Spencer for identification and description, and at his request I have undertaken the work.

Asymmetron bassanum is not uncommonly met with at depths of about twenty fathoms off the Victorian coast in Bass Strait and in Western Port in four fathoms. Specimens were secured by the "Endeavour" on the east side of Flinders Island, to the south of St. Francis Island in the Australian Bight, and also off Shoalhaven on the New South Wales coast. It has not hitherto been met with to the west of Bass Strait.

The new species was dredged at a depth of thirty-five fathoms on the south side of St. Francis Island in the Australian Bight in company with *A. bassanum*, from which it, however, is quite distinct. In the following account a description is given of its more important features.

II.—Description of the Species.

Asymmetron australis, *sp. nov.*

(Plate xxxvii., figs. 1-7.)

The average length of twelve specimens is 26 mm.; the average number of myotomes, 55; the average myotome formula, 33, 9, 13.

The *rostral fin* is slightly raised above the dorsal fin, and is rounded anteriorly. The anterior end of the notochord is inclined a little upwards in the rostral fin (Pl. xxxvii., fig. 1).

There are 25-33 *oral cirri* bearing sense papillæ, arranged in a single series and united together by a web. They are disposed at about equal intervals to the right and left of a median ventral one, as shown in Pl. xxxvii., figs. 3, 4 and 5. The web is continuous all along, and is highest in the mid-ventral portion, becoming lower anteriorly on each side. In Pl. xxxvii., fig. 6, there is a small basal portion only, in the mid line, but this, I think, must be the result either of injury or arrest of growth, for new tentacles do not develop in between other tentacles. As regards this point, Willey[1] writes:—"It is important to note that the buccal skeleton grows at each end only, and that fresh elements are not formed interstitially. In the adult the median cirri are smaller than the others; and one would at first naturally suppose that these were the youngest, and that this was the point at which fresh cirri would be formed; as a matter of fact, however, the small size of the median ventral cirri of the adult is deceptive, for they are the oldest cirri, and new ones are only added at the free extremities, right and left, of the buccal skeleton." Therefore I think the hoods with the tentacles arranged as in Pl. xxxvii., figs. 6 and 7, are also of the ordinary type, having a median unpaired tentacle.

The *oral sphincter* is situated in a line with the angle of the sixth myotome, and has about fifteen velar tentacles.

The *ventral fin* has chambers and fin rays. I have not been able to determine whether the rays are single or double.

The *dorsal fin* is about one-thirteenth the vertical height of the body, and the fin rays stop behind about the 49th myotome.

The *right metapleur* is continuous behind with the median ventral fin, the left stops immediately behind the atriopore. There are two *post-atrioporal cæca*, the right continuing much further back than the left and reaching almost to the anus.

The *gonads* are arranged in a single series on the right side and vary in number from 17-22. An important point noted is the presence of the gastrula stage of the egg. In examining the specimens I found several of the ova in this stage, but they are not preserved well enough for a good microscopical examination.

The above characters would place the species in the same subdivision of the genus *Asymmetron* as that in which we previously placed *A. bassanum*.[2]

In length, number of myotomes and myotome formula, and the number of oral cirri, *Asymmetron australis* agrees very closely with *Heteropleuron hedleyi*, found in Torres Strait, and described by Professor W. A. Haswell.[3] The rostral fin, however, differs in being raised above the level of the dorsal fin and in being more expanded; the dorsal fin rays extend further back, and ventral fin rays are present. In the description of *H. hedleyi* there is no mention of the post-atrioporal region of the atrial cavity, nor of the oral hood excepting the number of oral cirri.

1 Willey—Quart. Jour. Micro. Sci., xxxii., 1891, p. 214.

2 Morris & Raff—Notes on the Structure of *Asymmetron bassanum*—Proc. Roy. Soc. Vict., xxii. (n.s.), Pt. I., 1909, p. 88.

3 Haswell—Rec. Austr. Mus., vii., 1, 1908, p. 33, fig. 1.

Enumerating the species previously found in the Australasian seas, it will be seen that hitherto only one has been found along the south coast of Australia, viz., *A. bassanum*. The following is a list of the Australasian species and their distribution, as set out by Mr. W. M. Tattersall, B.Sc.,[1] with the addition of Professor Haswell's new species:—

Branchiostoma belcheri, Gray.—

Borneo, Singapore, Torres Strait, Maldive Islands and Ceylon.

Asymmetron bassanum, Günther.—

Bass Strait, and as far north as Port Jackson.

A. hectori, Benham.—

East coast of North Island of New Zealand.

A. cultellum, Peters.—

Torres Strait, north-east coast of Australia, Thursday Island and Ceylon.

A. lucayanum, Andrews.—

Bahamas, Louisiade Archipelago, Maldive Islands, Zanzibar and Torres Strait (Haswell).

Heteropleuron hedleyi, Haswell.—

Torres Strait.

As the species described differs entirely from *A. bassanum*, the only other species from the southern coast, it may be worth while to here note the difference in general external appearance between the two (Pl. xxxvii., fig. 2). Roughly speaking, we can say that in *A. bassanum* the widest portion of the body is at about its middle third, and from here it tapers gradually towards both ends. In *A. australis*, however, it appears widest at about the second quarter from its anterior end, and tapers gradually from here towards the posterior end and only very little towards the anterior end. Thus the anterior half of the animal is much wider than the posterior, whereas in *A. bassanum* the anterior and posterior halves are fairly equal. This seems to be a most striking difference between the two species. In addition, the smaller size of this species, and also the absence of the incomplete ring of pigment always found in *A. bassanum*, may be noted as further differences seen easily with the naked eye.

In comparing the oral hoods of the two species, an important difference is seen between them. As was noted above, the most median ventral oral cirrus in *A. australis* is unpaired. In *A. bassanum* the arrangement of the mid-ventral portion

1 Tattersall—Trans. Liverpool Biol. Soc., xvii., p. 293.

varies very much in the different specimens examined, for here there may be either a median *pair* of tentacles or a median *unpaired* one. I have to thank Miss Ethel Summons, Melbourne University, for first drawing my attention to the paired arrangement. In Pl. xxxvii., figs. 8 to 15, I have represented the bases of the oral cartilages in the mid-ventral portion of the hood of eight different specimens, and it will be seen by them that there is a great amount of variation here. Pl. xxxvii., figs. 8, 9, 10, 11, 12 show no median unpaired tentacle, but a distinct median *pair*, while in Pl. xxxvii., figs. 13, 14, 15 there is a median *unpaired* one. In Pl. xxxvii., fig. 16, the margin of the oral hood with the cirri cartilages is represented, and it will be seen that the basal portions of the cartilages of the median pair are smaller than the others and are inclined at a different angle to the margin of the hood, and so are clearly distinguishable. The two ventral cirri represented in Pl. xxxvii., fig. 12, are not so clearly paired as in the others.

In referring to the literature on the subject I can find nothing very definite. In 1895, Miss J. W. Kirkaldy,[1] giving the characteristic features of the Family Branchiostomidæ, says:—"A præoral muscular hood is developed in front of the mouth, provided along its circular margin with numerous tentacles, supported by a cartilaginoid skeleton; there is one median unpaired tentacle in the median ventral line, and from ten to twenty (according to age and species) on either side."

In 1876, Peters[2] described *Epigonichthys cultellum* as having ten to twelve pairs of oral cirri, and figuring the under surface of the anterior end draws the cirri showing clearly that there is *no* median cirrus, but he does not state definitely the presence of a median ventral pair. Miss Kirkaldy, however, in her paper, describes this species as having forty-one to forty-three oral cirri, thus giving it a median tentacle.

Then, again, Mr. J. D. F. Gilchrist[3] gives the number of oral cirri in *Branchiostoma capense* as thirty-six in all. If, as is generally taken to be the case, the cirri are paired on the two sides of the hood (with the exception of the median ventral one), *i.e.*, if the number of cirri is the same on the two sides, this would not allow of a median cirrus being present in this species. It is thus evident there is some uncertainty as to the exact arrangement of the cirri and that a structure previously described as characteristic of the Family Branchiostomidæ is actually subject to variation within the limits of a single species.

1 J. W. Kirkaldy—Quart. Jour. Micro. Sci., xxxvii. (n.s.), 1895, p. 309.
2 Peters—Monat. K. Preuss. Akad., 1876.
3 Gilchrist—Marine Investigation in South Africa, ii., 1904, p. 111.

V. Report on a sample of *Globigerina* Ooze from 1122 fathoms, East of Tasmania.

BY

F. CHAPMAN, A.L.S.

PALÆONTOLOGIST TO THE NATIONAL MUSEUM,
Melbourne.

V.—REPORT ON SAMPLE OF GLOBIGERINA OOZE.

Date, 13th July, 1909. Position, 42.17 S., 148.51 E. Depth, 1122 fathoms (bottom sample).

Details.—Globigerina Ooze. Colour, pale green, with a slight greenish tinge.

Carbonate of Lime.

PER-CENTAGE.	FORAMINIFERA.	OTHER ORGANISMS.
79	Chiefly *Globigerinæ* and *Pulvinulinæ*. The Textularids present are chiefly hyaline forms. (For species see list).	Echinoid spines, rare; Ostracodes, rare (for species see list); Alcyonarian spicules, frequent; Coccoliths, abundant.

Residue.

PER-CENTAGE.	SILICIOUS ORGANISMS.	FINE WASHINGS.
21	Sponge-spicules, abundant; Radiolarians, rare; Arenaceous Foraminifera, moderately common, as *Haplophragmium*, *Reophax*, *Technitella*.	Fine mineral particles, of a greenish colour.

Note on the Sample.

This is a fairly typical *Globigerina* ooze, with a large percentage of residue insoluble in HCl, owing to the abundance of silicious sponge-remains. This occurrence of sponge-spicules would naturally lead one to conclude that some of the arenaceous foraminifera which form their tests of these silicious needles would be present, and in this we are not disappointed. Both *Technitella* and *Marsipella* occur here, and the locality is new for both genera. *Technitella legumen* was previously recorded off Sydney and near Kerguelen Island. *T. raphanus* is an exceedingly rare form, having been hitherto obtained from only one locality, viz., off Kandavu, Fiji

Islands. The nearest locality to that from which the present sounding was taken hitherto recorded for *Marsipella cylindrica*, curiously enough, is also Kandavu. The family Miliolidæ is represented by the deep-water variety of *Biloculina depressa* and a few minute forms of *Miliolina*. The family Textulariidæ is much in evidence, chiefly represented by the genera *Bulimina* and *Bolivina*. Some starved forms of *Nodosaria* and some typical *Uvigerinæ* are the only members of the Lagenidæ. *Globigerina* is well represented and competes closely in numbers with *Pulvinulina*. A few other rotaline genera beside the last-named are found, some of very great interest. The foraminiferal fauna of this sample is fairly rich in species, and contains some apparently new varieties, and will repay an exhaustive research.

The Ostracoda are not common, but are, nevertheless, of especial importance. *Krithe producta* and *Cytheropteron abyssorum* are both deep-water forms; the latter being a very rare species, and recorded by Dr. Brady from one "Challenger" station only, viz., No. 161, to the west of Tasmania at 2600 fathoms. *Cythere lepralioides* is a South Atlantic form occurring here for the first time.

List of Foraminifera in Above Sample, from 1122 Fathoms.

Biloculina depressa, d'Orb., var. *murrhyna*, Schw.
Miliolina tricarinata, d'Orb., sp.
Sigmoïlina schlumbergeri, A. Silv.
Technitella legumen, Norman.
,, *raphanus*, Brady.
Marsipella cylindrica, Brady.
Rhizammina indivisa, Brady.
Reophax fusiformis, Will., sp.
,, *dentaliniformis*, Brady.
Haplophragmium canariense, d'Orb., sp.
Gaudryina pupoides, d'Orb.
Bulimina inflata, Seg.
,, *aculeata*, d'Orb.
Bifarina limbata, Brady, sp.
Bolivina textilarioides, Reuss.
,, *beyrichi*, Reuss.
,, *pygmæa*, Brady.
,, *obsoleta*, Eley.
? *Pleurostomella alternans*, Schw.
Cassidulina murrhyna, Schw., sp.

Lagena lagenoides, Will., sp.
,, *lævigata*, Reuss, sp.
,, *quadricostulata*, Reuss.
Nodosaria aff. *proxima*, Silv.
,, *mucronota*, Neug. sp.
Uvigerina aculeata, d'Orb.
,, *pygmæa*, d'Orb.
,, *angulosa*, Will.
Globigerina bulloides, d'Orb.
,, *triloba*, Reuss.
,, *dubia*, Egger.
,, *rubra*, d'Orb.
,, *æquilateralis*, Brady.
,, *inflata*, d'Orb.
Orbulina universa, d'Orb.
Pullenia sphæroides, d'Orb., sp.
Sphæroidina bulloides, d'Orb.
Patellina corrugata, Will.
Truncatulina ungeriana, d'Orb., sp.
,, *culter*, Parker & Jones.
,, *lobatula*, W. & J., sp.
,, *humilis*, Brady.
Pulvinulina canariensis, d'Orb., sp.
,, *crassa*, d'Orb., sp.
,, *patagonica*, d'Orb., sp.
,, *exigua*, Brady.
,, *truncatulinoides*, d'Orb., sp.
Rotalia soldanii, d'Orb., sp.
Nonionina umbilicatula, Mont., sp.
,, *pompilioides*, F. & M., sp.

List of Ostracoda.

Cythere scabrocuneata, G. S. Brady.
,, *lepralioides*, G. S. Brady.
Krithe producta, G. S. Brady.
Xestoleberis nana, G. S. Brady.
,, sp. nov., aff. *X. setigera*, G. S. Brady.
Cytheropteron abyssorum, G. S. Brady.

1914.

Commonwealth of Australia.

DEPARTMENT OF TRADE AND CUSTOMS.

FISHERIES.

Zoological Results of the Fishing Experiments carried out by F.I.S. "Endeavour" 1909-10 under H. C. DANNEVIG, Commonwealth Director of Fisheries.

PART IV.

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EXPLANATION OF PLATE I.

Fig. 1. *Heptranchias perlo*, Bonnaterre. Two-sevenths natural size.

,, 2. *Pristiophorus nudipinnis*, Günther. About two-thirds natural size.

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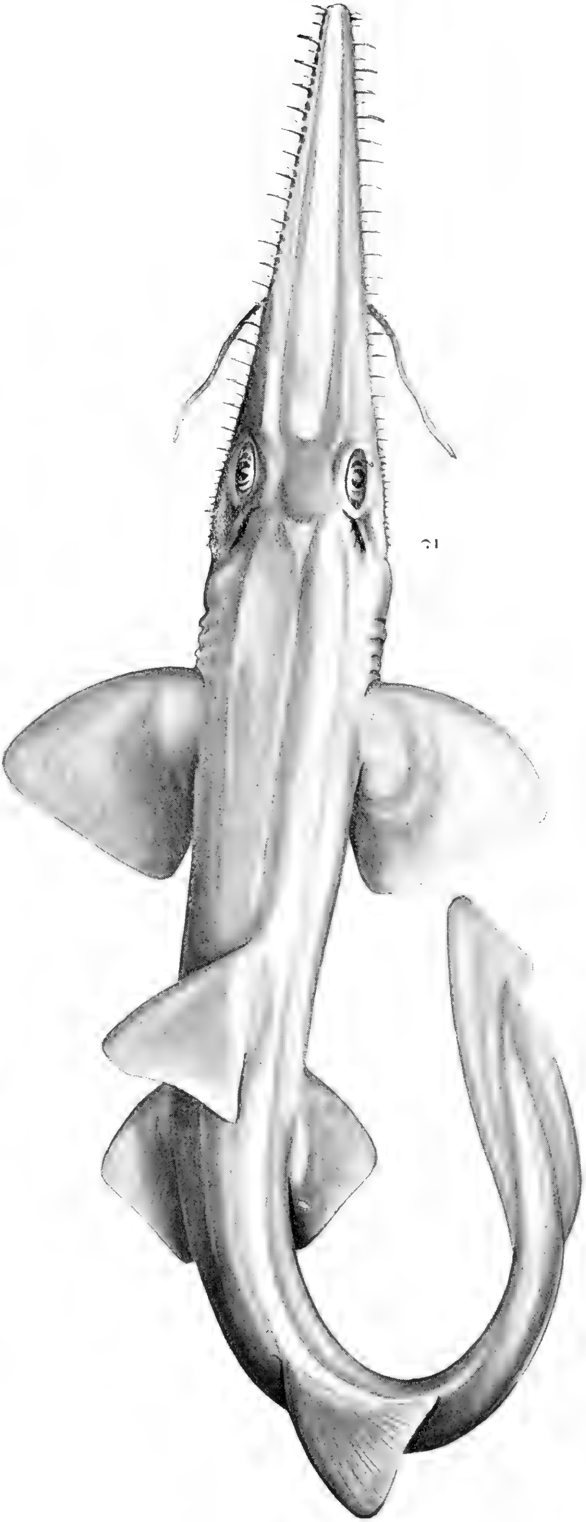

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A. R. McCULLOCH and D. B. FRY, del.

EXPLANATION OF PLATE II.

Fig. 1. *Parascyllium variolatum*, Dumeril. About two-sevenths natural size.

,, 2. *Parascyllium ferruguineum*, sp. nov. About two-sevenths natural size.

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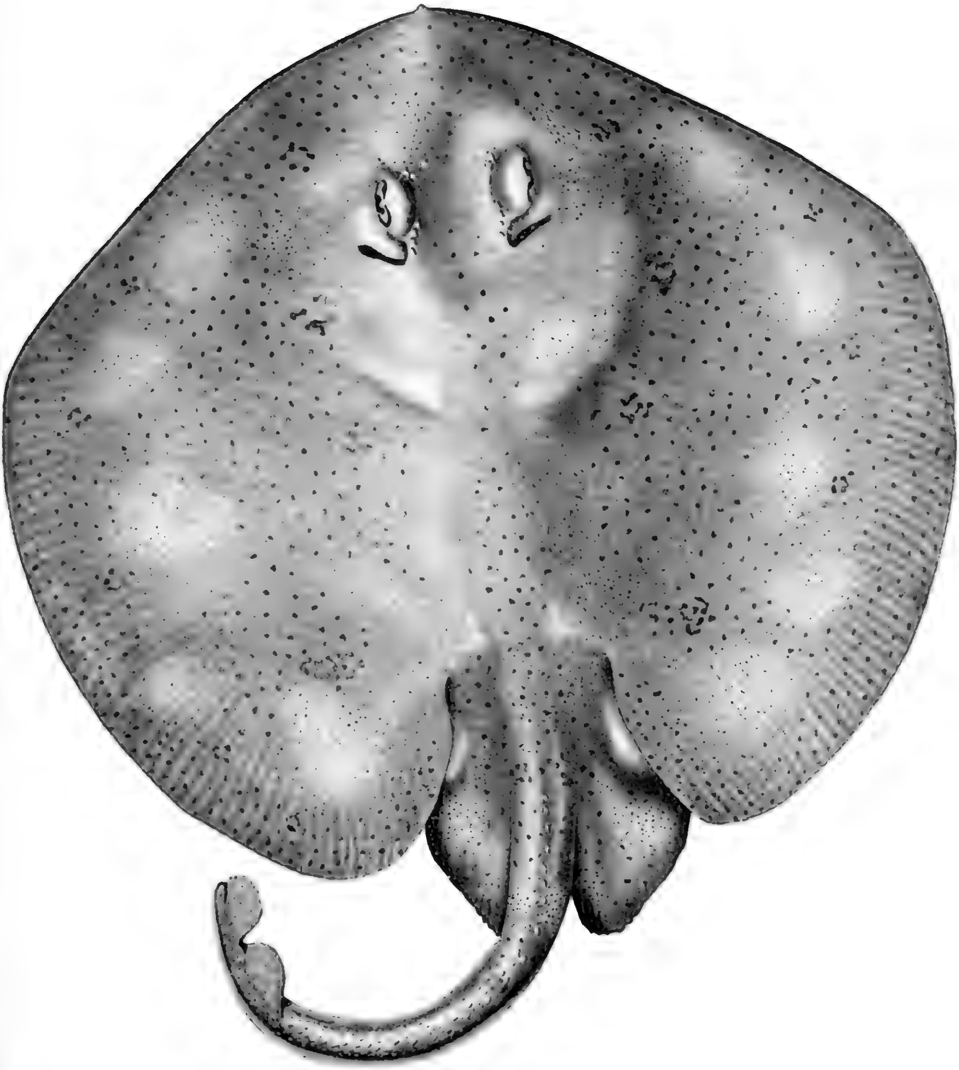
A. R. MCCULLOCH, del.

EXPLANATION OF PLATE III.

Raja waitii, sp. nov. About two-fifths natural size.

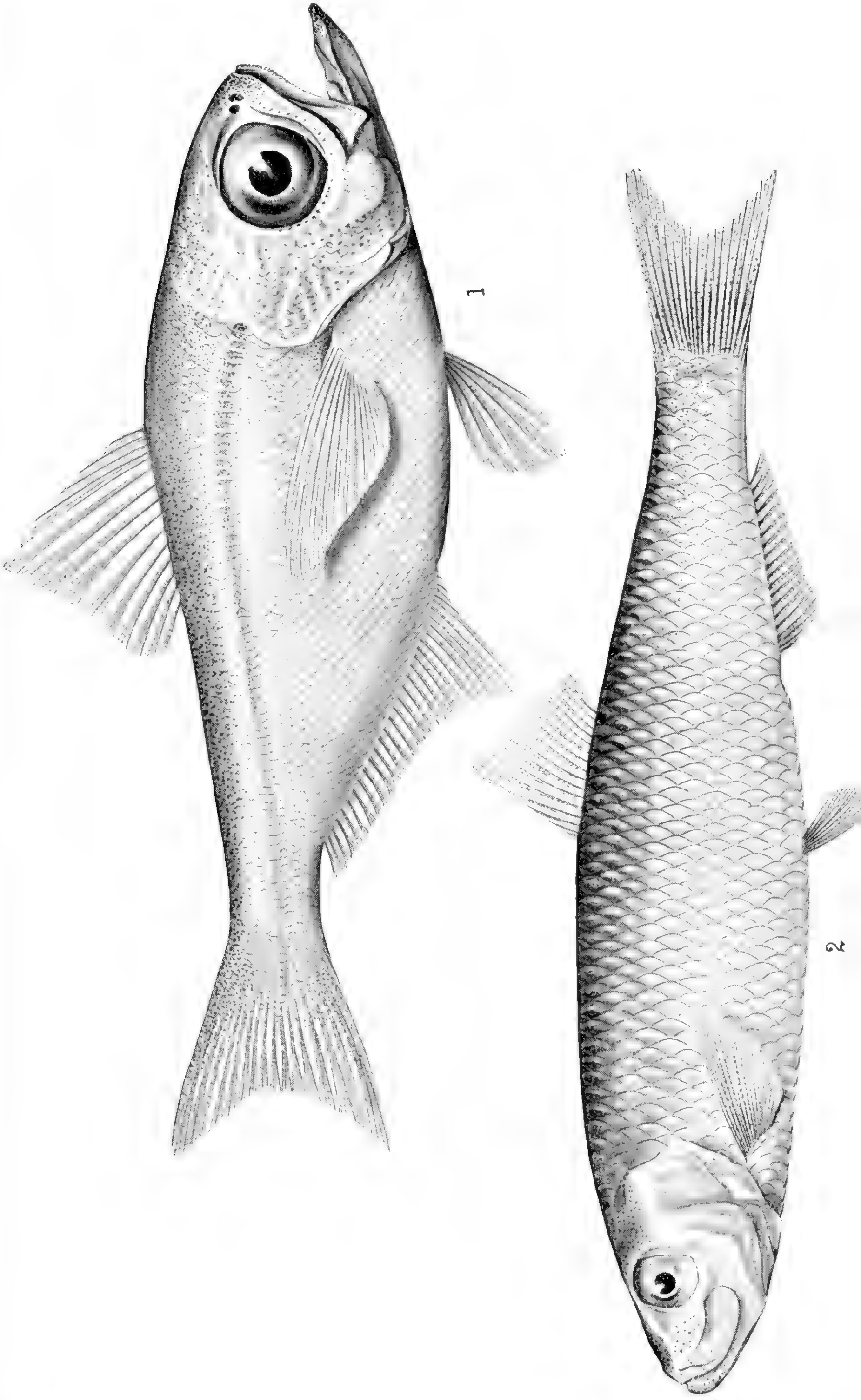


A. R. McCULLOCH, del.

EXPLANATION OF PLATE IV.

Fig. 1. *Pempheris elongata*, sp. nov. Once and a half natural size.

,, 2. *Clupea bassensis*, sp. nov. Once and a half natural size.



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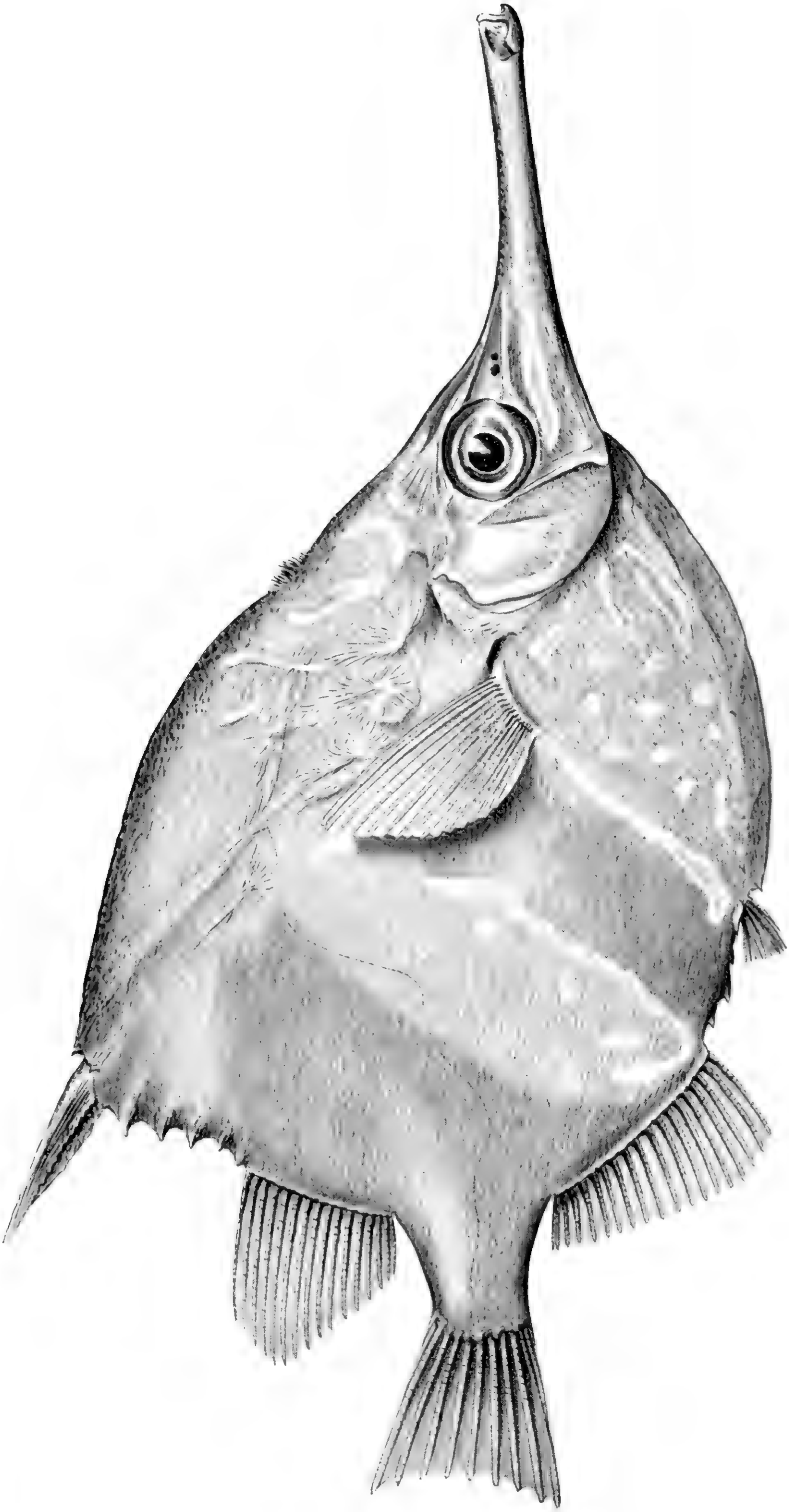
EXPLANATION OF PLATE V.

Centriscops humerosus, Richardson. Three-fourths natural size.



A. R. McCULLOCH, del.

EXPLANATION OF PLATE VI.

Fig. 1. *Hippocampus abdominalis*, Lesson. Natural size.
,, 2. ,, *graciliformis*, sp. nov. Twice natural size.

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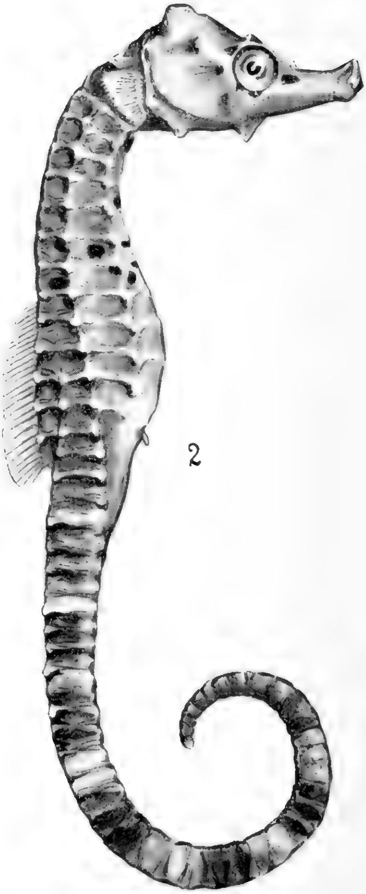

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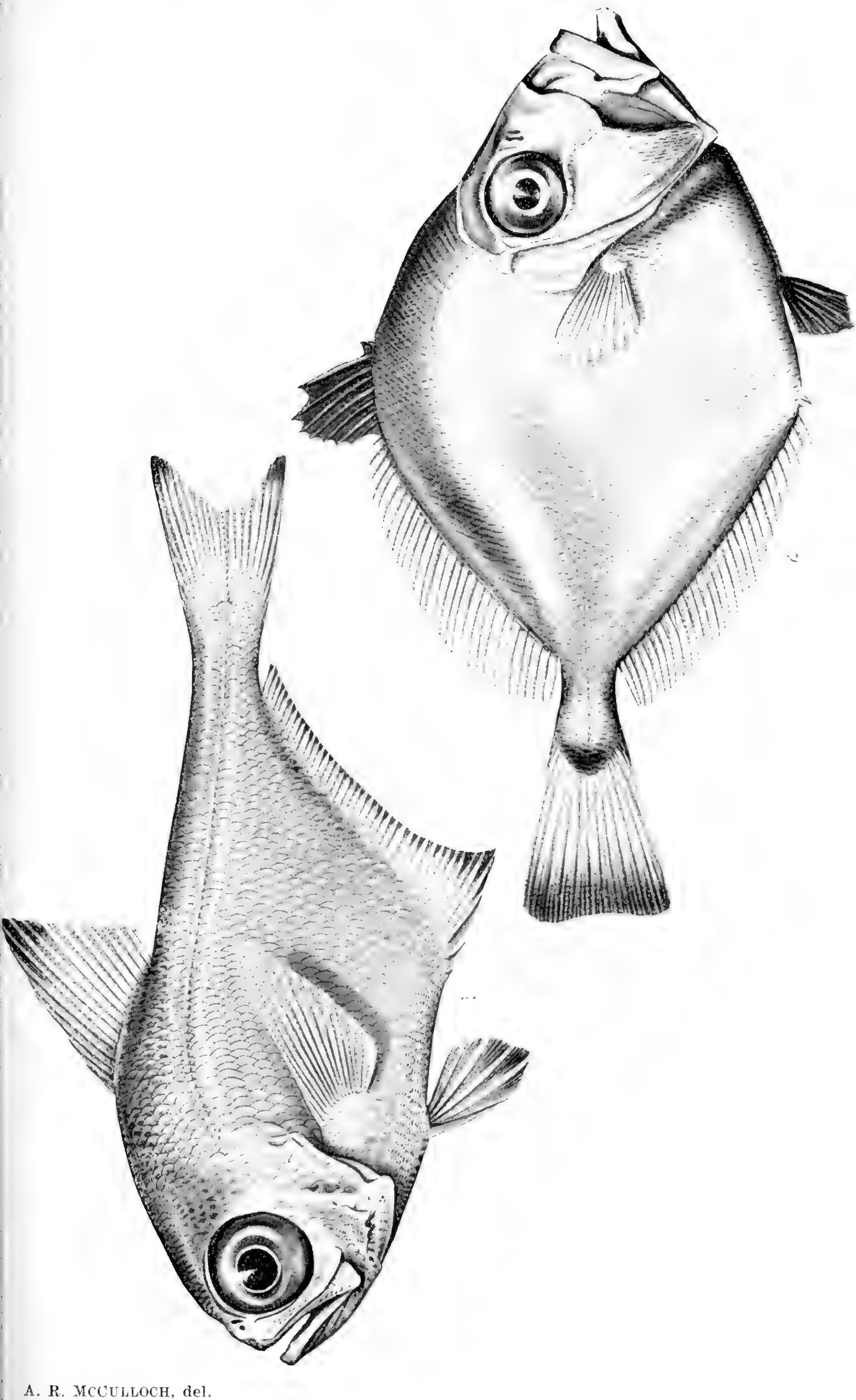
A. R. McCULLOCH, del.

EXPLANATION OF PLATE VII.

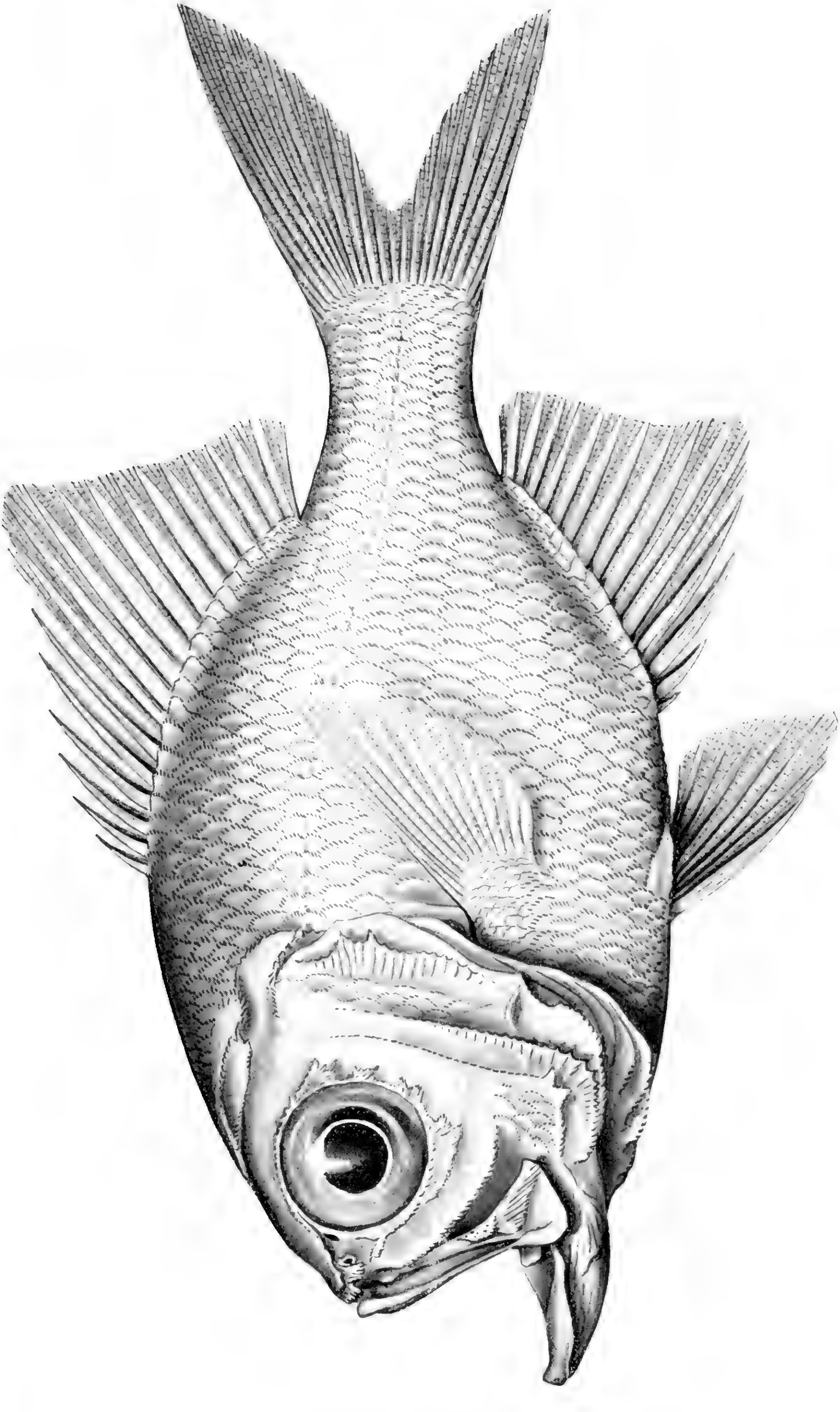
Fig. 1. *Pempheris affinis*, sp. nov. Slightly reduced.
,, 2. *Cyttus novæ-zelandiæ*, Clarke. Slightly reduced.



A. R. McCULLOCH, del.

EXPLANATION OF PLATE VIII.

Austroberyx gerrardii, Günther. Natural size.

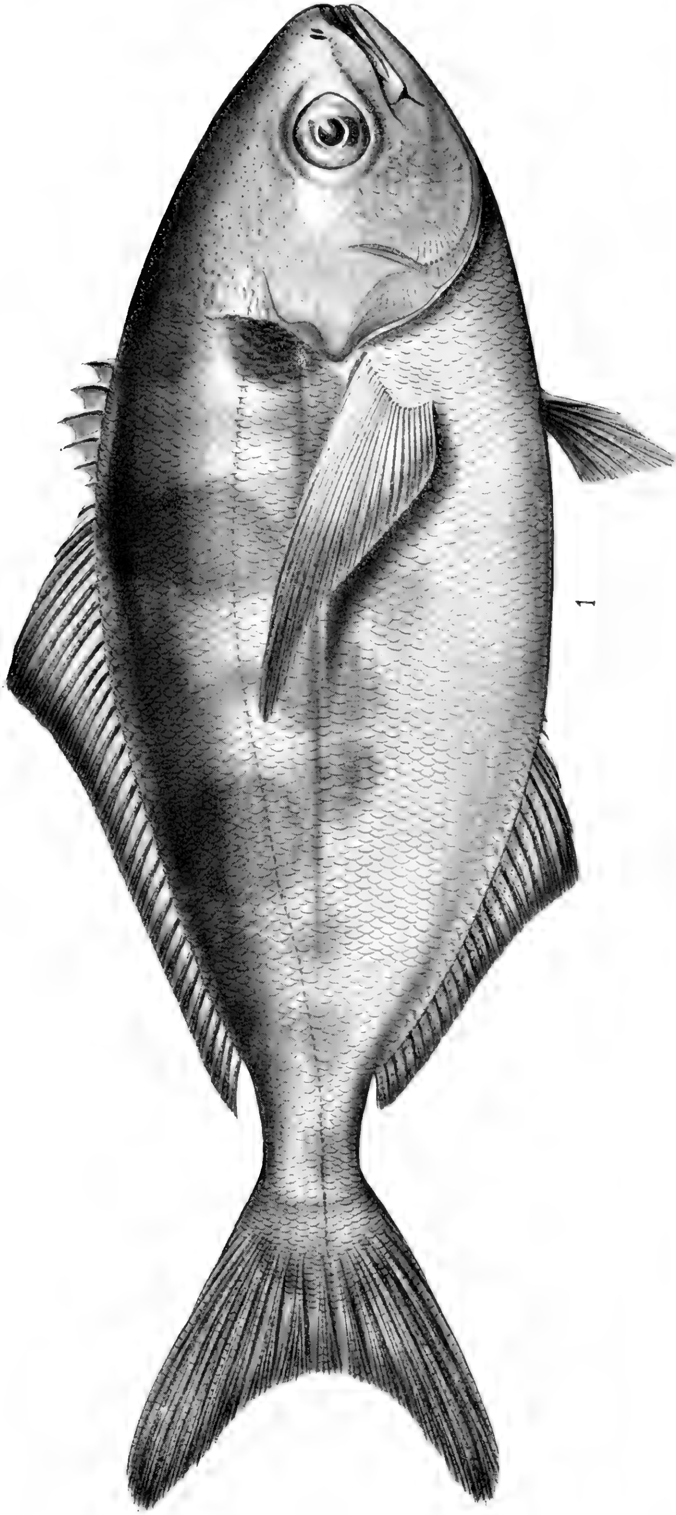


A. R. McCULLOCH, del.

EXPLANATION OF PLATE IX.

Fig. 1. *Seriolella brama*, Günther. Almost three-fourths natural size.

,, 2. *Solegnathus robustus*, sp. nov. Almost three-fourths natural size.



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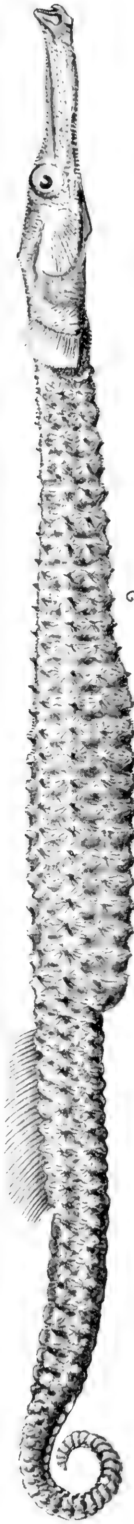

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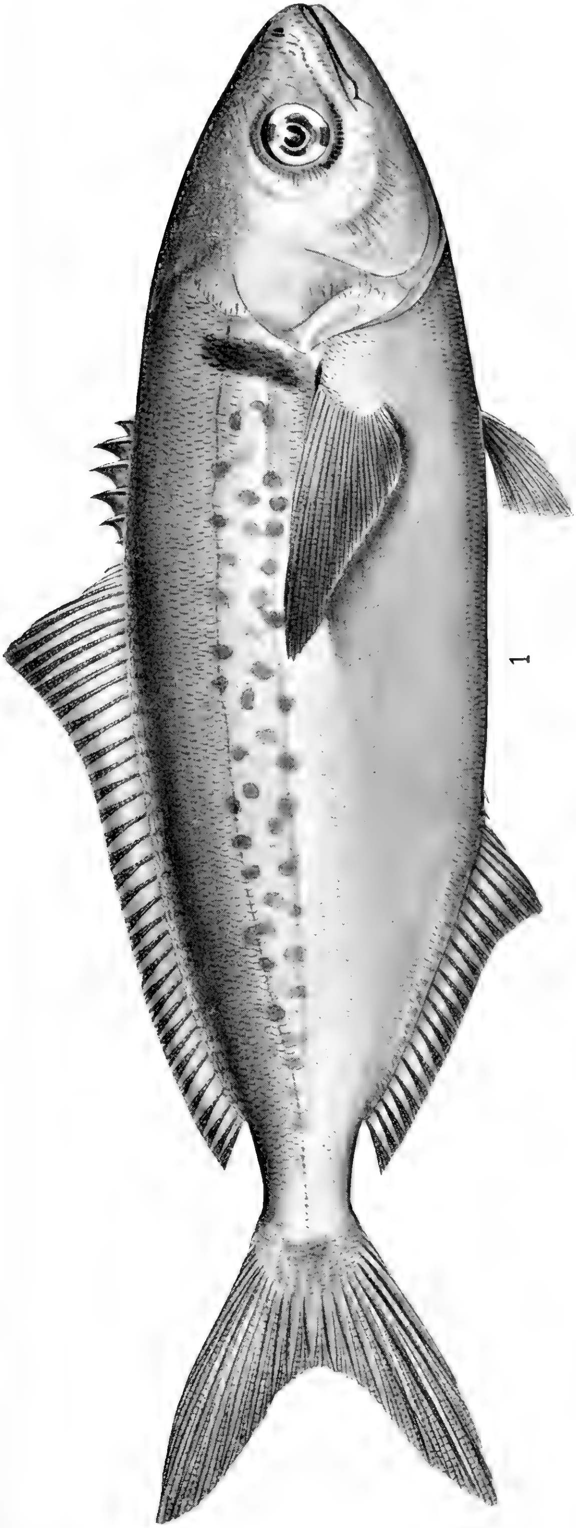
A. R. McCulloch, del.

EXPLANATION OF PLATE X.

Fig. 1. *Seriolella punctata*, Forster. Almost three-fourths natural size.

,, 2. *Tæniomembras microstoma*, Günther. Twice and one-fourth natural size.



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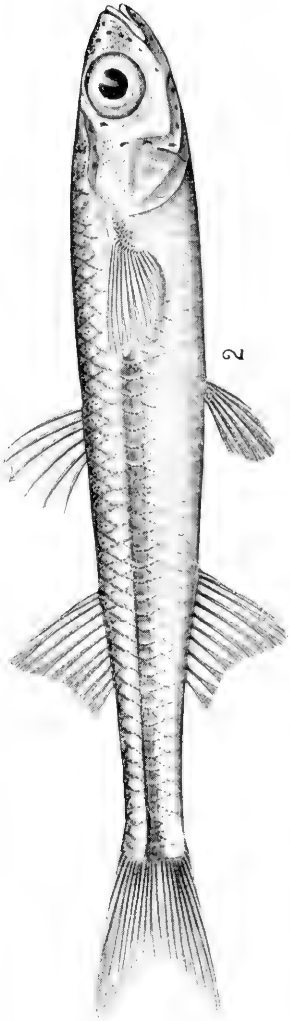

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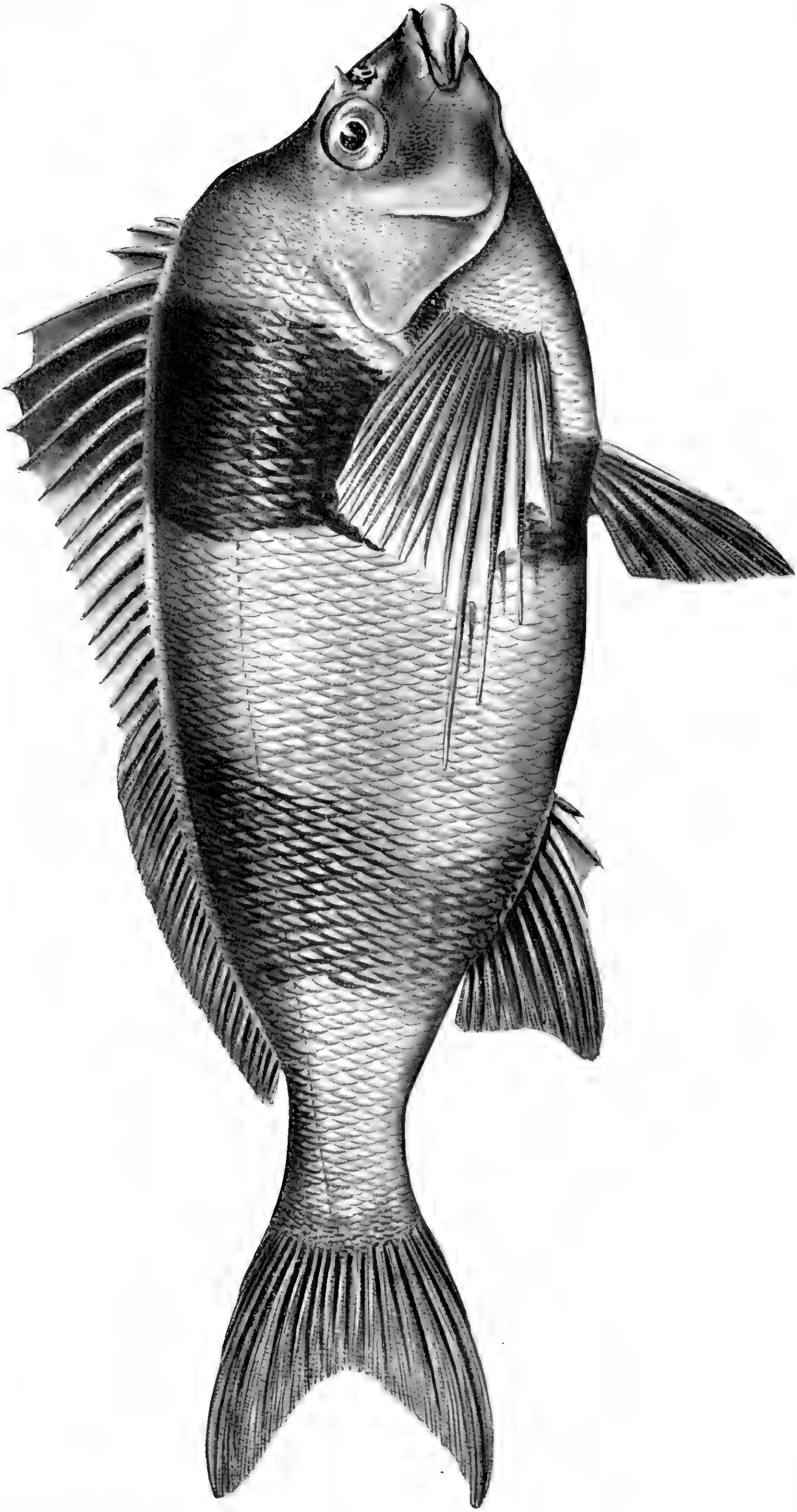
EXPLANATION OF PLATE XI.

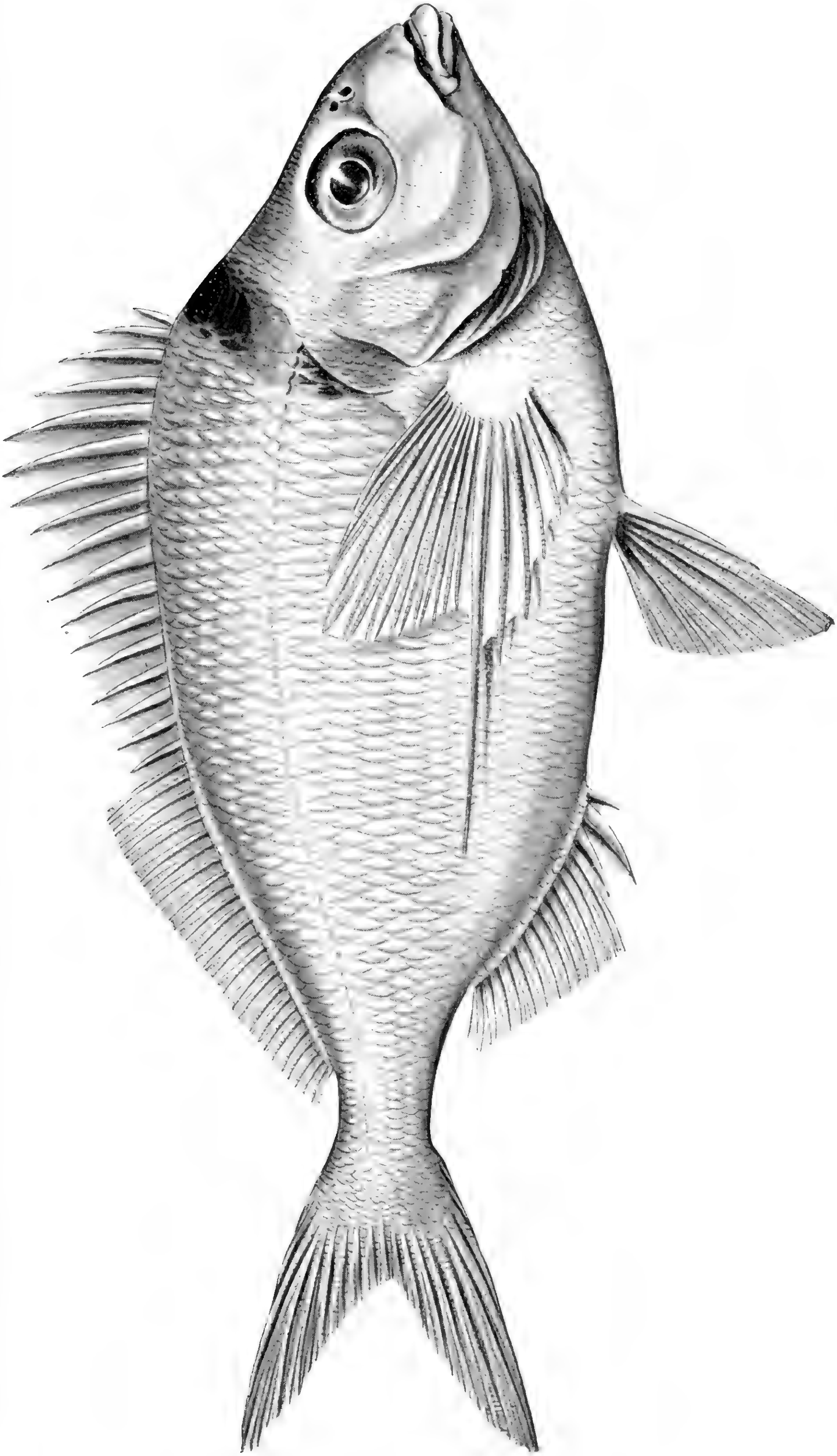
Goniistius vizonarius, Kent. About one-half natural size.



A. R. McCulloch, del

EXPLANATION OF PLATE XII.

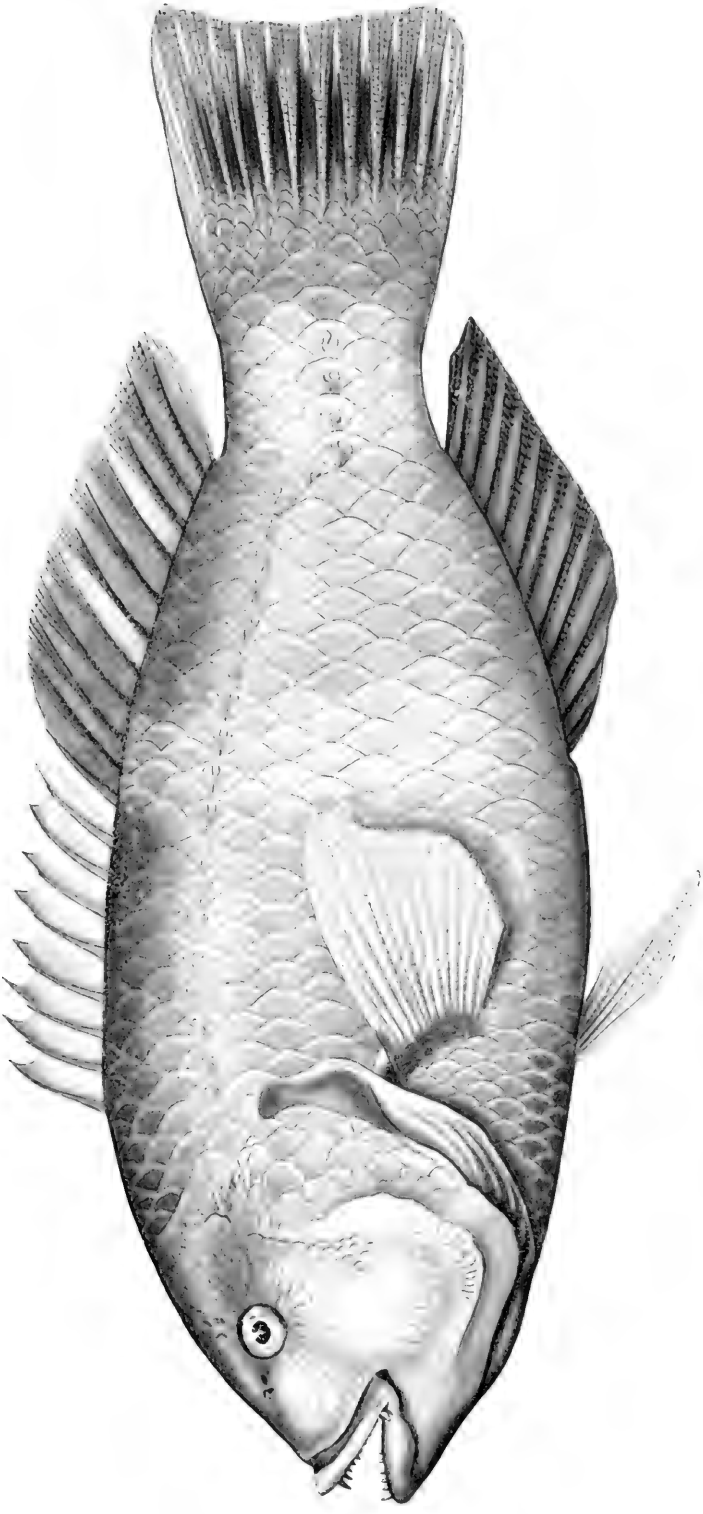
Dactylosparus macropterus, Forster. Slightly reduced.



A. R. McCULLOCH, del.

EXPLANATION OF PLATE XIII.

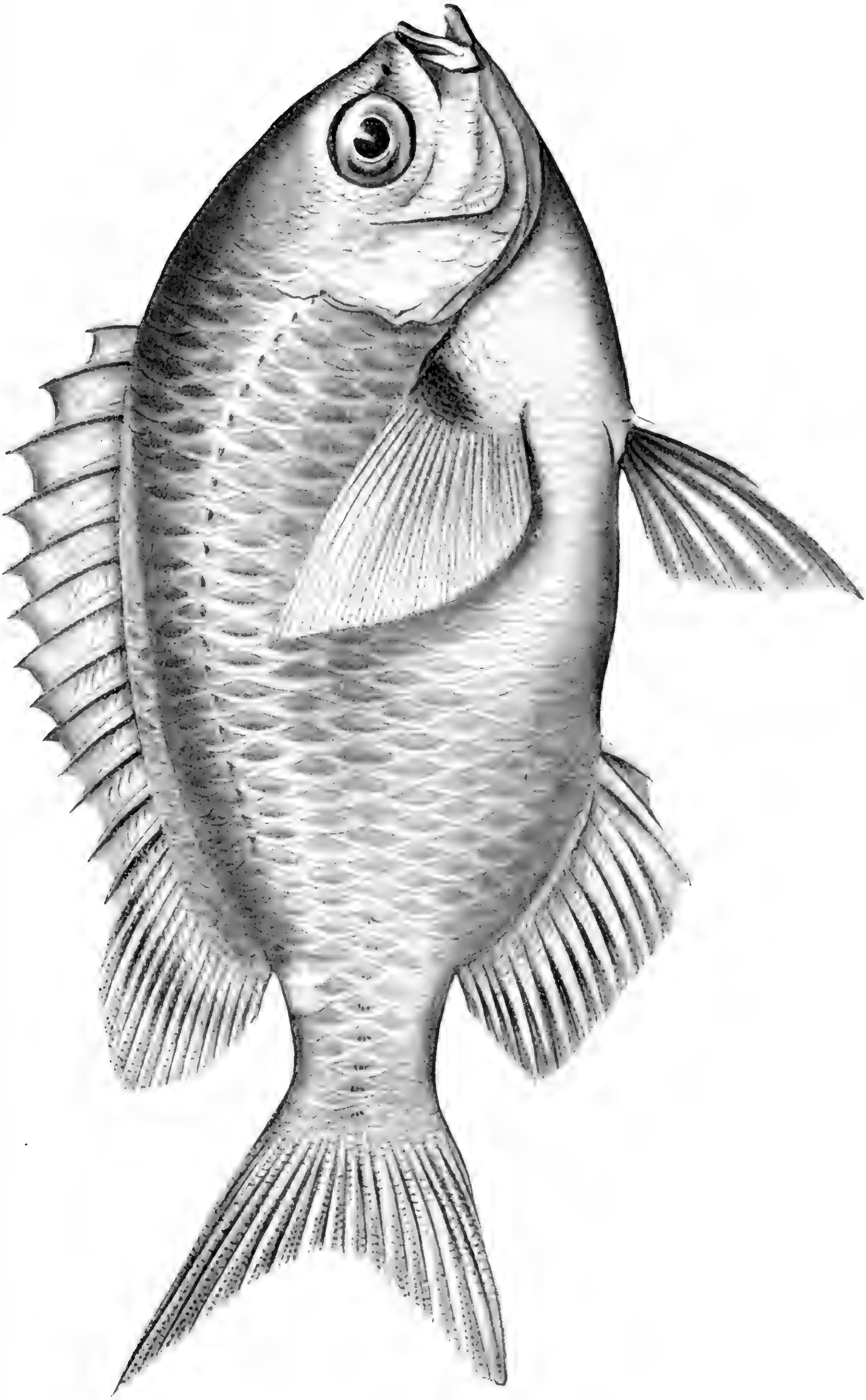
Pseudolabrus cyanogenys, Ramsay and Ogilby. One-half natural size.



A. R. McCULLOCH, del.

EXPLANATION OF PLATE XIV.

Chromis hypsilepsis, Günther. Natural size.



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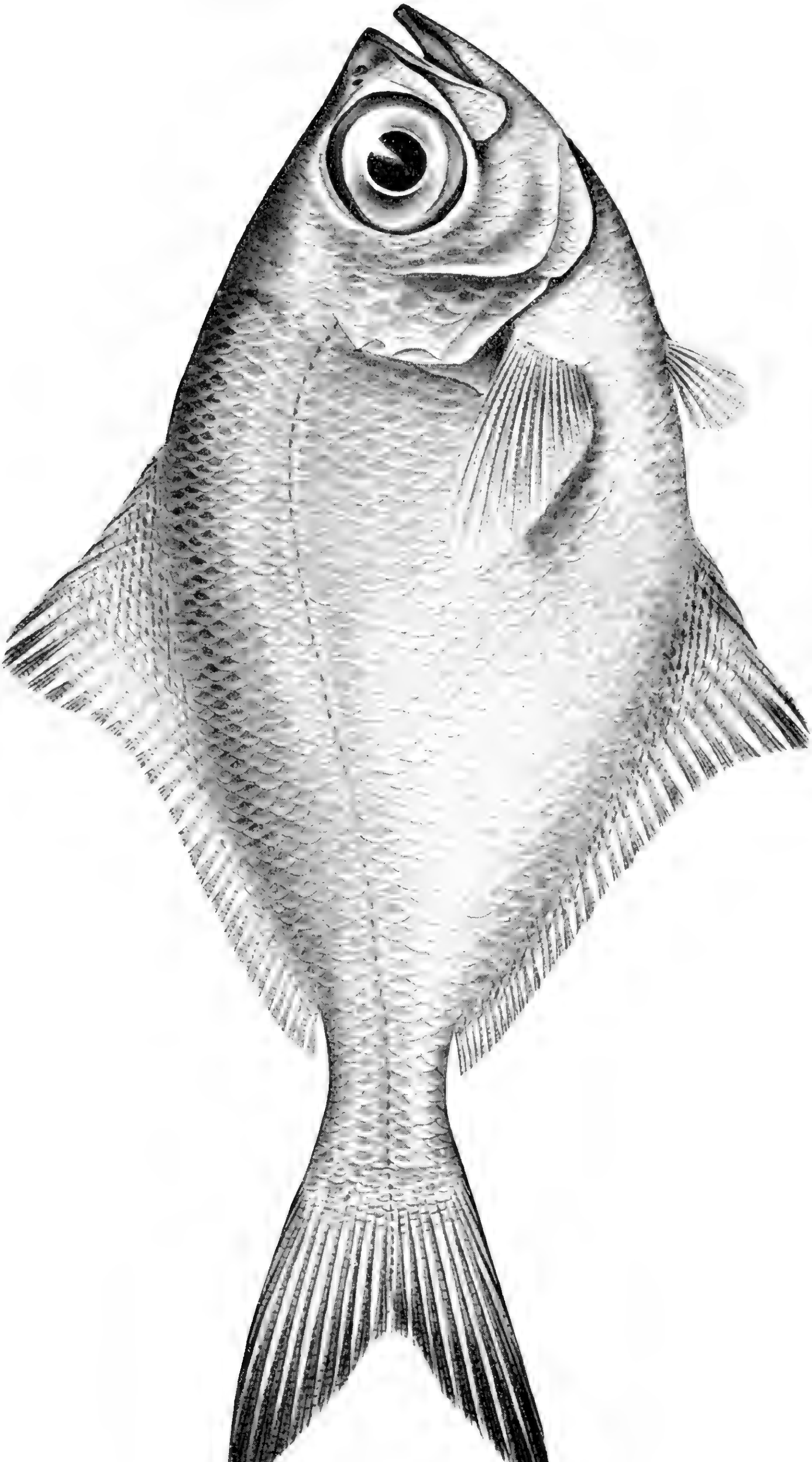
EXPLANATION OF PLATE XV.

Schuettea scalaripinnis, Steindachner. Slightly reduced.



A. R. McCULLOCH, del.

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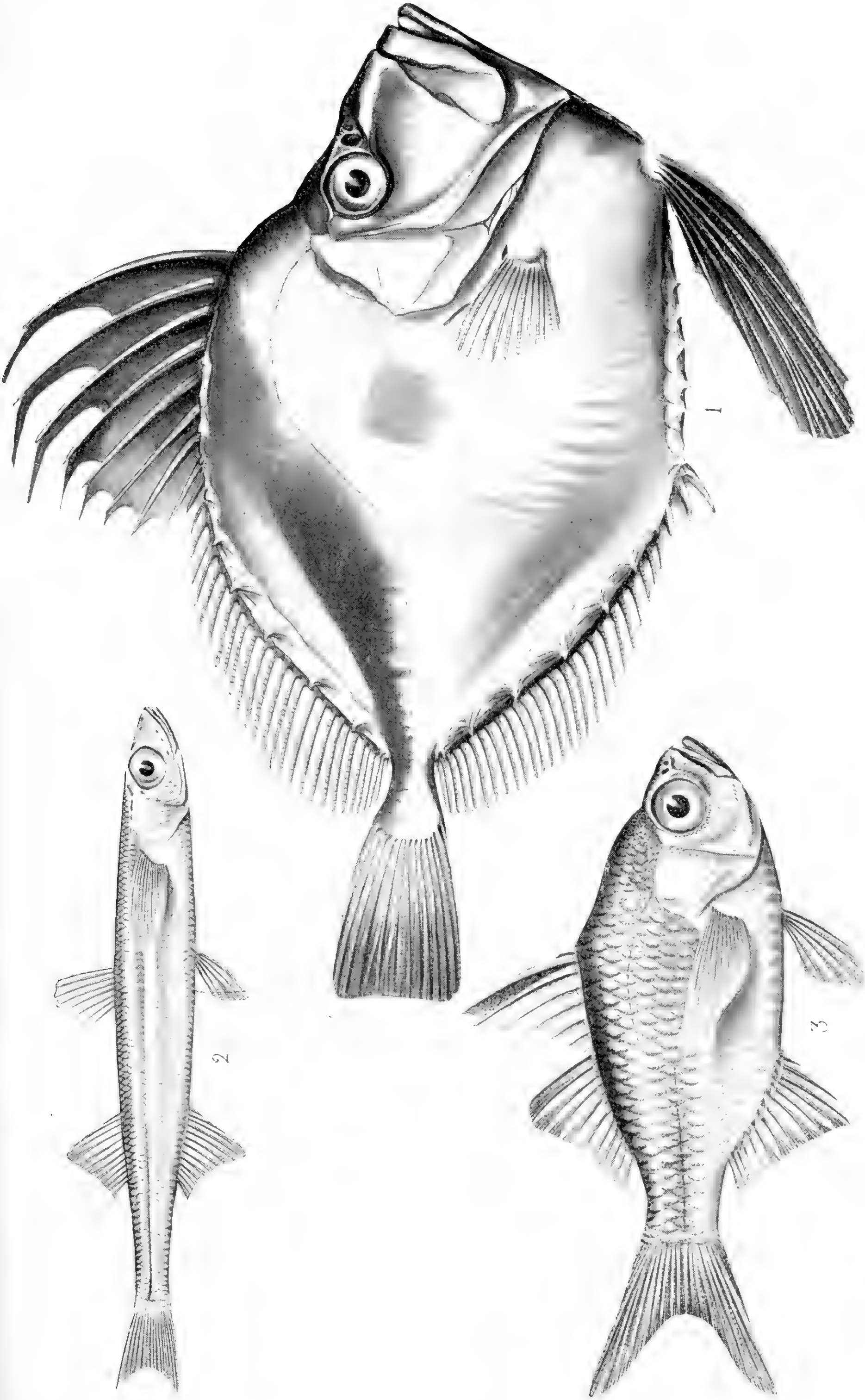

A. R. McCulloch, del.

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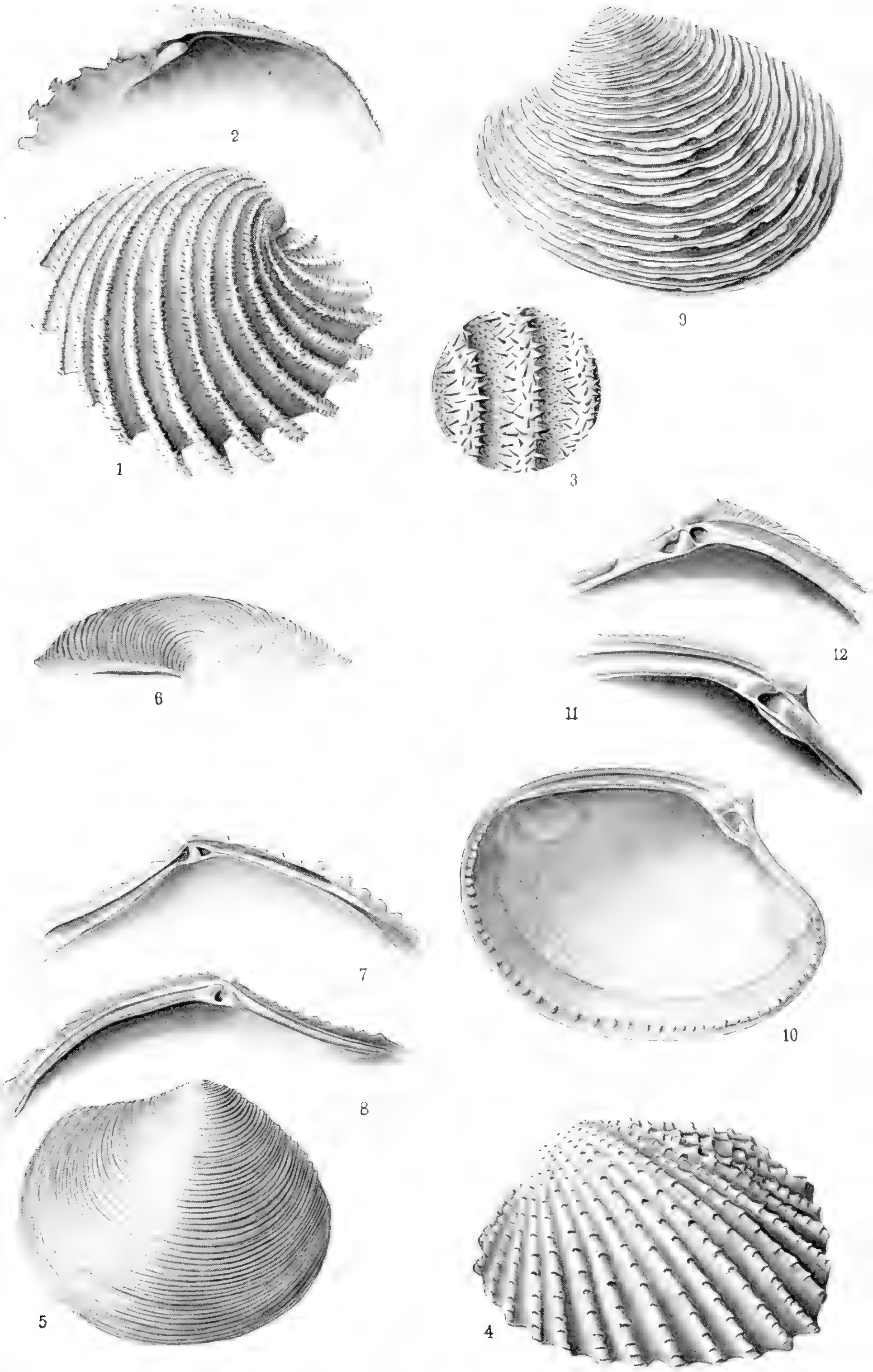

PHYLLIS CLARKE, del.

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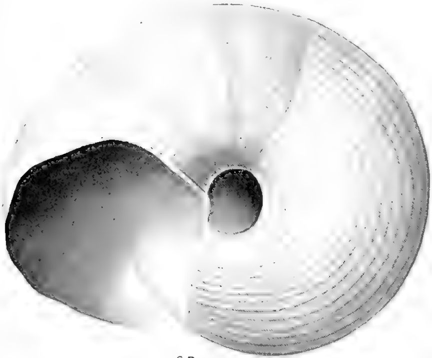
,, 22. ,, *lockyeri*, Hedley.



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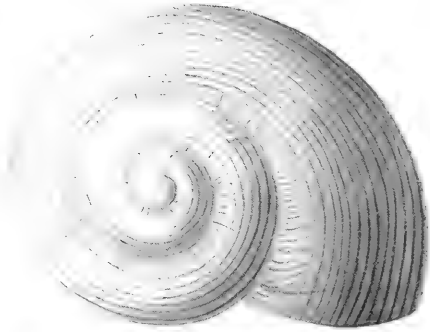

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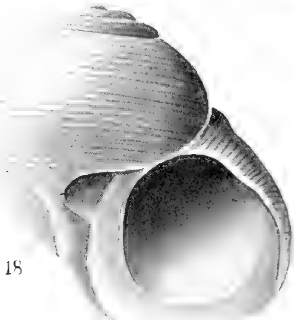

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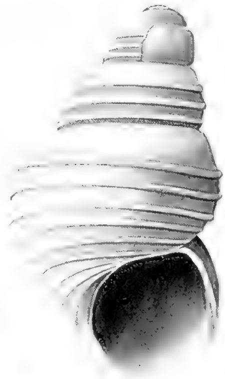

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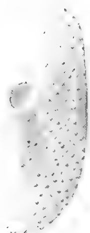

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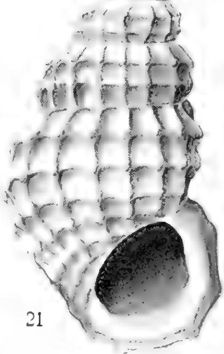

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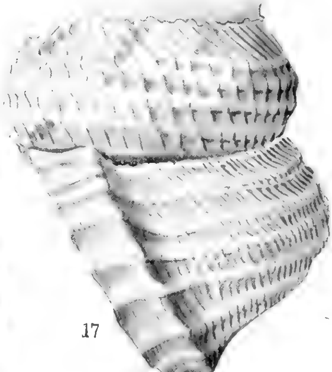

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PHYLLIS CLARKE, del.

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,, 25. *Onoba bassiana*, Hedley.
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,, 28, 29. *Cerithiopsis geniculosus*, Hedley. Shell and enlarged apex.
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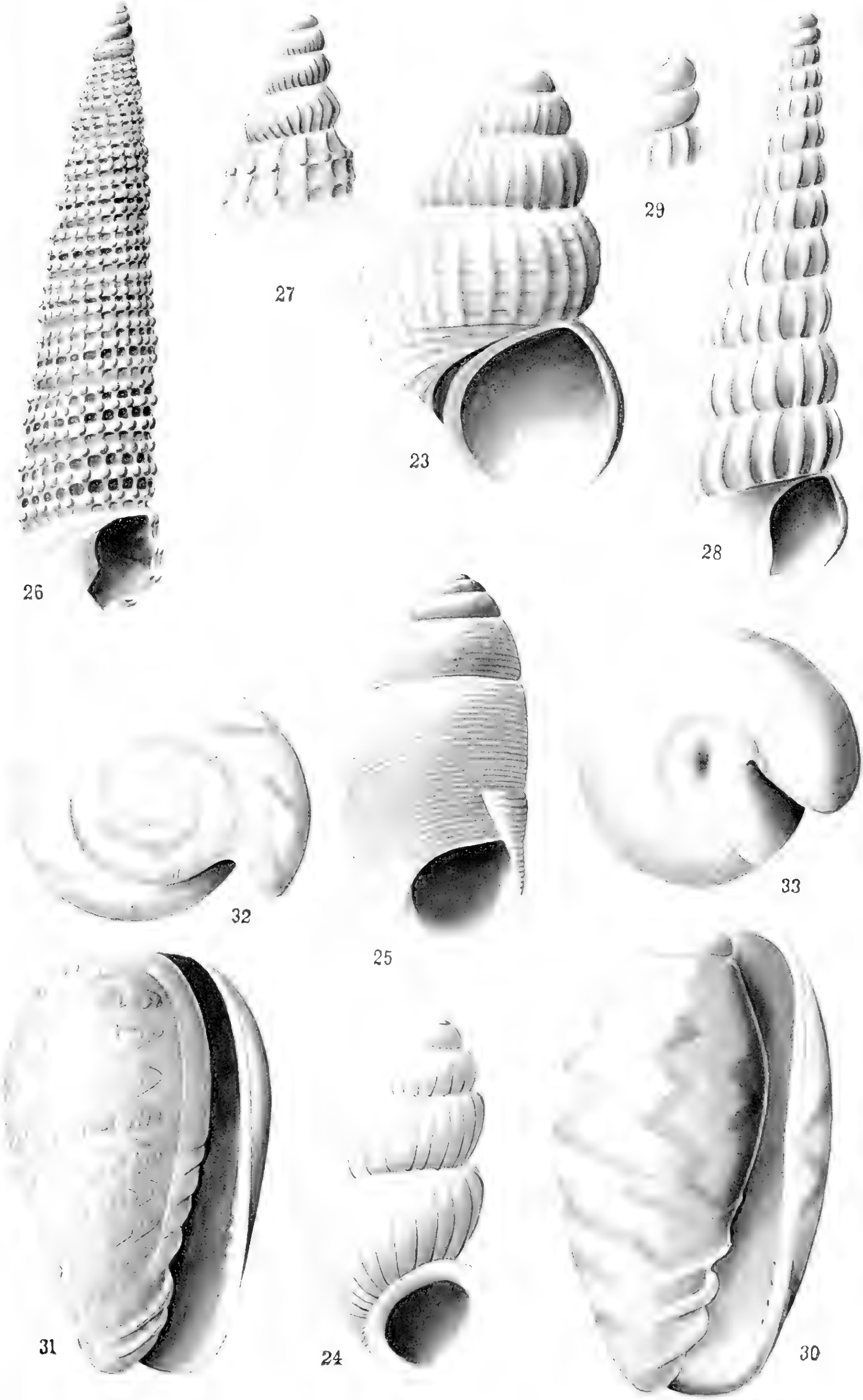

PHYLLIS CLARKE, del.

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,, 38. *Ringicula meridionalis*, Hedley.
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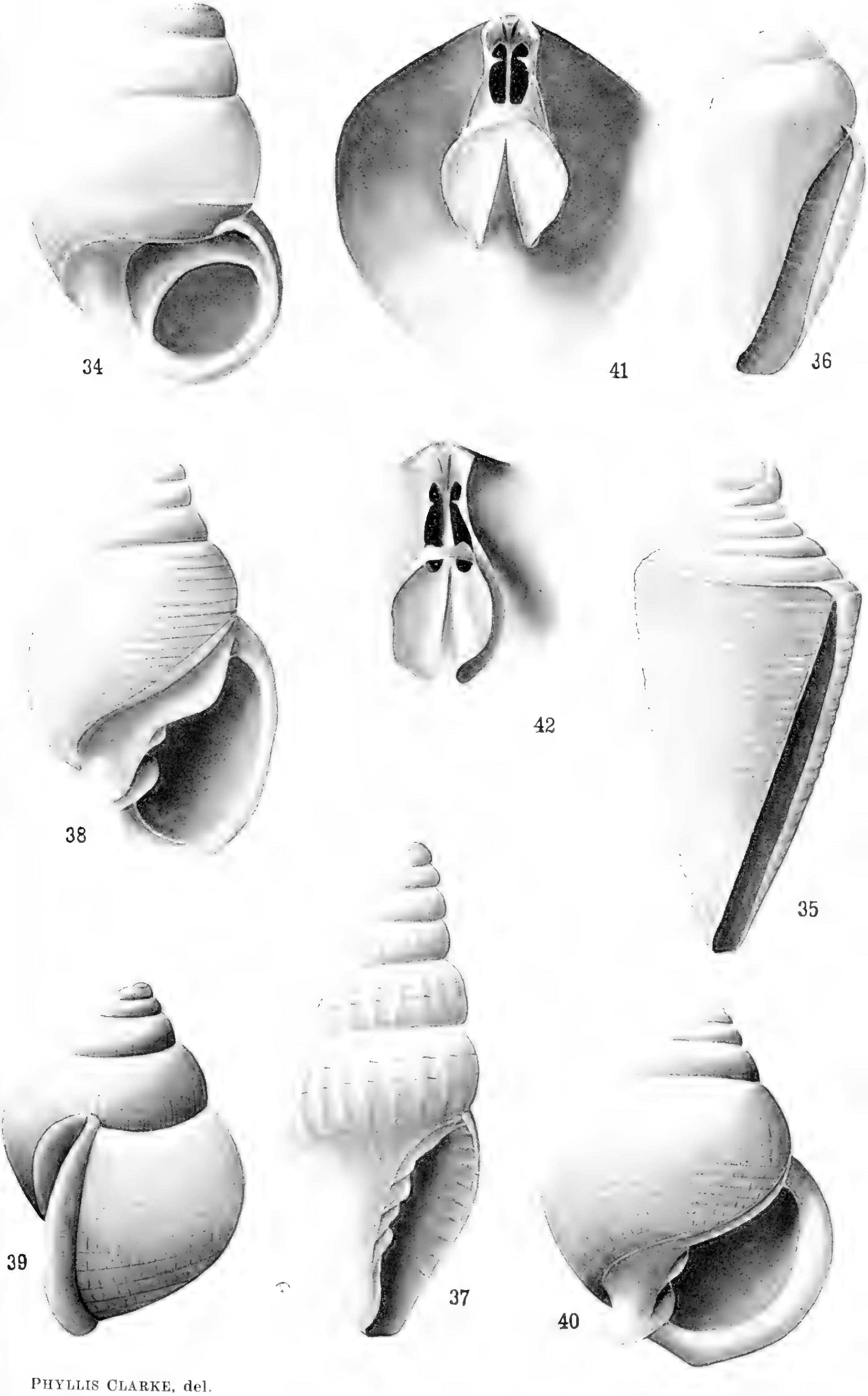
,, 41, 42. *Campages jaffænsis*, Blochmann. Different aspects of the brachial apparatus.



PHYLLIS CLARKE, del.

EXPLANATION OF PLATE XXI.

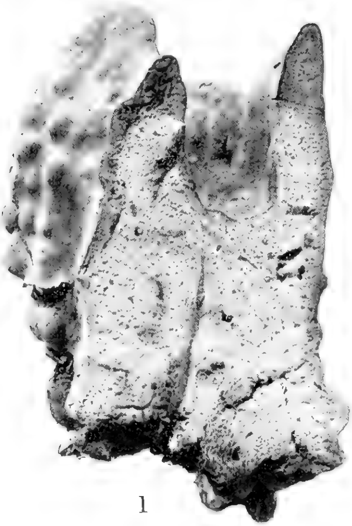
Fig. 1. *Spirastrella poculoides*, sp. nov.; x 7/10.

The specimen, which has been longitudinally bisected, is viewed from the inner surface.

Fig. 2. *Spirastrella alcyonioides*, sp. nov.; x 3/5.

Fig. 3. *Spirastrella montiformis*, sp. nov.; x 5/6.

The surface markings are traces left by an encrusting Cornulariid Alcyonarian.



1

2

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H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXII.

Fig. 1. *Latrunculia conulosa*, sp. nov.; natural size.

Fig. 2. *Paracordyla lignea*, gen. et sp. nov.; x 2/3.
The specimen, which has been longitudinally bisected, is viewed from the inner surface.

Fig. 3. *Polymastia craticia*, sp. nov.; x 3/8.

1

2

3

H. BARNES, JUNR., Photo.

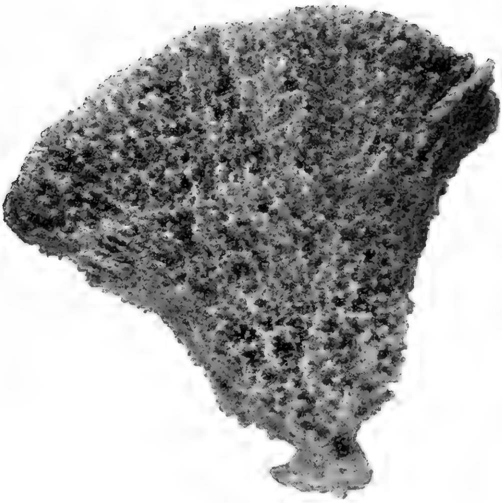
EXPLANATION OF PLATE XXIII.

Fig. 1. *Echinodictyum elegans*, Lendenfeld; x 1/3.

Fig. 2. *Crella incrustans*, Carter, var. *digitata*, var. nov., encrusting a bivalve; viewed from the side; x 1/2.

Fig. 3. *Crella incrustans*, var. *arenacea*, Carter; x 4/9.

Showing the irregularity of form assumed by the shallow-water New South Wales representatives of the species; the dermal encrustation is almost entirely denuded; the surface-grooves are less apparent in the figure than in the specimen itself.



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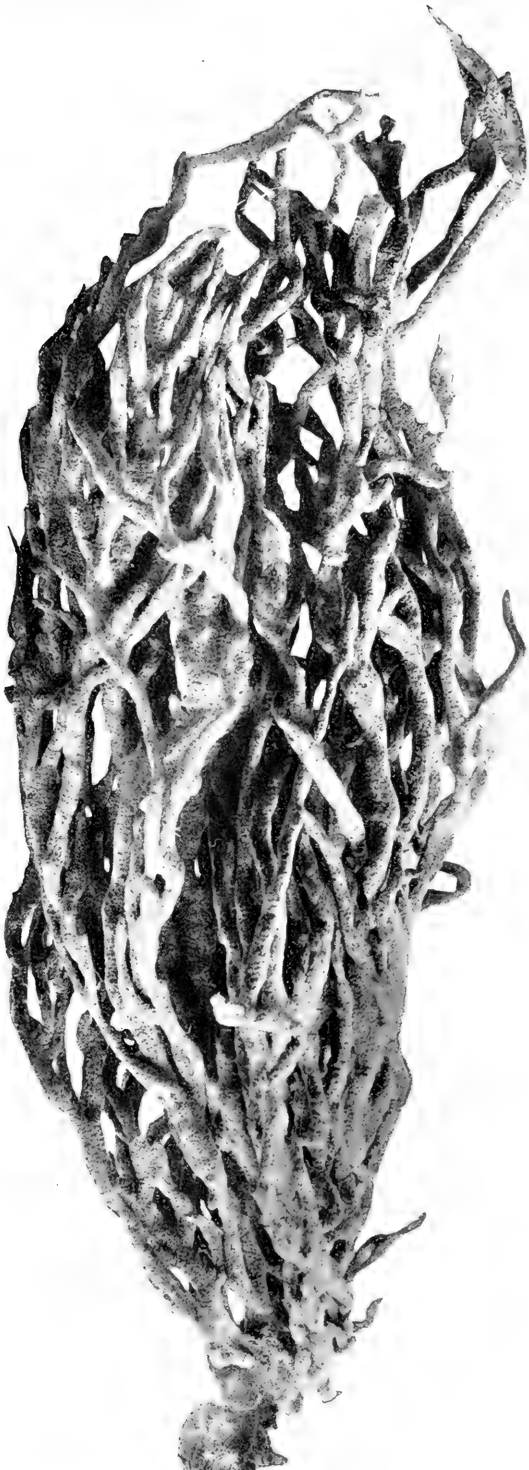
H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXIV.

Fig. 1. *Crella incrustans*, var. *perramosa*, var. nov.; x 1/3.



H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXV.

Fig. 1. *Rhaphidophlus paucispinus*, Lendenfeld; x 1/2.

Fig. 2. *Rhaphidophlus paucispinus*, Lendenfeld, var. *multiporus*, Whitelegge; x 2/7.

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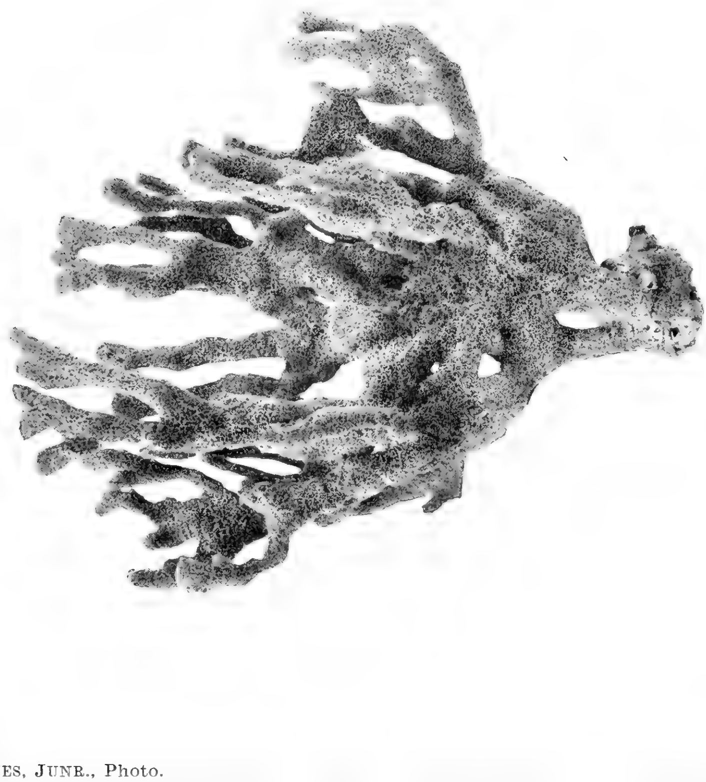

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H. BARNES, JUNR., Photo.

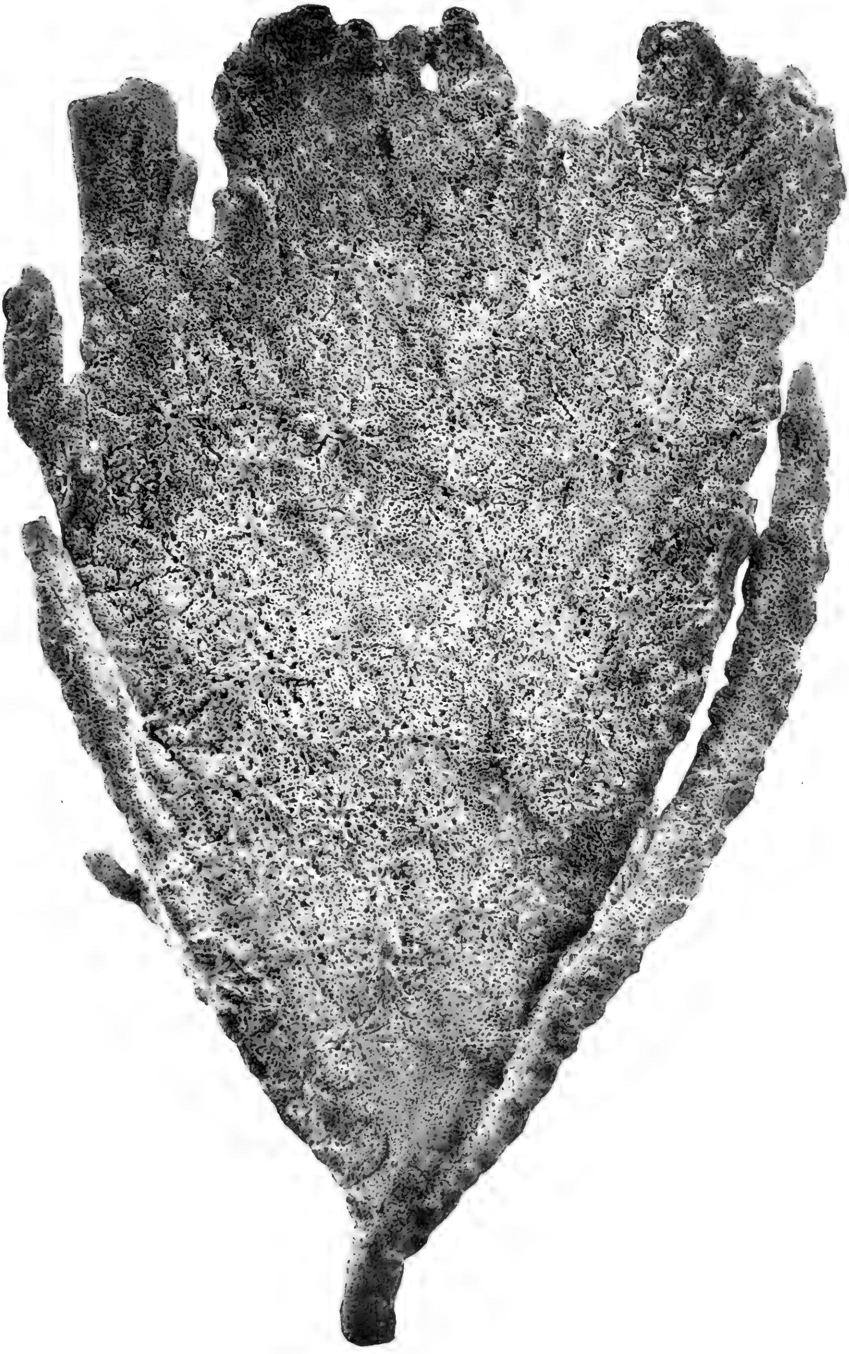
EXPLANATION OF PLATE XXVI.

Fig. 1. *Rhaphidophlus paucispinus*, Lendenfeld; x 1/3.

H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXVII.

Fig. 1. *Rhaphidophlus typicus*, Carter, var. *stellifer*, var. nov.; x 3/5.



H. BARNES, JUNR., Photo.

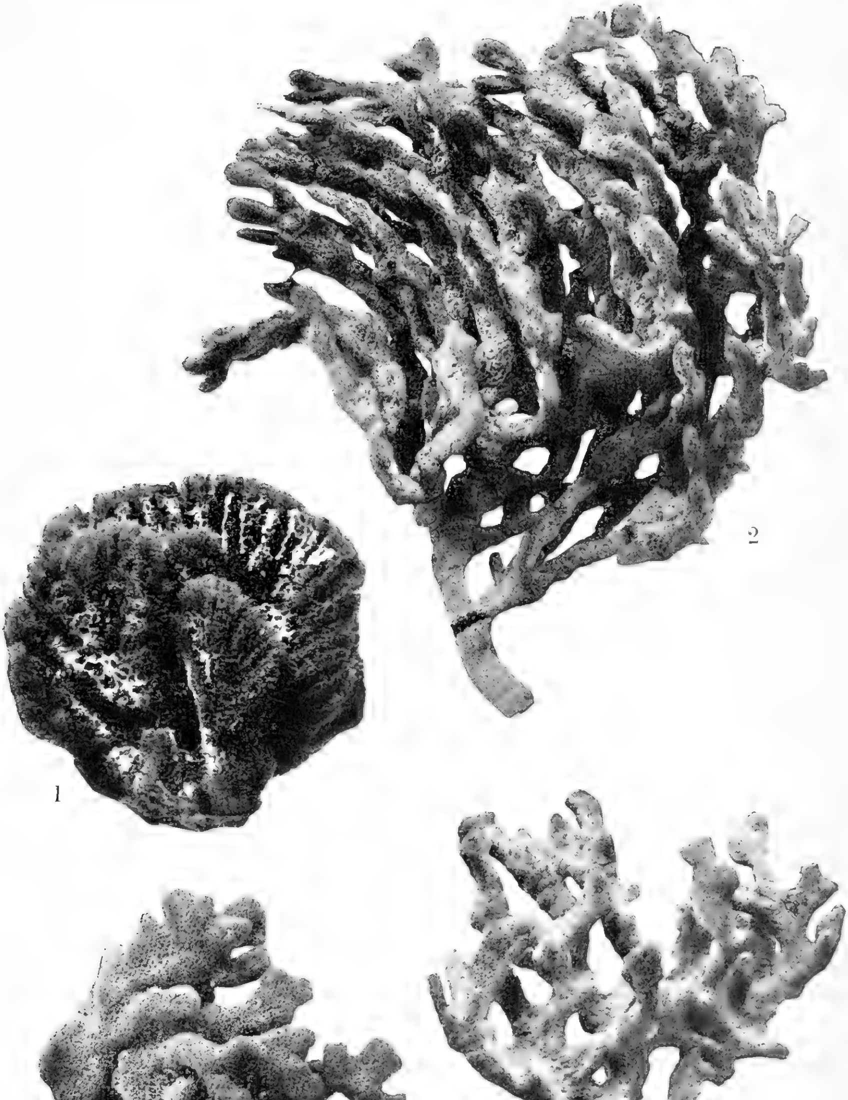
EXPLANATION OF PLATE XXVIII.

Fig. 1. *Rhaphidophlus typicus*, Carter, var. *obesus*, var. nov.; x 5/8.

Fig. 2. *Rhaphidophlus typicus*, Carter, var. *geminus*, var. nov.; x 1/2.

Fig. 3. *Rhaphidophlus typicus*, Carter, var. *proximus*, var. nov.; x 1/2.

Fig. 4. *Rhaphidophlus typicus*, Carter, var. *proximus*, var. nov.; x 1/2.

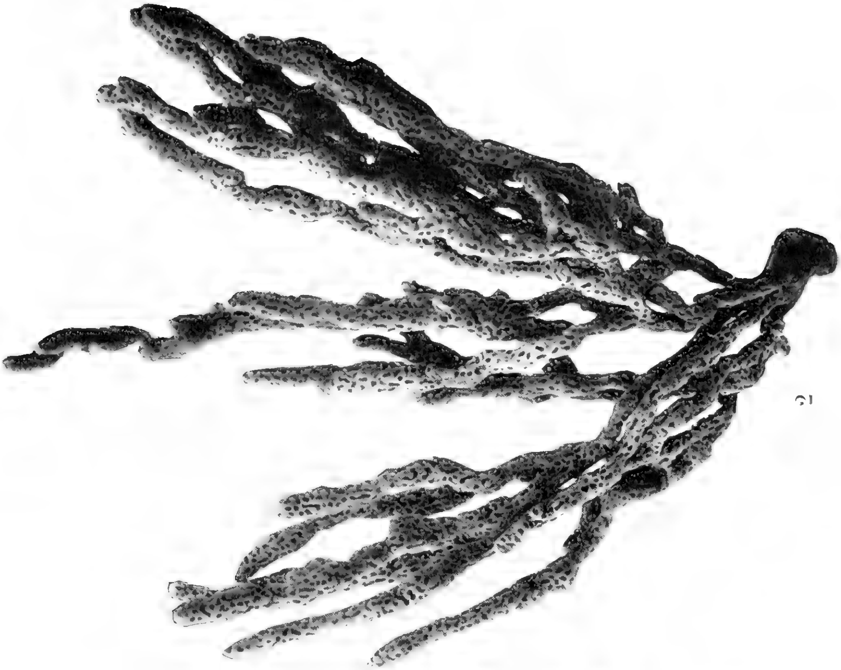


H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXIX.

Fig. 1. *Rhaphidophlus typicus*, Carter, var. *anchoratus*, Carter; x 3/8.

Fig. 2. *Echinoclathria arborea*, Lendenfeld; x 1/2.



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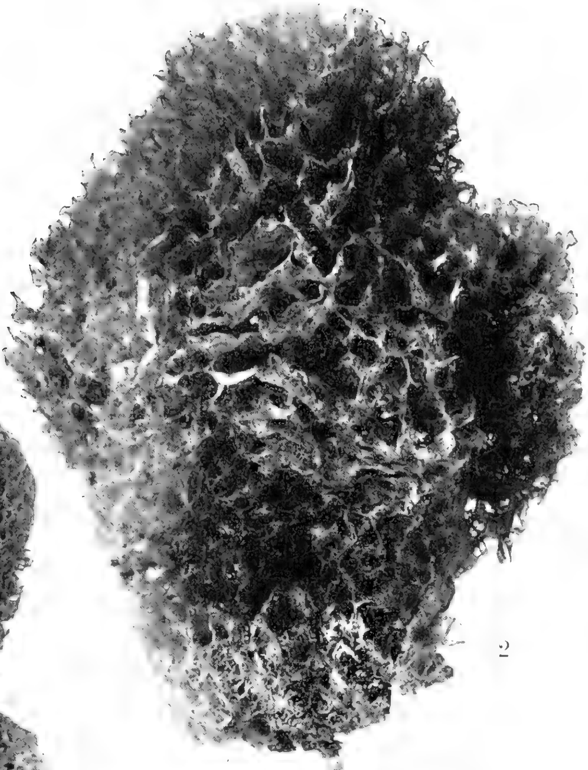
H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXX.

Fig. 1. *Echinoclathria rotunda*, sp. nov.; x 2/3.
Fig. 2. *Echinochalina reticulata*, Whitelegge; x 4/5.
Fig. 3. *Echinoclathria ramosa*, sp. nov.; x 3/5.



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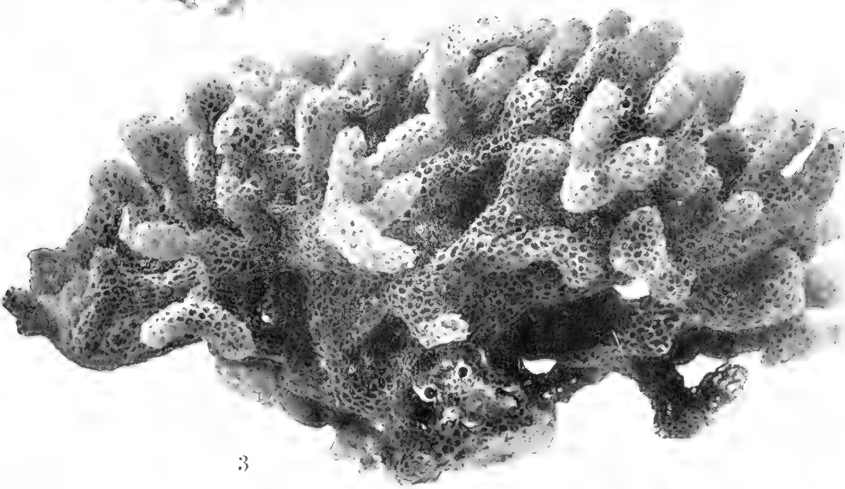

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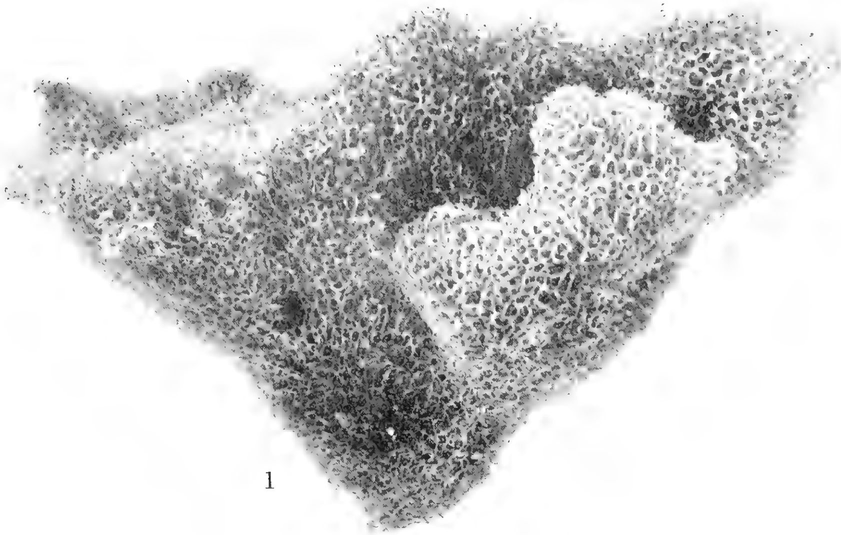
H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXI.

Fig. 1. *Echinochalina reticulata*, Whitelegge, var.; x 3/7.
Fig. 2. *Clathria costifera*, sp. nov.; x 4/9.



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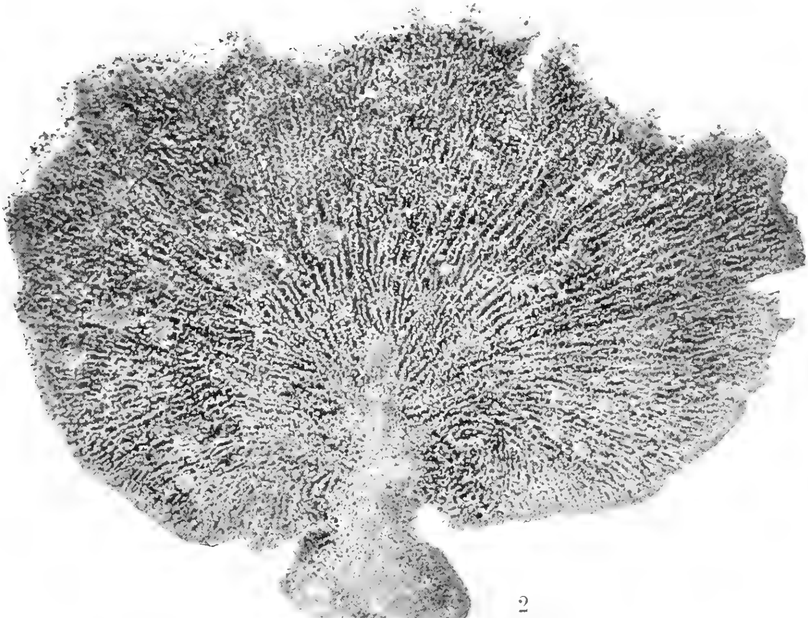

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H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXII.

Fig. 1. *Clathria rubens*, Lendenfeld; x 2/7.
Fig. 2. *Wilsonella conectens*, sp. nov.; x 5/8.
Fig. 3. *Clathria partita*, sp. nov.; x 1/3.

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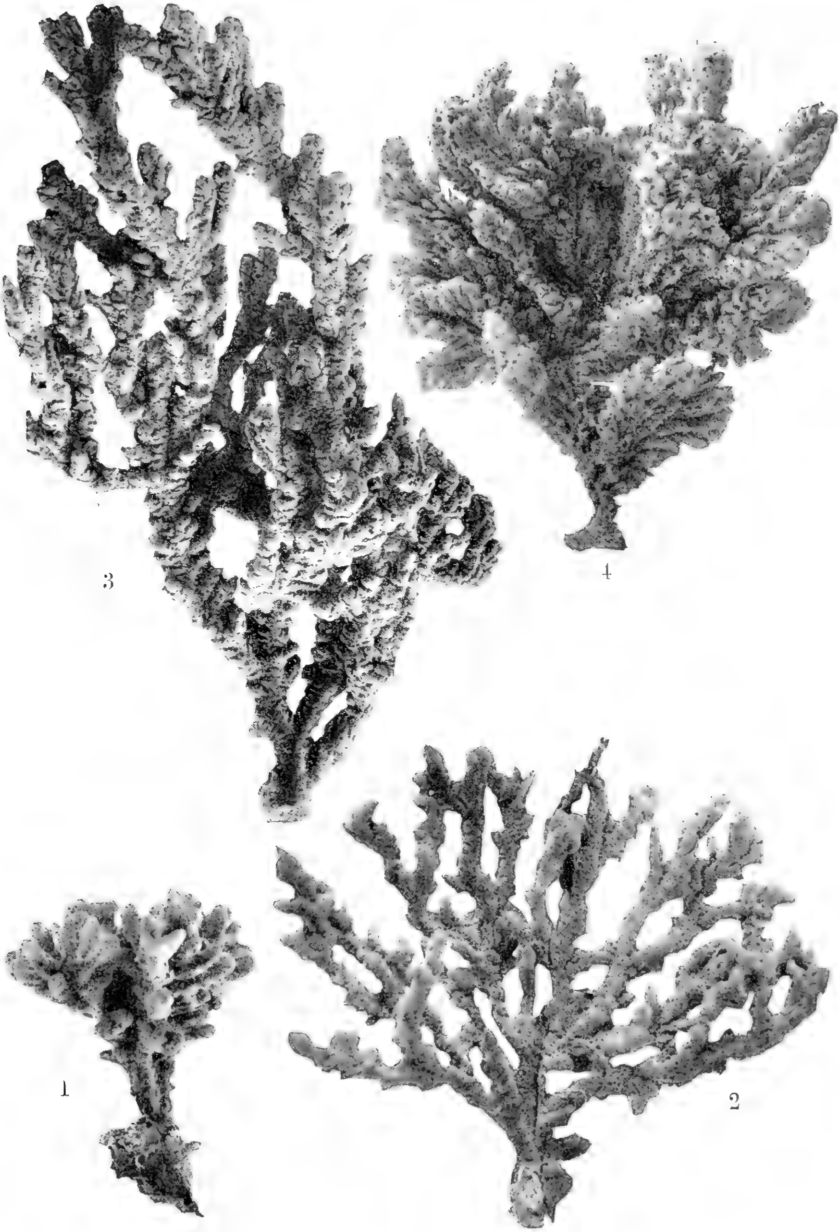
H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXIII.

Fig. 1. *Clathria transiens*, sp. nov., typical form; x 2/3.
Fig. 2. *Clathria transiens*, form (*b*); x 3/5.
Fig. 3. *Clathria transiens*, form (*c*); x 3/5.
Fig. 4. *Clathria caelata*, sp. nov.; x 2/3.



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EXPLANATION OF PLATE XXXIV.

Fig. 1. *Ophlitaspongia subhispida*, Carter, var. *viminalis*, Lendenfeld; x 1/2.

Fig. 2. *Clathria transiens*, form (*d*); x 3/4.

Fig. 3. *Wilsonella oxyphila*, sp. nov.; ? var.; x 1/2.

Fig. 4. *Wilsonella curvichela*, sp. nov.; x 5/13.

H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXV.

Fig. 1. *Ophlitaspongia tenuis*, Carter; x 3/5.
Fig. 2. *Ophlitaspongia confragosa*, sp. nov.; x 2/3.
Fig. 3. *Ophlitaspongia tubulosa*, sp. nov.; x 3/5.

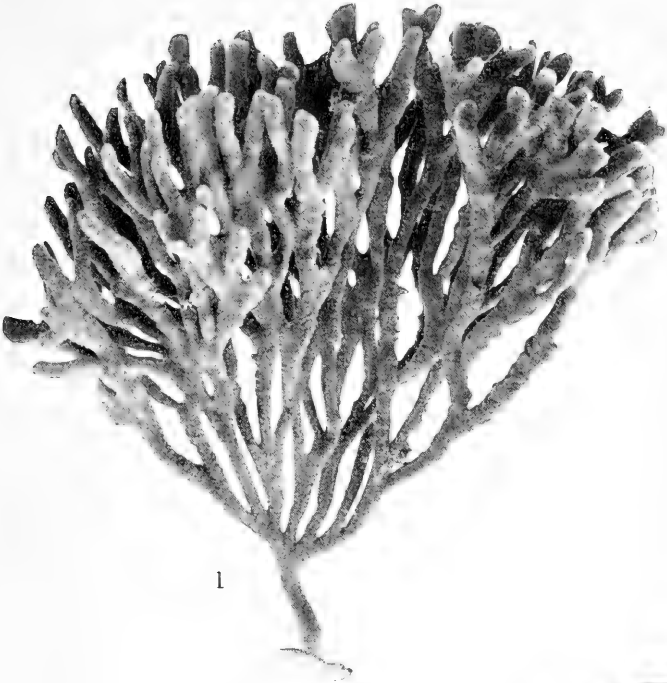
H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXVI.

Fig. 1. *Ophlitaspongia subhispida*, Carter; x 9/10.

Fig. 2. *Ophlitaspongia inornata*, sp. nov.; x 8/9.
The specimen is encrusted with a Cornulariid Alcyonarian.

Fig. 3. *Ophlitaspongia axinelloides*, Dendy; x 7/9.



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H. BARNES, JUNR., Photo.

EXPLANATION OF PLATE XXXVII.

In all figures—

AX. CART.	=	Axial cartilage
B. CART.	=	Basal cartilage.
D.F.C.	=	Dorsal fin chambers.
D.F.R.	=	Dorsal fin rays.
M.P. CART.	=	Median paired cartilages.
N.C.	=	Nerve cord.
N.T.	=	Notochord.
R.F.	=	Rostral fin.

Fig. 1.—Anterior end of *A. australis* showing rostral fin and notochord slightly raised. Drawn with the camera lucida.

Fig. 2.—Outlines of *A. bassanum* and *A. australis* to show proportional widths. Drawn with the camera lucida. Nat. sizes.

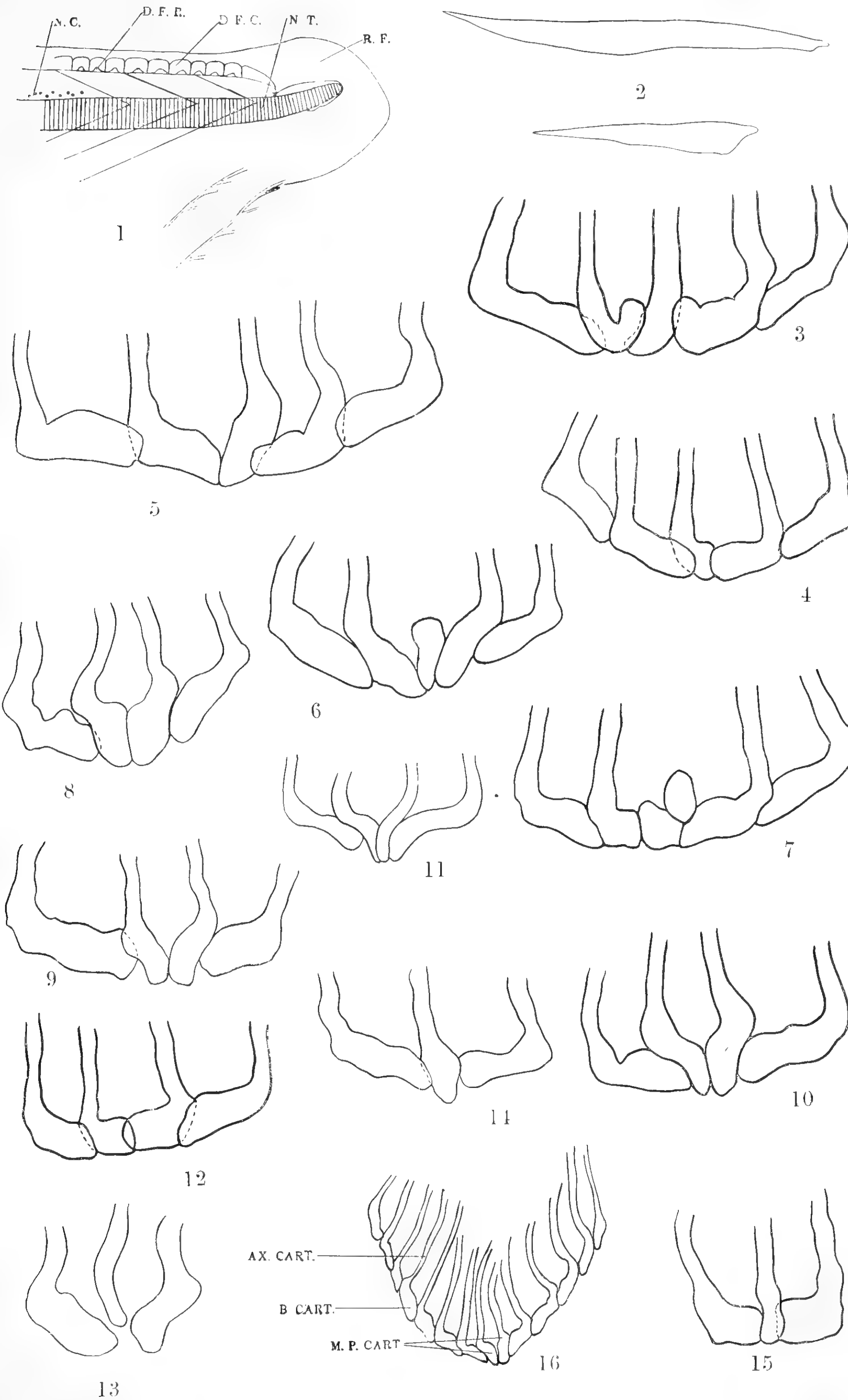
Figs. 3, 4 and 5.—Bases of the cartilages of the mid-ventral portion of the oral hood in three different specimens of *A. australis* to show median ventral unpaired tentacle.

Figs. 6 and 7.—The same in two other specimens with the median ventral unpaired tentacle stunted.

Figs. 8 to 12.—Bases of the cartilages of the mid-ventral portion of the oral hood in five different specimens of *A. bassanum* to show median paired tentacles.

Figs. 13, 14 and 15.—Bases of the cartilages of the mid-ventral portion of the oral hood in three other specimens of *A. bassanum* showing median unpaired tentacle.

Fig. 16.—Cartilages of oral cirri of *A. bassanum* showing position of the median ventral pair.


N. C.
D. F. R.
D. F. C.
N. T.
R. F.
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AX. CART.
B. CART.
M. P. CART.
16
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J. W. RAFF, del