

2nd Ser. ZOOLOGY.]

DEN 16  
[VOL. XVIII. PART 1.

1922

THE

TRANSACTIONS

OF

THE LINNEAN SOCIETY OF LONDON.

THE PERCY SLADEN TRUST EXPEDITION

TO

THE INDIAN OCEAN IN 1905,

UNDER THE LEADERSHIP OF

MR. J. STANLEY GARDINER, M.A.

VOLUME VII.

Reports Nos. 1 to 9 of this volume; Nos. 117—125 of the whole series.



LONDON:

PRINTED BY J. R. PEACE, M.A., AT THE CAMBRIDGE UNIVERSITY PRESS.  
SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON HOUSE, PICCADILLY, W. 1  
AND BY LONGMANS, GREEN, AND CO., PATERNOSTER-ROW, E.C. 4

April 1922.



## CONTENTS.

### PART I.—APRIL, 1922.

- I. *Report on the Sigmatotetraxonida collected by H.M.S. "Sealark" in the Indian Ocean.* By ARTHUR DENDY, D.Sc., F.R.S., F.L.S., Professor of Zoology in the University of London (King's College). (Plates 1-18.) . . . pages 1-164
- II. *Coleoptera, Staphylinidae.* Von Dr. MAX BERHAUER (Horn, Nied.-Oesterreich). (Mitgeteilt von Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) . . . 165-186
- III. *A Geographical Summary based on Dr. Max Berhauer's enumeration of the Staphylinidae of the Seychelles, Chagos, and Aldabra Islands, with Notes on their Biology.* By HUGH SCOTT, M.A., Sc.D., F.E.S. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) . . . 187-193
- IV. *Coleoptera: Scydmanidae, Scaphidiidae, Phalacridae, Curculionidae (Supplement), Lathridiidae, Mycetophagidae (including Propalticus), Bostrychidae, Lyctidae.* By HUGH SCOTT, M.A., Sc.D., F.E.S., Curator in Entomology in the University of Cambridge. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (Plates 19-22 and 7 Text-figures.) . . . 195-260
- V. *Coleoptera, Heteromera: Tenebrionidae.* Von HANS GEBIEN (Hamburg). (Mitgeteilt von Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (Tafel 23 und 22 Text-figures.) . . . 261-324
- VI. *Coleoptera: Cleridae.* Von Sigm. SCHENKLING (Berlin-Dahlem). (Mitgeteilt von Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (+ Textfiguren.) . . . 325-329
- VII. *The Hydroids from the Chagos, Seychelles and other Islands and from the coasts of British East Africa and Zanzibar.* By FLORENCE E. JARVIS. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (With Plates 24-26, and Text-figures 1-6.) . . . 331-360
- VIII. *Diptera: Asilidae, Scenopinidae, Dolichopodidae, Pipunculidae, Syrphidae.* By C. G. LAMB, M.A., B.Sc. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (With Plates 27-30.) . . . 362-416
- IX. *Madrepোরaria: Agariciidae.* By Dr C. J. VAN DER HORST. (Communicated by Prof. J. STANLEY GARDINER, M.A., F.R.S., F.L.S.) (With Plates 31 and 32, and Text-figures 1 and 2.) . . . 417-429

### PART II.—MARCH, 1925.

Index . . . . . 431-444

## NO. I.—REPORT ON THE SIGMATOTETRAXONIDA COLLECTED BY H.M.S. "SEALARK" IN THE INDIAN OCEAN.

By ARTHUR DENDY, D.Sc., F.R.S., F.L.S., Professor of Zoology  
in the University of London (King's College).

(Plates 1-18.)

The scope of the sub-order Sigmatotetraxonida is here greatly enlarged by the inclusion therein of the Lithistidae and Clavulidae, and the group as now constituted is by far the largest of the tetraxonid sub-orders, being represented in the "Sealark" collection by no less than 126 species. Of this total 57 species are here described as new, 65 are identified with previously known species (in some cases as new varieties) and 4 are identified generically only.

The importance of the collection is indicated even more clearly by the fact that it has seemed desirable to propose six new genera for the reception of species represented therein. Of these, Colloclathria is of special interest on account of the occurrence of gelatinous spicules (colloscleres) similar to those of the recently proposed genus Collosclerophora Dendy [1916 E]; Barbozia, Didiscus and Sigmoseptrella are of great importance from the taxonomic point of view, throwing much light upon the origin of the Spirastrellinae and necessitating the transference of the Clavulidae from the astrotetraxonid to the sigmatotetraxonid series, while the peculiar discorhabd of Didiscus has suggested some novel ideas with regard to spicule-formation [Dendy and Nicholson, 1917].

In addition to many novelties the collection also contains representatives of such rare and interesting genera as Merlia (represented only by single spicules), Forcepia, Tedanione, Cornulum, Sideroderma\*, Cyamon, Halicnemis, Acanthoxifer, Hemiasterella, Trichostemma, &c., and adds very greatly to our knowledge of the group as a whole.

The following is a complete list of the species dealt with in the present contribution:—

### Order TETRAXONIDA.

#### Sub-order SIGMATOTETRAXONIDA.

##### Family Lithistidae.

- |   |                                      |
|---|--------------------------------------|
| 1. <i>Theonella pulchrifolia</i> n. sp. | 3. <i>Taprobana herdmanni</i> Dendy. |
| 2. <i>Discoderma tuberosa</i> n. sp.    | 4. <i>Petronica massalis</i> Dendy.  |

##### Family Tetillidae.

- |  |  |
|--|--|
| 5. <i>Tetilla furcifer</i> n. sp.        | 9. <i>Cinachyra anomala</i> (Dendy).                                       |
| 6. <i>Cinachyra vaccinata</i> n. sp.     | 10a. <i>Paratetilla bacca</i> (Selonka) var. <i>violacea</i> (Kieschnick). |
| 7. <i>Cinachyra isis</i> Lendenfeld.     | 10b. <i>Paratetilla bacca</i> var. <i>corrugata</i> nov.                   |
| 8. <i>Cinachyra providentia</i> , n. sp. |  |

\* Name replaced in this Report by *Siderodermella* (q. v.).

## Family Haploscleridae.

## Sub-family Gellinae.

11. *Gellina fibulatus* (Schmidt) var. *microsigma* Dendy.  
 12. *Gellina flagellifer* Ridley and Dendy.  
 13. *Gellina calyx* Ridley and Dendy var. *indica* nov.  
 14. *Gellina toxius* Topsent.  
 15. *Gellina petrosioides* (Dendy).  
 16. *Gellodes caruosa* Dendy var. *laza* nov.  
 17. *Toxochalina robusta* Ridley.

## Sub-family Renierinae.

18. *Reniera semitubulosa* (Lamarek?).  
 19. *Reniera rosea* (Bowerbank).  
 20. *Reniera cribriformis* Ridley.  
 21. *Reniera camerata* Ridley.  
 22. *Reniera cribriculata* n. sp.  
 23. *Reniera tuberosa* n. sp.  
 24. *Reniera tufoides* n. sp.  
 25. *Reniera bignifurmis* n. sp.  
 26. *Petronia seychellensis* n. sp.  
 27. *Petronia mammiformis* n. sp.  
 28. *Halichondria panicea* Johnston var.  
 29. *Halichondria reticulata* n. sp.  
 30. *Halichondria nigra* n. sp.  
 31. *Halichondria aphysioides* n. sp.  
 32. *Halichondria tenuiramosa* nom. n.

## Sub-family Chalininae.

33. *Pachychalina subcylindrica* Dendy.  
 34. *Chalina confusa* n. sp.  
 35. *Cerochalina reticulata* Dendy var. *salomonensis* nov.  
 36. *Cerochalina differentiata* n. sp.

## Sub-family Phloeodictyinae.

37. *Oceanapia toxophila* n. sp.  
 38. *Phloeodictyon seychellense* n. sp.  
 39. *Phloeodictyon porosum* n. sp.  
 40. *Phloeodictyon fistulosum* (Bowerbank).  
 41. *Phloeodictyon incrustatum* n. sp.  
 42. *Phloeodictyon polysiphonia* n. sp.

## Sub-family Merliinae.

43. *Mertia* sp.

## Family Desmacidonidae.

## Sub-family Esperellinae.

## Section MYCALEE.

44. *Mycale crassissima* (Dendy).  
 45. *Biemna tubulata* (Dendy).  
 46. *Paresperella* sp.

## Section CLADONHIZEE.

47. *Amphilectus* (?) *unguiculatus* n. sp.

## Sub-family Ectyoninae.

## Section CLATHRIAE.

48. *Microciona atrusanguinea* Bowerbank.  
 49. *Microciona streptosia* Hope var. *robusta* nov.  
 50. *Aulospongia tubulatus* (Bowerbank).  
 51. *Bubaris conulifera* n. sp.  
 52. *Bubaris salomonensis* n. sp.  
 53. *Clathria procera* (Ridley).  
 54. *Clathria corallitincta* Dendy.  
 55. *Clathria spicata* Hallmann.  
 56. *Clathria whiteleggii* n. sp.  
 57. *Clathria madrepora* n. sp.  
 58. *Clathria spongodes* n. sp.  
 59. *Clathria chelifera* (Hentschel).  
 60. *Echinoclathria intermedia* Whitelegge.  
 61. *Raspailia* sp.  
 62. *Ectyon ceylonica* (Dendy).  
 63. *Echinodictyon clathratum* Dendy.

## Section COLLOSCLEROPHOREAE.

64. *Collocathria ramosa* n. gen. et sp.

## Section PLOCAMIEE.

65. *Plocamia coriacea* (Bowerbank).  
 66. *Plocamia elegans* (Ridley and Dendy).  
 67. *Plocamia massalis* n. sp.  
 68. *Lithoplocamia lithistoides* n. gen. et sp.

## Section HYMEDESMIEE.

69. *Hymedesmia laevissima* n. sp.  
 70. *Hymedesmia lipochela* n. sp.  
 71. *Hymenophia radiata* (Bowerbank).  
 72. *Rhabdarenia pusilla* (Carter).

## Section MYXILLEE.

73. *Plumhalichondria clathrodes* n. sp.  
 74. *Plumhalichondria gardineri* n. sp.  
 75. *Myxilla incrustans* (Johnston).  
 76. *Myxilla arenaria* Dendy.  
 77. *Hanigerra papillata* n. sp.  
 78. *Forcipia stephensi* n. sp.  
 79. *Forcipia* (?) sp.

## Section CRELLEE.

80. *Yersia spinulata* (Hentschel).  
 81. *Crella cyathophora* (Carter) var. *acutata* nov.

## Section IOTROCHOTEE.

82. *Iotrochota purpurea* (Bowerbank).  
 83. *Iotrochota baculifera* Ridley.

## Section ACARNEE.

84. *Acarus topsenti* n. sp.

## Section TEDANIEE.

85. *Tedania digitata* (Schmidt).  
 86. *Tedania reticulata* Thiele.  
 87. *Tetanion wilsoni* n. sp.

## Section CEROLOPHOREE.

88. *Coranella hundbecki* n. gen. et sp.  
 89. *Coranella strepsichela* n. sp.  
 90. *Siderodermella ramosa* n. sp.

## Section CYAMONEE.

91. *Cyamon rickertii* (Bowerbank).

## Sub-family Axinellinae.

## Section AXINELLEAE.

92. *Sigmazinella bihamigera* n. sp.  
 93a. *Sigmazinella durissima* (Dendy) var. *massalis* nov.  
 93b. *Sigmazinella durissima* (Dendy) var. *erecta* nov.  
 93c. *Sigmazinella durissima* (Dendy) var. *tethyoides* nov.  
 94. *Axinella bulbarinoides* n. sp.  
 95. *Axinella spiculifera* (Lamarek).  
 96. *Phakellia donnani* (Bowerbank).  
 97. *Phakellia comulosa* n. sp.  
 97a. *Phakellia comulosa* var. *mauritiana* nov.  
 98. *Acanthella carteri* Dendy.  
 99. *Acanthella pulcherrima* Ridley and Dendy var. *calyx* nov.  
 100. *Acanthella cavernosa* n. sp.  
 101. *Auletta elongata* Dendy.  
 102. *Auletta lyrata* (Esper) var. *lucispiculata* Dendy.  
 103. *Hymeniacidon varioperculata* n. sp.  
 104. *Hymeniacidon conglomerata* n. sp.  
 105. *Leucophaea fenestrata* Ridley.  
 106. *Spongonorites salomonensis* n. sp.

## Section HETEROXYEE.

107. *Higginsia petrosioides* n. sp.  
 108. *Higginsia higgini* n. sp.  
 109. *Halimnania salomonensis* n. sp.  
 110. *Acanthozifer ceylonensis* Dendy.

Family *Clavulidæ*.Sub-family *Spirastrellinæ*.

- |  |  |
|--|--|
| 111. <i>Barbozia primitiva</i> n. gen. et sp.                                  | 114b. <i>Spirastrella vagabunda</i> Ridley var. <i>gelatinosa</i> nov. |
| 111a. <i>Barbozia primitiva</i> var. <i>digitata</i> nov.                      | ✕ 115. <i>Spirastrella decumbens</i> Ridley.                           |
| 112. <i>Didiscus placospongioides</i> n. gen. et sp.                           | 116. <i>Spirastrella globularis</i> n. sp.                             |
| 113. <i>Sgnosceptrella quadrilobata</i> n. gen. et sp.                         | ✕ 117. <i>Timea stellarians</i> (Carter).                              |
| ✕ 114. <i>Spirastrella vagabunda</i> Ridley.                                   | ✕ 118. <i>Timea unistellata</i> (Topsent).                             |
| ✕ 114a. <i>Spirastrella vagabunda</i> Ridley var. <i>tubulodigitata</i> Dendy. | ✕ 119. <i>Placospongia carinata</i> (Bowerbank).                       |
|  | 120. <i>Hemiassterella intermedia</i> n. sp.                           |

Sub-family *Clioninæ*.

- 121.
- Cliona celata*
- Grant.

Sub-family *Suberitinæ*.

- |   |   |
|---|---|
| 122. <i>Suberites cruciatus</i> Dendy var. <i>depressa</i> nov. | 125. <i>Polymastix conigera</i> Bowerbank.        |
| ✕ 123. <i>Tarpios fugax</i> Duchassaing and Michelotti.         | 126. <i>Trichostemma sarsii</i> Ridley and Dendy. |
| 124. <i>Polymastix tubulifera</i> n. sp.                        |   |

I have again to acknowledge my indebtedness to Miss Hilda L. Deakin, B.Sc., for valuable help, chiefly in making microscopical preparations and drawings, and to the Trustees of the Percy Sladen Fund for the financial assistance by which such help was rendered possible. The photographic illustrations are mainly the work of my skilled assistant, Mr Charles Biddolph.

As this part completes the account of the "Sealark" Tetraxonida, I propose to give at the end the reference list of literature applicable to the order.

## Sub-order 3. SIGMATOTETRAXONIDA Hentschel [1909].

Tetraxonida with sigmatose microscleres or derivatives thereof (except when these have been lost secondarily). No true asters are present but pseudasters sometimes occur\*.

Family *Lithistidæ*.

Sigmatotetraxonida in which the skeleton is composed chiefly of desmas, typically united in a continuous framework, so that the sponge often acquires a stony hardness.

I assign to the Lithistidæ a place amongst the Sigmatotetraxonida on account of the fact that they sometimes contain sigmatose microscleres but, so far as I am aware, never true asters. As there are very few species in the collection it is undesirable to enter into the question of the subdivision of the family (hitherto usually regarded as an order) except as regards the genera and species represented.

Genus *THEONELLA* Gray [1868].

Lithistidæ with tetracrepid desmas, phyllotrixenes or (and) dichotrixenes (typically dermal) and microrhabds; without discotrixenes.

\* For a discussion as to the origin of these see under Cyamoneæ and Spirastrellinæ; also Dendy [1921].

1. *Theonella pulchraifolia* n. sp.

(Plate 9, fig. 1 a—m.)

This species is unfortunately represented only by a number of broken fragments. These have the form of irregular, flattened plates, which may be strongly curved. They are about 3 mm. thick and the largest piece measures 15 by 10 mm.; there is another of about the same size and four or five smaller bits. Probably all belong to the same specimen. Oscula and pores not made out. Texture hard and stony, but friable. Colour in spirit white.

The main skeleton is a close reticulation of tetracrepid desmas, united together by interlocking of the much-branched rays. The reticulation may become much closer at the surface. There is possibly a dermal skeleton of phyllotrixenes, but, although these spicules are abundant in boiled-out preparations, I have rarely, if ever, seen one in position at the surface.

*Spicules*.—(1) Desmas (Plate 9, figs. 1 a—e); these are very irregular and have their rays much branched, especially towards the extremities, the ultimate branches being short and crowded and constituting the interlocking processes. The mode of interlocking is shown at *xx* in fig. 1 b. They are typically tetracrepid (fig. 1 a) but deviations from the type occur, as shown in the figures. The more central portions of the rays are usually nearly smooth, but at the surface of the sponge the outer aspects of the rays are more or less abundantly ornamented with large blunt tubercles (fig. 1 b). Maximum diameter of desma, say, about 0.34 mm.

(2) Phyllotrixenes (fig. 1 f—m); very irregular, with short shaft and usually much-branched, smooth, foliaceous rays; the terminal portions of the branches often appear to be reduced to thin, flat films of silica; maximum diameter of cladome, say, about 0.14 mm. A peculiar feature of these spicules is the enormous enlargement of the axial canal in the shaft and in the basal portions of the cladi, perhaps due to erosion. This may be carried to such an extent that the shaft and cladi may be almost separated from one another. This feature is well shown in the illustrations (see especially fig. 1 l, m).

(3) Dichotrixenes (fig. 1 n); with short shaft and smooth, sharp-pointed, bifurcate rays; total diameter of cladome about 0.12 mm. Like the phyllotrixenes, these spicules are abundant in boiled-out preparations, but I have failed to find them in position in the sponge.

(4) Long, slender, smooth microxea (fig. 1 o); fusiform, gradually and finely pointed at each end, often more or less angulate in the middle; size about 0.14 by 0.003 mm.

(5) Comparatively short, smooth or very minutely roughened microxea (fig. 1 p); straight or nearly so, fusiform, sharply pointed at each end; size about 0.057 by 0.0027 mm.

Owing to the unsatisfactory condition of the specimens it is quite possible that some elements of the spiculation may have been overlooked, but I do not think that this is very probable. It is also possible that the microxea, which occur chiefly, if not exclusively, in boiled-out preparations, may be foreign, but again I do not think so. The long slender ones resemble the corresponding spicules of *Discodermia tuberosa*, though perhaps of larger average size, but the short, often minutely roughened ones, are quite different from the short, roughened microrhabds of that species.

*Register Number, Locality, &c.* CXXIII. 1, Salomon, C., 3.7.05, 120—150 fathoms.



## Genus DISCODERMIA Barboza du Bocage [1869].

Lithistidae with tetracrepid desmas and a dermal skeleton composed of discotriaenes, to which phyllotriaenes may be added; microscleres in the form of microrhabds.

2. *Discodermia tuberosa* n. sp.

(Plate 9, fig. 2 a—g.)

Sponge massive, irregular, tuberous. There is no evidence of any definite attachment except in one specimen (R.N. IX. 2 A), which has a quantity of calcareous debris partly embedded in what was evidently the lower end of the slightly elongated sponge. The surface is uneven, but clean and fairly smooth, though harsh to the touch. Vents, in two cases at any rate, minute and grouped abundantly on the upper part of the sponge; now mostly closed by a thin, translucent membrane, presumably a sphincter. One of the specimens (R.N. IX. 2 c) shows a longitudinal folding of the whole sponge, which, if carried far enough, would enclose the group of vents in a cup-shaped depression. The surface of the sponge shows narrow subdermal canals, mostly running upwards towards the group of vents but sometimes ramifying irregularly. The texture is hard, compact and incompressible. The largest specimen measures about 25 mm. in maximum diameter. The colour in spirit is pale yellowish.

The skeleton is a close-meshed reticulation of much-branched tetracrepid desmas, with a dermal layer of discotriaenes.

*Spicules*.—(1) Tetracrepid desmas (Plate 9, fig. 2 a); with very irregularly and much-branched rays. Adjacent desmas never seem to be fused with one another, but held together simply by interlocking of their terminal ramifications. A single desma measures, say, about 0.7 mm. in maximum diameter, from apex to apex of opposite branches.

(2) Discotriaenes (fig. 2 b—d); with a smooth, flat disc, commonly having an irregularly sinuous margin, and short, stout, subconical shaft. Diameter of disc up to about 0.5 mm.; length of shaft about 0.1 mm. The form of the young spicule, in which the cladi have not yet united to form the disc, is shown in fig. 2 e, which shows that all the rays at this stage have roughened surfaces.

(3) Microxea (fig. 2 f); slender, slightly curved or even angulate in the middle, gradually and finely pointed at each end, surface very minutely roughened; size about 0.09 by 0.0027 mm. Very abundant throughout the sponge.

(4) Microstrongyla (fig. 2 g); short, straight, sausage-shaped, with finely roughened surface; size about 0.0164 by 0.0027 mm. These spicules are extremely numerous just beneath the dermal layer of discotriaenes; they also occur in much smaller numbers along with the microxea in the deeper parts of the sponge.

There seem to be no transitional forms between (3) and (4).

I have found no other spicules that can safely be regarded as really belonging to the sponge. Mounted preparations usually contain a larger or smaller number of fragments of long, slender megascleres, but some of these are certainly foreign inclusions. If any of them are proper to the sponge they are very local and sporadic in their distribution and I have never been able to find a complete one that does not appear to be foreign. R.N. IX. 2 c,

however, contains some bundles of irregularly ended, slender styli (?) which may perhaps form part of the proper spiculation. On the other hand, all the specimens contain a small number of large calthrops, which have quite evidently been derived from specimens of *Nodonia perfecta* in the same jars.

This species is evidently very closely related to *Discodermia panoplia* Sollas [1888 A] from near the Ki Islands, and might even be regarded as a variety thereof. It differs considerably, however, in the form of the desmas, which in Sollas's species are covered with low, wart-like tubercles and have not got the relatively slender terminal branches present in our species. A further difference may possibly be found in the occurrence of fusiform, slender, sharp-pointed oxea amongst the megascleres of *D. panoplia*, but Sollas has never seen these spicules entire and their nature must be regarded as somewhat enigmatical.

Sollas describes the microxea and microstrongyla of his species as "smooth," but I am inclined to think, from the examination of one of his preparations, that they are occasionally slightly roughened. On the other hand, while these spicules are typically roughened in *D. tuberosa*, they may, even in that species, be occasionally smooth or nearly so. This is notably the case in R.N. x. 5, so that I do not think that this character, taken alone, can be regarded as of specific value.

*Locality, Register Numbers, etc.* IX. 2 A, B, C, x. 5, S. de Malha, 4.9.05, C. 1, 150 fathoms.

## Genus TAPROBANE Dendy [1905].

Lithistidae of plate-like form, with minute, sphinctrate apertures scattered on each side of the plate; with monocrepid, tuberculate desmas and long, slender oxea; without special ectosomal spicules and with microscleres in the form of sigmata only.

3. *Taprobane herdmanni* Dendy [1905].

(Plate 1, figs. 1, 1 a.)

This species, hitherto known only by a single specimen from the Gulf of Manaar, is represented in the "Sealark" collection by one magnificent dry specimen (R.N. CXLVII.) and a number of pieces in spirit (R.N. LXXIV. and CVI. 4) which are probably all fragments of another large specimen. The pieces in spirit agree very closely with the original type, but the pustule-like areas on the surface are difficult to detect without preparation. This is no doubt due to the hispidation of the surface and to the amount of foreign matter collected upon it. They can be recognized in surface sections under the microscope quite easily.

The dry specimen, of which I give a photograph (Plate 1, figs. 1, 1 a), comes from the same locality (Amirante) as the pieces in spirit, but is clearly a distinct individual. It has the form of an irregularly curved plate, about 1.5 cm. thick, 27 cm. in greatest height and 31.5 cm. in greatest width. It has evidently been torn off from some support, to which it appears to have been attached by a broad base extended obliquely to the sponge-lamina. The margin of the plate is broadly rounded and undulating.

Both surfaces are still strongly hispid in places, but what I take to be the outer (inhalant) surface is extensively encrusted with foreign growths. On this surface the minute, pustule-like inhalant areas are thickly scattered and are distinctly visible where

not obscured by hispidation or foreign matter. On the inner (exhalant) surface the pustule-like exhalant areas are much more conspicuous (fig. 1  $\alpha$ ) and in many cases the single vent is very distinctly visible in the middle of the circular diaphragm. Each area, with its slightly raised margin, measures a little over 1 mm. in diameter, and they are very thickly scattered over the entire surface.

As regards spiculation this specimen (R.N. CXLVII.) differs slightly from the type in the more robust character of the sigmata, which are enormously abundant. These spicules commonly show a slight roughening (minute spination), a feature which may also sometimes be present in the type, though less easily recognizable on account of the smaller size of the spicule, and overlooked in the original description. I may add that the sigmata are contort, blunt at the extremities, and measure (in R.N. CXLVII.) about 0.016 mm. in length, in a straight line between the apparent ends, by 0.002 mm. in thickness.

*Previously known Distribution.* Gulf of Manaar (Dendy).

*Register Numbers, Localities, &c.* LXXIV., OVI. 4, Amiranthe, 13.10.05, E. 16, 39 fathoms; CXLVII., Amiranthes, 11.10.05, dredged.

#### Genus PETROMICA Topsent [1898 c].

Lithistidæ of massive form, with scattered pores and vents; with thin dermal membrane destitute of special skeleton; with monocrepid desmas feebly united or quite separate; with monaxonid rhabdi often collected in fibres which may terminate in surface conuli; without microscleres.

#### 4. *Petromica massalis* Dendy. [1905].

(Plate I, fig. 2.)

There is in the collection a single fine specimen (Plate I, fig. 2) of this interesting species, very perfect, except that it has been cut in half lengthwise. The external form is somewhat turbinate, with a constricted base of attachment and a flattened top on which are scattered large conuli, while smaller conuli occur between the large ones and also, more abundantly, scattered all over the lateral surfaces of the sponge at fairly regular intervals. The large conuli themselves appear to be made up of aggregations of small ones and the latter mark the points where the characteristic spicule-bundles of the skeleton come to the surface.

There is a very distinct dermal membrane supported on the ends of the spicule-bundles but without any skeleton of its own. It shows, however, a minutely reticulate character due to the presence of anastomosing fibrillar bands, which form a network whose principal nodes are the apices of the small papillæ. The conulose surface thus bears a close resemblance to that of many horny sponges (*Eucratosa*).

The specimen measures about 40 mm. in height and 45 mm. in maximum width. The colour in spirit is light brown. The vents are small and scattered, especially on the upper part of the sponge.

The cut surface shows a distinctly radial arrangement of skeletal columns. With regard to the skeleton itself I have nothing to add to my former description, the specimen agreeing

very closely with those from Ceylon. Thus the ends of the branches of the desmas are nearly always smooth and not minutely tuberculated as in *P. grimaldii* Topsent [1904 A].

*Previously known Distribution.* Ceylon Seas (Dendy).

*Register Number, Locality, &c.* xcvi. 1, Amiranthe, 13.10.05, E. 15, 39 fathoms.

#### Family Tetillidæ.

Tetractinellid Sigmatotetragonida in which the skeleton is typically arranged in a radial manner. The characteristic megascleres are long-shafted protriænes and anatriænes and the characteristic microscleres are sigmata.

#### Genus TETILLA Schmidt [1868].

Tetillidæ without any special cortical skeleton, without porocalices and without a subdermal layer of short-shafted triænes.

The name Tethya has been used by recent writers [Baer, 1905; Lendenfeld, 1906, 1907; Hentschel, 1912] for this genus, but I have already [1916 c] given my reasons, in dealing with the genus Donatia, for abandoning the name Tethya altogether, and I adhere to Schmidt's name Tetilla, by which the genus has so long been known.

I doubt whether it is necessary to follow Lendenfeld [1906] in merging Craniella in Tetilla (Tethya), but that question does not arise in connection with the present collection.

#### 5. *Tetilla furcifer* n. sp.

(Plate 10, fig. 1  $\alpha-k$ .)

The single specimen in the collection has a somewhat curious external form. I suspect that it has been removed from some substratum to which it was not very firmly adherent. The surface of attachment (base) is oblong and almost rectangular, but with one long side of the rectangle bulging out. It is slightly and unevenly concave and exhibits a radially striated appearance due to the spicule-bundles of the skeleton, the skeleton nucleus lying at about the centre of this surface. On the upper surface the middle portion of the sponge is strongly convex and approximately hemispherical, but it flattens out towards the two ends of the base, which are quite thin. The upper surface is distinctly but not very strongly hispid and at the same time more or less thickly encrusted with fine calcareous sand. The hispidating spicules tend to point downwards like a thatch. At the margin they appear as a very slightly developed marginal fringe, though the hispidation is not really more strongly developed here than it is on other parts of the upper surface. The specimen measures 24 mm. in length by 15 mm. in greatest breadth and about 7 mm. in greatest thickness (in the middle). The colour in spirit is light chocolate brown throughout, but it may have been stained by some other specimen, of which there were many in the same jar. The texture is firm and compact.

Neither vents nor pores are visible except in microscopic sections. These show that there is a distinctly fibrous cortex, though the fibrous tissue is not very dense and is developed chiefly in its deeper portion, the outer part being rather collenchymatous with very numerous small nuclei. The two kinds of tissue are, however, to a large extent intermingled. The cortex is about 0.4 mm. thick and is not very sharply differentiated from the

underlying choanosome. The vents are probably scattered irregularly. They may be numerous but only one happens to be cut through in my sections (Plate 10, fig. 1*a*). It is almost completely closed and lies flush with the general surface. It forms the termination of a fairly wide oscular tube surrounded by a thick layer of dense fibrous tissue, which extends inwards far below the cortex. The wall of the oscular tube contains sparse bundles of very slender prodiaenes, arranged longitudinally, but with their shafts converging in the neighbourhood of the vent, with the cladi frequently projecting just outside and inside the opening. The inhalant pores seem to be very sparsely scattered over the general surface, and narrow inhalant canals pierce the cortex almost at right angles. There are no conspicuous intracortical or subcortical cavities. The histological condition of the material will not allow me to say anything as to the form or arrangement of the flagellate chambers.

The general skeleton is arranged as usual in the genus and consists of ill-defined, crowded spicule-bundles, radiating from the centrally-placed skeleton nucleus to all parts of the exposed surface, where they form the hispidating brushes and the marginal fringe. The bundles consist chiefly of long oxea, but fairly numerous prodiaenes occur mixed with these in the surface brushes and marginal fringe.

*Spicules*.—(1) Oxea (fig. 1*e*); straight or nearly so, fusiform, approximately isoactinal, tapering very gradually to a fine point at each end; measuring up to about 3.3 by 0.034 mm.; occasionally becoming stylote (fig. 1*d*).

(2) Large prodiaenes (fig. 1*e*, *e'*); shaft measured up to 5.08 by 0.012 mm., with cladi about 0.078 by 0.005 mm. The shaft tapers gradually to hair-like dimensions and ends in a fine point. The variations in form of the cladome are shown fig. 1*e'*. A few large protriaenes (fig. 1*f*, 1*f''*) and promonenes (fig. 1*g*) have also been observed, but the prodiaenes are far more abundant.

(3) Small, hair-like prodiaenes (occasionally protriaenes) (fig. 1*h*—*j'*). These occur chiefly in the wall of the oscular tube, around the vent. They differ from the large ones only in point of size and there is probably no absolute distinction even in this respect. They may be only about a quarter the length of the large prodiaenes and slender in proportion.

(4) Sigmata (fig. 1*k*); very slender, strongly contort, length in a straight line from bend to bend up to about 0.012 mm.

A very interesting feature of this species is the occurrence of a process of external gemmation. The surface of the sponge, when viewed under a lens, shows a considerable number of minute, oval bodies, of a dark brown colour, attached to projecting spicules or spicule-bundles. These bodies (fig. 1*b*) measure about 0.5 mm. in longer diameter. Each consists of a dense, solid mass of cells, probably of the nature of amoebocytes, all crowded together. The entire mass is pierced lengthwise by a small bundle of the projecting spicules of the parent sponge, either oxea or diaenes, along which it appears to be creeping outwards from the cortex, with which, in the earlier stages, it is still connected by a thick or slender stalk. Numerous sigmata are scattered through the bud, but it contains no other spicules that can be regarded as proper to it. There can be little doubt that these curious little gemmules creep out to the ends of the projecting spicules and then separate from the parent sponge altogether. A very similar process appears to take place in *Thenea muricata*, as figured by Vosmaer [1885].

This well-characterized species is perhaps nearly related to Carter's *Tetilla* (*Tethya*) *casula*, from South Africa [*vide* Carter 1871 F and Kirkpatrick 1902]. The latter is supposed to live lying freely on a sandy bottom and has a fairly well-developed marginal fringe of spicules. The external forms of the two species have much in common, but I am inclined to think that *T. furcifer* must be attached to the substratum during life, otherwise I think the margin of the sponge would have followed an approximately circular outline, as in *T. casula*. The two species also agree in the apparently complete absence of anatriaenes, a very unusual feature in the genus. *T. casula*, however, has short curved oxea as well as the long straight ones, and the protriaenes appear to be normal, no mention being made of diaenes or monenes.

*Register Number, Locality, &c.* CXIX. 13, Salomon.

Genus CINACHYRA\* Sollas [1886, 1888].

Tetillidae in which the inhalant pores are for the most part localized in special porocalices. The vents may or may not take the form of similar porocalices.

This genus was proposed by Sollas for *C. barbata*, obtained by the "Challenger" Expedition at Kerguelen.

Sollas's diagnosis runs as follows: "The cortex is not excavated by subdermal cavities; oxeate spicules traverse it radiately. The incurrent and excurrent openings are confined to special flask-shaped recesses. The mesoderm of the choanosome is a collenchyma; the chamber system is eurypylous."

The genus has been widely accepted by more recent writers† and a considerable number of additional species have been assigned to it, but curiously enough not one of these possesses the radially arranged cortical oxea so characteristic of the type. All of them, however, possess porocalices, and this feature may be accepted as the most important diagnostic character‡.

The discovery of two new species by the "Sealark" Expedition and the addition of certain species originally assigned to *Tetilla* brings the total number of known species up to twenty, as follows:—*C. euryptoma* Keller [1891], *C. barbata* Sollas [1886, 1888], *C. vertex* Lendenfeld [1907], *C. raccinata* n. sp., *C. trochiformis* Keller [1891 A], *C. nuda* Hentschel [1912], *C. schulzei* Keller [1891], *C. cinachyroides*§ (Hentschel) [1911 A], *C. mertonii* Hentschel [1912], *C. isis* Lendenfeld [1906], *C. providentiae* n. sp., *C. alba-bidens* Lendenfeld [1906], *C. hirsuta* (Dendy) [1889], *C. anomala* (Dendy) [1905], *C. phacoides* Hentschel [1911 A], *C. malaccensis* I. B. J. Sollas [1902], *C. voeltzkowi* Lendenfeld [1897], *C. hamata* Lendenfeld [1906], *C. alba-obtrusa* Lendenfeld [1906], *C. alba-tridens* Lendenfeld [1906]. Lendenfeld [1903] also includes in the genus Kieschnick's *Tetilla amboinensis* [1900] and Carter's *Tethya cranium* var.

\* Originally spelt *Cinachyra* but altered by the author in the "Challenger" Report.

† *Vide* especially I. B. J. Sollas [1902] and Kirkpatrick [1905] for useful information.

‡ Lendenfeld [1903] lays chief stress upon the arrangement of the vents in porocalices and does not mention the inhalant pores in his diagnosis. The arrangement of the latter appears to me to be more constant than that of the vents. In my *Tetilla poculifera* [1905] the vents appear to take the form of porocalices while the inhalant pores are scattered, and I exclude such species from the genus *Cinachyra*.

§ Referred by Hentschel to the genus *Tetilla* but almost certainly a *Cinachyra*.

*robusta* [1887], but the former species obviously belongs to my genus *Paratetilla*, which is sharply distinguished from *Cinachyra* by the presence of caltrops or short-shafted trienes arranged in a special layer beneath the surface, while the latter has been shown by Sollas [1888] and Kirkpatrick [1905] to be a *Tetilla*.

The task of discriminating between the various species of *Cinachyra* appears by no means an easy one at first sight, but a careful study of the genus leads to some very interesting results. The following characters seem to afford the most valuable guides:—

(1) The presence or absence of trichodragmata. These spicules occur in only a single species, *C. eurystoma*, which might on this account be regarded as the type of a distinct genus, as has been done in several analogous cases, but trichodragmata are so widely distributed amongst the Tetraxonida, and in such a curiously sporadic manner, that I am beginning to doubt the advisability of using them for purposes of generic distinction. Each case must, however, be judged on its merits, and it is hardly possible to be consistent in this respect.

(2) The presence or absence of small oxea, in addition to the large oxea of the radial bundles. Such small oxea occur in ten of the twenty species. They are usually scattered quite irregularly in the interior of the sponge, often in very large numbers. Their presence is interesting as indicating a possible origin of the short oxea which form the reticulate skeleton of the *Gellinae*.

(3) The presence or absence of short, radially arranged, cortical oxea, found only in *C. barbata*. It is perhaps doubtful whether or not these belong to the same category as the foregoing. The presence of similar cortical spicules in *Craniella* has been regarded as the chief justification for the separation of that genus from *Tetilla*.

(4) The presence or absence of minute siliceous globules or microspheres, which occur in several species and seem to be distinctive\*.

(5) The presence or absence of very small, hair-like protriaenes, hispidating the pore-membrane in the porocalices. This character occurs in *C. eurystoma*, *C. barbata*, *C. vertex*, *C. vaccinata*, *C. alba-bidens* and *C. hirsuta*, and seems to have arisen by spreading inwards, accompanied by reduction in size, of the protriaenes which are so commonly met with around the opening of the porocalyx. The extent to which this has been accomplished varies in different cases. In *C. hirsuta* the process seems to have only just begun and there are very few of the small hispidating protriaenes, apparently confined to the region near the mouth of the porocalyx; in *C. vaccinata*, on the other hand, the character is very strongly developed. It is a singular fact that it is apparently not developed at all in *C. nuda*, which so closely resembles *C. vaccinata* in most respects.

(6) The shape of the porocalices—whether shallow and wide or deep and narrow, with small external apertures, or slit-like. Though there are great differences between the extremes, intermediate conditions occur and something, doubtless, depends upon the state of contraction, but nevertheless the character seems to be a distinctly useful one for taxonomic purposes.

\* In my report on the Ceylon sponges [1905] I attached less taxonomic importance to the small scattered oxea and microspheres than I am now inclined to do, and referred to *Tetilla* (*Cinachyra*) *hirsuta*, in which both are absent, a specimen in which both are present (R.N. 129). I can no longer maintain this identification.

(7) The arrangement of the porocalices. In one species only (*C. trochiformis*) they are confined to a sharply defined zone round the base of the sponge, but an approach to this condition is found in certain other species such as *C. anomala*.

(8) The presence of groups of vents distinguishable from the porocalices, as in *C. vaccinata*, *C. nuda* and *C. mertoni*. In most cases oscular chambers and porocalices appear to be indistinguishable\*.

The characters above enumerated suffice for the discrimination of most of the species, but in a few cases they have to be supplemented by characters drawn from spicular measurements or from the suppression of cladi in the trienes. The spicules, however, seem to exhibit remarkably little variation in form throughout the genus, the most notable exception being the trienes of *C. vaccinata*, which seem all to have a very characteristic enlargement of the apex of the shaft. The following dichotomous key shows how the characters mentioned can be utilized for the determination of the species. It is, of course, largely an artificial arrangement, adopted merely as a matter of convenience, and much more investigation will be necessary before we can hope to draw up a scheme which shall adequately represent the phylogenetic relationships of the species.

#### KEY TO THE KNOWN SPECIES OF CINACHYRA.

- |   |  |
|---|--|
| 1. With trichodragmata ... ..   | <i>C. eurystoma</i> , Red Sea.                             |
| Without trichodragmata ... ..   | (2)  |
| 2. With small as well as large oxea ... ..  | (3)  |
| Without small oxea ... ..   | (12)   |
| 3. With small cortical oxea radially arranged ... ..  | <i>C. barbata</i> , Kerguelen.                             |
| Without radially arranged cortical oxea ... ..  | (4)  |
| 4. Pore-membranes hispidated by hair-like protriaenes ... ..  | (5)  |
| Pore-membranes not hispidated by hair-like protriaenes ... ..                                       | (6)  |
| 5. Shafts of trienes without enlarged apices.   |  |
| Surface shaggy, with long, separate tufts of projecting spicules ... ..                             | <i>C. vertex</i> , Antarctic.                              |
| Shafts of trienes with enlarged apices.   |  |
| Surface without long, separate tufts of projecting spicules ... ..                                  | <i>C. vaccinata</i> , Diego Garcia.                        |
| 6. Porocalices confined to well-defined zone around base of sponge ... ..                           | <i>C. trochiformis</i> , Red Sea.                          |
| Porocalices not confined to well-defined zone around base of sponge ... ..                          | (7)  |
| 7. Without anatriaenes ... ..   | <i>C. nuda</i> , Arncliffe Sea.                            |
| With anatriaenes ... ..   | (8)  |
| 8. With microspheres ... ..   | (9)  |
| Without microspheres ... ..   | (10)   |
| 9. Porocalices cup-shaped, with wide openings ... ..  | <i>C. sen. koi</i> , Coast of Aden and Mozambique Channel. |
| Porocalices slit-like, with narrow openings ... ..  | <i>C. cinachyroides</i> , N.W. Australia.                  |
| 10. Groups of vents sharply distinguished from porocalices ... ..                                   | <i>C. mertoni</i> , Kei Islands.                           |
| Vents not distinguishable from porocalices ... ..   | (11)   |
| 11. Porocalices cup- or flask-shaped, not greatly elongated radially ... ..                         | <i>C. isis</i> , N.W. Australia.                           |
| Porocalices bottle-shaped, greatly elongated radially ... ..  | <i>C. providentiae</i> , Providence.                       |
| 12. Pore-membranes hispidated by hair-like protriaenes ... ..                                       | (13)   |
| Pore-membranes not hispidated by hair-like protriaenes ... ..                                       | (14)   |
| 13. Porocalices bottle-shaped, greatly elongated radially, with very small external openings ... .. | <i>C. alba-bidens</i> , S.W. Pacific.                      |
| Porocalices cup-shaped or tubular, with wide external openings ... ..                               | <i>C. hirsuta</i> , Gulf of Manaar.                        |

\* Compare, however, Kirkpatrick [1905].

- |  |      |  |
|--|------|--|
| 14. Porocalices comparatively shallow, with wide external openings ...                       | (15) |  |
| Porocalices bottle-shaped, greatly elongated radially, with very small external openings ... | (18) |  |
| 15. With microspheres ...  |      | <i>C. anomala</i> , Ceylon.              |
| Without microspheres ...   | (16) |  |
| 16. Some of the porocalices with relatively large internal openings, probably vents ...      |      | <i>C. phaeoides</i> , S.W. Australia.    |
| Porocalices apparently all alike ...   | (17) |  |
| 17. Oxea not more than 3.5 mm. long ...  |      | <i>C. malaccensis</i> , Malay Peninsula. |
| Oxea up to 5 mm. long ...  |      | <i>C. rodtzkowi</i> , Zanzibar.          |
| 18. All or many of the anatrienes represented by anamonenes ...                              |      | <i>C. hamata</i> , Agallus Bank.         |
| Anamonenes absent ...  | (19) |  |
| 19. Some of the trienes with cladi reduced to stumps ...                                     |      | <i>C. alba-obtusa</i> , New Guinea.      |
| Trienes nearly always with well-developed cladi ...  |      | <i>C. alba-tridens</i> , Diego Garcia.   |

The genus *Cinachyra* is widely distributed in the Indian Ocean, extending westwards to the Red Sea, eastwards to the west coast of Australia and through the Malay Archipelago to the S.W. Pacific, and southwards to the Antarctic. It does not appear to be known outside this region. Many of the species occur on coral reefs or in similar situations where the water is apt to be charged with fine sand or mud, and the arrangement of the inhalant pores, and sometimes of the vents also, in specially protected groups more or less concealed within the porocalices, must be regarded as an adaptation to the special conditions of the environment. The genus may be a polyphyletic one, but most, at any rate, of the species seem to be closely related to one another.

6. *Cinachyra vaccinata*\* n. sp.

(Plate 1, fig. 4; Plate 11, fig. 1 *a-l*.)

There are two specimens of this interesting sponge in the collection, both from Diego Garcia. The larger one (Plate 1, fig. 4) appears to have been quite perfect when received, except that it had probably been torn away from a small area of attachment at one end. It is irregularly oval in shape, about 56 mm. in length by 45 mm. in maximum diameter. The surface is largely occupied by the very numerous, irregularly scattered porocalices. These vary greatly in shape and size. They may be deeply cup-shaped or pocket-shaped, or more shallow cups, or even plain, flat areas, flush with the general surface but circumscribed by a slightly raised margin; in diameter they vary up to about 11 mm. It seems possible that the differences in the form of the porocalices may be due partly to differences in the state of contraction. In one case the cup is deep and the mouth is closed to a narrow slit. There are two groups of small vents, each group occupying a rather shallow depression only about 4 mm. in diameter. One group contains about a dozen vents, varying in diameter and closely crowded together; the other not so many. The vents are not covered over by a pore-membrane but are freely exposed in the bottom of the oscular depression. Both groups lie on the same side of the sponge, one near one end and the other near the other, which seems to indicate that this was the upper surface. It is possible that there may also be a few small, singly scattered vents, but if so I cannot distinguish them from the smallest porocalices. The surface of the sponge between the

\* So called from the resemblance of the flattened pore-areas to vaccination marks.

porocalices is almost quite smooth, though thinly encrusted in places with a deposit of whitish calcareous mud. The sharp margin of a porocalyx is occasionally slightly hispid. The surface of the pore-bearing membrane appears smooth to the naked eye but is microscopically hispid with the hair-like protrienes, amongst which a deposit of fine mud is entangled. The colour in spirit is pale yellowish grey and the texture fairly firm and compact.

The second specimen (R.N. LVIII.) is rather smaller, but the lower part of it has evidently been torn off. The general surface is rather more hispid and rather more thickly encrusted. The remaining porocalices are for the most part deeply funnel-shaped and there are none of the perfectly flattened ones. There is a group of small vents in a strongly depressed oscular area not far from the middle of the upper surface, the diameter of the oscular area being about the same as in the other specimen. The colour is the same.

The skeleton of the sponge is, as usual, strongly radiate, consisting for the most part of somewhat ill-defined bundles of very long and rather slender oxea. The terminal portions of these bundles spread out slightly to form surface brushes which penetrate through the encrusting layer of fine mud to a greater or less extent. These surface brushes contain numerous anatrienes and occasional, well-developed protrienes. A very characteristic feature of the skeleton is the occurrence of numerous long, slender, sinuous fibres or bundles of hair-like protrienes. These come from within the sponge and run up to the under surfaces of the pore-membranes of the porocalices in great numbers (Plate 11, fig. 1 *a*). Here they break up into elegant, divaricating tufts, and some of the cladomes; together with a longer or shorter portion of the shaft, project freely from the surface of the pore-membrane between the inhalant pores (fig. 1 *b*). Both specimens contain numerous short, slender oxea scattered in the soft tissues between the skeletal bundles, but these spicules are far more numerous in the smaller of the two specimens.

*Spicules*.—(1) Large oxea (fig. 1 *c*); long, slender, straight or slightly curved, fusiform, very gradually and finely pointed at each end, measuring up to about 3.7 by 0.034 mm. Occasionally stylote (fig. 1 *d*). Some very slender oxea of about the same length are possibly young.

(2) Relatively large protrienes and prodrienes (fig. 1 *e-f'*); with long, slender shaft tapering away from the cladome to hair-like dimensions and then terminating in an elongatedly oval swelling; cladi slender, slightly crooked, fairly sharply pointed, usually about equal in length. It is difficult to find these spicules in an unbroken state suitable for measurement, but the shaft seems to measure up to some 3 or 4 mm., or even more, in length with a diameter of about 0.01 mm. just below the cladome; with cladi about 0.14 by 0.008 mm., but of course variable. They occur sparingly in the ordinary surface brushes.

(3) Small, hair-like protrienes and prodrienes (fig. 1 *g-h'*); similar in form to the larger ones; with the enlarged distal extremity very conspicuous; length of shaft about 1.3 mm., with a diameter just below the cladi of 0.003 mm.; with cladi about 0.032 by 0.0025 mm. The cladi seem to be straighter than in the larger forms. These spicules are extremely abundant in relation with the porocalices (see also fig. 1 *a, a'*).

(4) Anatrienes (fig. 1*j, j'*); with well-developed cladome and very long and slender shaft ending in an elongated inflation as in the case of the protrienes: cladi fairly strongly recurved and sharply pointed. In the only unbroken specimen, suitable for measurement, that I have been able to isolate, the shaft measures about 1.8 mm. in length by 0.005 mm. in diameter just below the cladome, and the cladi about 0.037 by 0.005 mm.; as, however, the cladi may be about twice this length, we must assume that the shaft may be larger in proportion, and this probably is usually the case.

(5) Short, slender oxea (fig. 1*k*); usually slightly curved or even angulated in the middle; fusiform; finely and gradually pointed at each end; measuring about 0.2 by 0.004 mm.

(6) Slender, contort sigmata (fig. 1*l*); up to about 0.016 mm. in maximum length from bend to bend; smooth or nearly so.

The above descriptions and measurements of the spicules are taken from R.N. LXVII. 2, but the other specimen agrees very closely.

The histological preservation of the material is not satisfactory, and stained paraffin sections show but little detail. It is easy to see, however, that there is no true cortex, but a rather thick, gelatinous ectosome, with a more or less well-marked tendency to become fibrous, especially in its outer portion. There may perhaps be a small number of inhalant pores outside the porocalices, but I cannot attribute any systematic importance to this character, as is done by Miss Sollas [1902].

So far as general external appearance and the arrangement of the vents and porocalices are concerned this species agrees remarkably closely with Hentschel's *Cinachyra nuda* from the Arafura Sea [1912]. It also agrees with that species in the presence of the small oxea, but it differs in the possession of anatrienes and the presence of the hair-like protrienes developed in relation to the porocalices. The last-mentioned character it shares with *C. barbata* Sollas [1888] from Kerguelen, *C. vertex* Lendenfeld [1907] from the Antarctic, *C. euryzona* Keller [1891] from the Red Sea, *C. hirsuta* (Dendy) [1889] from the Gulf of Manaar, and *C. alba-tridens* Lendenfeld from Diego Garcia [1906]. The first four of these differ widely from our species in other respects. The fact that *C. alba-tridens* comes from Diego Garcia makes one suspect that it might be identical with *C. vaccinata*, but the form of the porocalices seems to be quite different and the small oxea seem to be wanting in that species. Moreover the apparently constantly enlarged extremities of the shafts of all the trienes in *C. vaccinata* constitute, so far as I am aware, a unique character in the genus.

*Register Numbers, Localities, &c.* LVIII, LXVII. 2, Diego Garcia, 10.7.05, 12½ fathoms.

#### 7. *Cinachyra isis* Lendenfeld [1906].

(Plate 10, fig. 3*a—b*.)

The single specimen of this sponge in the collection is spherical and about 25 mm. in diameter. The surface is rough and almost shaggy, the projecting spicules being matted together and intermingled with calcareous sand. There is no evidence of attachment. The colour in spirit (after formalin) is light brown throughout. The porocalices are fairly numerous, irregularly scattered, cup-shaped, with wide external openings varying greatly

in diameter up to about 3 mm. Exhalant openings cannot be distinguished. Altogether the sponge closely resembles Lendenfeld's figure of *C. isis*, but the specimen is much smaller.

Stained sections show that there is no fibrous cortex. The ectosome cannot be sharply distinguished from the choanosome and both are crowded with large, rounded, oval or irregular cells densely filled with very minute granules. These cells are about 0.012 mm. in diameter. It is to them that the colour of the sponge is due.

The skeleton is arranged as usual. The cladi of protrienes occur abundantly in the surface fur and in the outer portions of the radial spicule-bundles. The cladi of anatrienes are abundant in the latter locality, at about the junction between ectosome and choanosome. There are no small protrienes hispidating the pore-bearing membrane in the porocalices.

*Spicules*:—(1) Large oxea; stout, fusiform, sometimes slightly anisoactinal, gradually and finely pointed at each end, commonly measuring about 3.6 by 0.06 mm., but measured up to 4.3 by 0.078 mm. These spicules are thus a good deal smaller than those described by Lendenfeld, which measured 5.4 to 7.1 mm. by 0.045 to 0.086 mm. Ours is, however, a much smaller specimen and this probably accounts for the difference. Lendenfeld also says that these spicules are rather strongly anisoactinal and that the ends are rather blunt, but there is no specific distinction in these characters.

(2) Prottriene (Plate 10, fig. 3*a—a'*); with long, slender shaft tapering very gradually to hair-like dimensions, without any terminal inflation; measuring, say, about 3.8 by 0.014 mm. Cladome very variable. Cladi straight or rather crooked, inclined forwards at angles of about 40°; usually equally developed; up to about 0.12 mm. in length, but commonly less. I have once seen a prottriene; and once a prottriene with one cladius unequally bifurcate close to the base.

(3) Anatrienes (fig. 3*b*); with very slender, hair-like shaft and slender, sharply-pointed cladi moderately recurved. In a typical example the shaft measures about 2.7 by 0.005 mm. (below the cladome) and tapers away to a very slender hair without any terminal inflation, while the cladi are of almost the same diameter at the base and about 0.04 mm. long. The shaft is sometimes a little longer and I have once seen the cladi nearly twice the length given.

(4) Short oxea; abundantly scattered in the choanosome, scarce in the ectosome. Straight, slender, finely pointed at each end; measuring about 0.18 by 0.004 mm.

(5) Sigmata; strongly contort, very slender, measuring up to about 0.012 mm. in maximum length in a straight line from bend to bend, and only about 0.001 mm. in thickness. Lendenfeld describes the sigmata in *C. isis* as attaining a length of from 20—28  $\mu$ , with a thickness of 1  $\mu$ . He does not say what he means by "length," but if he uses that term in the same sense that I do, the sigmata of the type are about twice as long as those of our specimen. He also speaks of their being "feindornig," a character which may possibly be recognizable in our specimen under a very high power, but which is certainly so slightly developed that no stress can be laid upon it.

Thus there appear to be certain slight differences in spiculation between the "Sealark" specimen from the Seychelles and the type of the species from the north-west coast

of Australia, but these differences cannot be regarded as amounting to specific distinction.

*Previously known Distribution.* N.W. coast of Australia (Lendenfeld).

*Register Number, Locality, &c.* CXXXIII. 4, Seychelles, F. 9, 37 fathoms.

X 8. *Cinachyra providentiae* n. sp.  
(Plate 1, figs. 5, 5 a; Plate 10, fig. 2 a--f)

The largest specimen (Plate 1, figs. 5, 5 a) is an irregularly hemispherical sponge about 80 mm. in diameter, which has evidently been torn off from its base of attachment, the actual lower surface showing as a section through the so-called "nucleus" from which the spicule-bundles radiate. The upper surface is uneven, extensively encrusted in one place by a thin nullipore, in another by a coral. Elsewhere it is covered by a well-developed fur of spicules mingled with fine calcareous sand, the spicules being chiefly the projecting portions of anatriaenes, now mostly broken off and matted together. Here and there all over the exposed surface are scattered the well-defined, circular or oval openings of the porocalices. These openings vary greatly in size, probably in accordance with their state of contraction. They are usually very small, sometimes not more than 1 mm. in diameter, but the largest has a diameter of 4 mm. At a short distance within each opening there is usually a well-developed sphincter-diaphragm, easily visible under a pocket-lens. When the sponge is cut open the porocalices are seen to be radially elongated, much longer than broad, and more or less bottle-shaped. They may extend two-thirds of the way in towards the centre of the sponge. The largest I have seen measures 29 mm. in depth, with a maximum breadth (in the middle) of 10 mm. and an external opening about 3 mm. in diameter. The surface of the porocalyx is lined by a finely reticulate membrane, with pore-sieves in the meshes of the reticulation. There appear to be no vents distinct from the porocalices.

The colour of the sponge throughout is pale yellowish grey. The texture is firm and compact between the porocalices, but it readily splits up radially.

There is no true cortex but a fairly sharply differentiated ectosome about 1 mm. thick and of a slightly paler colour than the choanosome. This ectosome appears to be collenchymatous rather than fibrous in character.

The skeleton has the usual strongly radiate arrangement so characteristic of the genus, and consists chiefly of densely crowded bundles of large oxea with but narrow intervals between them. Mingled with these oxea are numerous anatriaenes, whose cladi, in addition to projecting from the surface, may also appear abundantly at the junction of ectosome and choanosome. Protriaenes are far less numerous but they occur abundantly around the external openings of the porocalices, which seems to be their favourite situation in species of *Cinachyra*. There are no small protriaenes hispidating the pore-bearing surface of the porocalices.

*Spicules*.—(1) Large oxea (Plate 10, fig. 2 a); straight or slightly curved; fusiform, tapering very gradually to each extremity; ends variable, from very finely pointed to strongly lute, sometimes irregular; size up to about 6.0 by 0.077 mm. Occasionally these spicules become stylote, sharply pointed at one end and broadly and evenly rounded off at the other (fig. 2 b).

(2) Protriaenes (fig. 2 c, c'); with very long, slender shaft and relatively very short cladi directed forwards at angles of about 30°. Cladi approximately straight, fairly stout and fairly sharply pointed. A typical example had a shaft measuring 6.7 by 0.02 mm. (at the thickest) and cladi about 0.06 mm. long by 0.012 mm. thick at the base\*. The shaft tapered away very gradually to the apex, which was bluntly pointed but without any terminal inflation. Another example, with the end of the shaft broken off, was about 8.5 mm. long, the shaft had a maximum diameter of 0.02 mm., and the cladi, rather irregularly bent, were only about 0.028 mm. long. A third, perfect example, had a shaft 7.7 by 0.02 mm., and cladi averaging about 0.06 by 0.012 mm., one being rather longer than the others. The cladi may be irregular and I have seen one bifurcate. In another case all three were equally developed and each 0.12 mm. long.

(3) Anatriaenes (fig. 2 d, d'); with long, slender, hair-like shaft and well-developed cladome, with gradually sharp-pointed cladi curving backwards on arcs of a sphere. The shaft has no terminal dilatation. In a typical example the shaft measured about 5 mm. in length by 0.014 mm. in diameter (below the cladome), and the cladi about 0.07 by 0.012 mm.; the chord of the cladome measuring 0.1 mm.

(4) Short, slender oxea (fig. 2 e); usually very slightly curved; fusiform; gradually and sharply pointed at each end; size about 0.22 by 0.0055 mm.

(5) Sigmata (fig. 2 f); slender, contort, smooth (or very nearly so), measuring about 0.016 mm. in maximum length from bend to bend.

The above details of the spiculation are taken from R.N. XXI. 1, which must be regarded as the type of the species.

This species evidently comes very near to von Lendenfeld's *Cinachyra alba-tridens* [1906] from Diego Garcia, differing principally in the presence of the short, slender oxea. Lendenfeld says that the sigmata in his species are microspined, but this character is often so slight and difficult to determine that it has little taxonomic value. He also speaks of the presence of peculiar sigmata which he terms "Simotoxe," but these are very scarce and seem to be merely abnormal forms of the ordinary sigmata.

There is a second specimen (R.N. XX. 3) from the same locality (Providence) as the one described above and agreeing very closely with it; it represents about half of a somewhat smaller sponge. R.N. XXV. 2 and LXXVIII. 6 may also be referred provisionally to the same species. They both come from Cargados Carajos and differ slightly from the type in certain respects, but the material is hardly sufficient to deserve special consideration. All these specimens contain the characteristic small oxea, and as von Lendenfeld had three specimens of *C. alba-tridens*, presumably all without the small oxea, it seems likely that the presence or absence of these spicules will furnish a valid specific distinction.

*Register Numbers, Localities, &c.* XX. 3, Providence, 4.10.05, D. 3, 29 fathoms; XXI. 1, Providence, 3.10.05, D. 1, 39 fathoms; ? XXV. 2, Cargados Carajos, 31.8.05, B. 20, 28 fathoms; ? LXXVIII. 6, Cargados Carajos, 28.3.05, B. 2, 30 fathoms.

\* One of the cladi was broken short.



9. *Cinachyra anomala* (Dendy).

(Plate 1, fig. 3.)

*Tetilla anomala* Dendy [1905].

The type of this species, collected by Professor Herdman at Ceylon, was an imperfect fragment in which no porocalices were visible; judging from the specimens now before me they must all have been removed with the portion of the sponge torn away, as might very well happen.

A specimen (Plate 1, fig. 3) collected by the "Sealark" Expedition at Cargados Carajos is in a much better state of preservation. It is sub-spherical, about 30 mm. in maximum diameter, and has evidently been attached by a somewhat contracted base about 13 mm. in diameter. Around and just above this base are numerous porocalices, arranged in an ill-defined zone occupying the lower third of the surface or thereabouts. The upper two-thirds of the surface are quite free from porocalices, and show no vents. The porocalices are cup-shaped or pocket-shaped and run more or less vertically upwards from the wide external opening, which is about 1—3 mm. in diameter. (In the type specimen narrow inhalant canals were described penetrating the ectosome here and there. The occurrence of such isolated inhalant canals outside the porocalices has been described in *C. roeltzkowii* Lendenfeld [1897].)

The general surface of the Cargados specimen is covered with a thin, whitish crust, composed of projecting spicules and calcareous sand. In the lower part of the sponge the spicules show some tendency to project downwards over the openings of the porocalices, like a thatch. The colour of the sponge internally is dirty greyish yellow with distinctly brown ectosome; the surfaces of the porocalices are light brown.

The arrangement of the skeleton calls for no special comment beyond the statement that there are no small protriaenes hispidating the pore-bearing membrane of the porocalices.

The spiculation agrees very closely with that of the type. The minute siliceous spherules (microspheres) are thickly scattered through the choanosome.

A second specimen (R.N. XLVII. 5) obtained by the "Sealark" Expedition at Praslin Reef, but not in such a good state of preservation, bears a close resemblance to the first in general appearance and spiculation: but the siliceous spherules, if indeed present, are not nearly so numerous, nor are the anatriaenes, and the identification must remain doubtful. Similar remarks apply to R.N. LVII. 3, from Coin Peros, in which, however, anatriaenes are abundant. This specimen is of a light chocolate brown colour throughout and heavily encrusted with calcareous sand.

The chief distinguishing characters of this species are the widely open, cup-shaped porocalices, the presence of microspheres or siliceous globules, the absence of small oxea, and the absence of small protriaenes hispidating the surface of the porocalices.

*Previously known Distribution.* Ceylon Seas (Dendy).

*Register Numbers, Localities, &c.* XXXIII. 4, Cargados Carajos, 30.8.05, B. 13, 30 fathoms; ? XLVII. 5, Praslin Reef; ? LVII. 3, Coin Peros.

## Genus PARATETILLA Dendy [1905].

Tetillidae with an ectosomal layer of short-shafted triaenes, resembling calthrops and usually very irregular in shape. Commonly or always (?) with porocalices.

This genus appears to be very characteristic of the Indian Ocean and Western Pacific, but it is doubtful whether more than a single very variable species (*P. bacca*) can at present be recognized. Hentschel [1912] has expressed the opinion that Lendenfeld's genus *Amphitethya* [1906] should be regarded as synonymous with *Paratetilla*, a genus which was ignored by Lendenfeld although he himself suggested that *Tetilla bacca*, or a part thereof, should be included in *Amphitethya*. I am inclined to think, however, that *Amphitethya*, which has a very peculiar form of sigma in addition to its amphitriaenes, and is, moreover, devoid of porocalices, may very well be kept distinct. The discovery by Topsent [1897 A] of amphitriaenes, occurring apparently as an abnormality in one specimen of *Paratetilla bacca* (*Tetilla merguensis*), can certainly not be regarded as a sufficient reason for identifying the two genera. The generic position of Hentschel's *Paratetilla aruensis* [1912], in which amphitriaenes also occur, is more doubtful, but for the present it may well remain as a second species of *Paratetilla*.

X 10. *Paratetilla bacca* (Selenka).*Stelletta bacca* Selenka [1867].*Tethya merguensis* Carter [1883 n, 1887].*Tetilla merguensis* Sollas [1888].*Tetilla ternatensis* Kieschnick [1896].*Tetilla merguensis* Topsent [1897 A].*Tetilla bacca* Lindgren [1898].*Tetilla amboinensis* Kieschnick [1900].*Tetilla violacea* Kieschnick [1900].*Tetilla rubra* Kieschnick [1900].*Tetilla bacca* Thiele [1900].*Tetilla bacca* Lendenfeld [1903].*Cinachyra amboinensis* Lendenfeld [1903].*Paratetilla cineriformis* Dendy [1905].*Paratetilla eccentrica* Row [1911].

This appears to be a very variable species, a fact which accounts for its having been described under so many distinct specific names. I have tried in vain to discover distinguishing characters by which the various described forms could be really separated into species, and am at length constrained to follow the example of Thiele [1900] who identified all the then described species with Selenka's *Stelletta bacca*, and to apply the same treatment to my own *P. cineriformis* and Row's *P. eccentrica*.

Selenka's original description was highly unsatisfactory, and he even speaks of the spicules as calcareous, but fortunately he gives excellent figures of both the external form and the principal spicules, so that an identification is not difficult. The former shows a sponge with a strongly hispid surface and no less than sixteen large "Auströmungsöffnungen," as the author terms them. The failure to interpret these openings correctly has been one of the sources of confusion with regard to this species. I have no doubt that in Selenka's specimen, as in the fairly numerous specimens examined by myself, they are really porocalices, for they are far too numerous to be oscula. Subsequent writers have also failed to distinguish properly between oscula and porocalices, so that Lendenfeld was led to include some of the described forms in the genus *Tetilla* and others in *Cinachyra*. It seems doubtful whether true oscula, as distinct from porocalices, are ever present.

Although the surface generally appears to be more or less strongly hispid it is some-



times almost entirely devoid of projecting spicules, as in the variety *corrugata* described below. The dark colour of the more superficial parts of the sponge, almost black in spirit, is evidently a very characteristic feature.

As regards spiculation the most striking character is, of course, afforded by the curious short-shafted trienes of the ectosome, and the great variation in form to which these are subject has been largely responsible for several supposed specific distinctions. In the original type these spicules appear to have been predominantly, if not entirely, regular, or subregular, with straight rays. An extreme deviation from this condition is found in Row's *Paratetilla eccentrica*, characterized by great abnormality in these spicules, shown in the reduction and contortion of the rays. Between these extremes all sorts of intermediate conditions occur. These spicules also vary very greatly in number in different specimens, being very abundant in some and very rare in others.

Another difficulty arises in connection with the short, slender, hair-like oxea, often scattered abundantly in the choanosome. These are probably always present, but have been overlooked by several writers, as by myself in *P. cineriformis*, in which they actually exist in a vestigial condition.

The species is highly characteristic of the Indian Ocean and extends westwards to the Red Sea and eastwards to Samoa. It has hitherto been recorded from the following localities:—Samoa (Selenka), Torres Straits (Sollas), Amboina (Topsent, Kieschnick), Ternate (Kieschnick), Java Sea and Gaspar Straits (Lindgren), Mergui Archipelago (Carter), Ceylon (Dendy), Red Sea (Row).

*Paratetilla bacca* is represented in the "Sealark" collection by a considerable number of specimens, most of which agree very closely with Kieschnick's *Tetilla violacea* from Amboina, which may be reduced to varietal rank. One specimen, however, seems sufficiently distinct from any previously described form to merit description under a new varietal name (*P. bacca* var. *corrugata*).

10 a. *Paratetilla bacca* var. *violacea* (Kieschnick).

(Plate 1, fig. 6.)

I identify with this variety seven specimens which all agree pretty closely in external form and spiculation. The shape of the sponge (Plate 1, fig. 6) is more or less spherical, with a more or less restricted base of attachment. The largest specimen (R.N. CXI. 1) measures about 55 mm. in diameter, the smallest (R.N. LIII. 3) about 20 mm. One specimen (R.N. LII. 7) gives off a strap-shaped process, about 15 mm. long and 4 mm. wide, from a point above the base; this looks as if it might be an attachment process such as those described by Topsent [1897 A], but which has not yet found the substratum. The degree of hispidation of the surface varies much, depending largely upon the extent to which the projecting ends of the spicules have been broken off. Thus in R.N. XLVII. 4 the spicules are nearly all broken off close to the surface, which appears nearly smooth, while in R.N. CXI. 1 it is distinctly hairy, with a large amount of calcareous sand entangled amongst the projecting spicules. Each specimen bears numerous porocalices, distributed pretty evenly over the surface. These are provided with sphincter diaphragms and their appearance depends much upon the state of contraction. When completely

closed they are hardly visible, but when fully open they are conspicuous cup-shaped depressions, approximately hemispherical in shape and with wide apertures about 4 mm. in diameter. There are no recognizable vents apart from the porocalices, but the examination of stained sections (R.N. CXIX. 3) shows that pores are not confined to the porocalices but also occur scattered between them. The colour of the sponge (in spirit) is dark chocolate brown, becoming paler in the interior.

The spiculation agrees pretty closely with that of the variety about to be described and calls for no special comment, except that the spindle-shaped oxea never appear to exceed about 4 mm. in length, with a diameter of about 0.048 mm., and are usually less, say about 3.4 by 0.043 mm. In this respect, therefore, the "Sealark" specimens agree fairly well with Kieschnick's *Tetilla violacea*, in which the oxea measure up to 3.0 by 0.045 mm., and differ from the Samoan type of the species, in which, according to Selenka, the oxea measure 5—7 mm. in length by 0.04 mm. in thickness. The smaller size of the oxea appears to constitute the chief distinguishing feature of the variety *violacea* as compared with the type.

The sigmata in the "Sealark" specimens seem to be rather smaller than in Kieschnick's specimen, measuring only about 0.016 mm. in extreme length from bend to bend, while Kieschnick gives 0.02 mm., but does not say how his measurement was taken.

*Register Numbers, Localities, &c.* XLVII. 4, Pruslin Reef; LII. 7, LIII. 2, 3, Coetivy; CXI. 1, Egmont Reef; CXIX. 3, 9, Salomon.

10 b. *Paratetilla bacca* var. *corrugata* nov.

(Plate 1, fig. 7.)

The single specimen in the collection (Plate 1, fig. 7) is a large fragment of an apparently spherical or hemispherical sponge with a radius of about 35 mm. The surface has a very uneven, corrugated appearance, due chiefly to the occurrence of numerous deep porocalices, whose openings are usually elongated and slit-like and sometimes form a meandriform pattern, due apparently to fusion of contiguous porocalices. Between the porocalices the surface is uneven and hummocky, but at the same time subglabrous, with only a very few projecting spicules scattered here and there. The depth of the porocalices may be at least 10 mm., their openings are large but vary greatly in size. No ordinary vents are visible in the specimen. The texture is firm and compact, but compressible laterally. It is strongly fibrous radially and readily splits up in the direction of the fibres. The colour externally (in spirit) is dark purplish brown, almost black, internally it is very pale yellowish brown.

The boundary between ectosome and choanosome is quite indefinite. The ectosome is not very distinctly fibrous except where it forms the walls of the porocalices, but it is very densely charged with minute brown pigment granules, less abundant in the walls of the porocalices than elsewhere. These pigment granules also invade the choanosome, gradually becoming less numerous towards the interior of the sponge. Their abundance in the ectosome probably conceals to a large extent the fibrous character of the latter.

The porocalices have smooth walls pierced by very numerous minute pores, communicating by numerous narrow canals with irregular subcortical crypts, from which inhalant

or exhalant canals run inwards. The state of preservation of the specimen will not allow of my saying anything about the flagellate chambers, the choanosome in its present condition being compact and almost uniformly granular.

The main skeleton consists of stout radiating bundles of large oxea and triænes, with very wide intervals between the bundles. Even at the surface of the sponge wide gaps exist between the slightly expanded ends of the bundles. The outer portions of the bundles, in the ectosome, contain the cladomes of numerous anatriænes, with protriænes around the openings of the porocalices. The walls of the porocalices are not hispidated by any spicules. The radiating bundles pass to the surface between the porocalices, and very few spicules project beyond the surface at all, and then usually only to a very slight extent. In the ectosome are irregularly scattered the short-shafted triænes characteristic of the genus. They are sparsely developed and do not appear to be accompanied by any paratangential oxea. They seem to be completely absent from the walls of the porocalices.

*Spicules*.—(1) Large oxea; stout, straight, fusiform, approximately iso-actinal, sometimes gradually and finely pointed at each end, but frequently stylote or stronglylote in varying degrees, or with irregularly pointed apices; measuring up to about 3.8 by 0.05 mm. and usually only a little less. These spicules frequently have the axial canal greatly enlarged.

(2) Prottriænes. There seem to be two fairly distinct varieties of this spicule, but doubtless intermediate forms occur: (a) with very long, slender shaft, tapering very gradually to almost hair-like dimensions but ending in a blunt point; thickest not far from the middle; measuring about 6.0 by 0.02 mm.; cladi short, stout, rather crooked, equal in length, measuring about 0.08 by 0.012 mm.; (b) with much longer and relatively more slender cladi, nearly straight and very sharply pointed, measuring about 0.16 by 0.006 mm., with shaft only about 3.1 by 0.008 mm.

(3) Anatriænes; with short, stout, sharp-pointed cladi recurved approximately on arcs of a sphere, and very long, slender shaft tapering gradually to a fine hair; shaft about 5 by 0.012 mm., with cladi 0.033 by 0.01 mm. A few unadikenes and anannonænes also occur.

(4) Short-shafted orthotriænes; shaft usually much shorter than cladi (but I have seen one example in which it was longer), rounded off at the apex; cladi very variously developed, typically straight, regular, gradually and sharply pointed, measuring, say, about 0.37 by 0.029 mm., but very variable, often unequally developed, often irregularly bent or even contorted, or more or less completely aborted. Regular forms with straight or almost straight cladi are much more numerous than the others.

(5) Short, slender, hair-like oxea; measuring about 0.3 by 0.002 mm.; abundantly scattered in the choanosome, apparently absent from the ectosome.

(6) Slender, contort sigmata; about 0.0165 mm. in greatest length from bend to bend; very numerous, especially in the choanosome.

This variety is evidently nearly related to the Ceylon form, *Paratetilla bacca* var. *cineriformis*, but differs in its more robust growth, the much stronger development of the porocalices and the larger size of the spicules generally. The short, hair-like oxea are

reduced to vestiges in the Ceylon form and were not referred to in the original description thereof. The form of the porocalices and the manner in which they tend to become confluent, as well as the smaller size of the oxea, serve to differentiate this variety from the type of the species. The character of the porocalices also distinguishes it pretty sharply from *P. bacca* var. *violacea*.

*Register Number, Locality, &c.* LIX., Diego Garcia, 10.7.05, 10 fathoms.

#### Family Haploscleridæ.

Monaxonellid Sigmatotetraxonida in which sigmatose microscleres of various forms are typically present but never take the form of chela. The skeleton is reticulate and the fibre is typically neither plumose nor echinated. The megascleres are usually diactinal.

This family consists of sigmatotetraxonid sponges in which the tetractinellid megascleres have been entirely suppressed while the microscleres have not yet reached that stage of evolution which is represented by the chela of the Desmacidonidæ. The origin of the family from the Tetillidæ is not difficult to imagine, although no very satisfactory intermediate forms have yet been met with. The suppression, more or less complete, of the triænes is a well-known phenomenon amongst the Stellettidæ, and it is only reasonable to suppose that it occurs also amongst the Tetillids, in many of which, indeed, the oxea tend to dominate over the triænes. A greater difficulty is perhaps to be found in the character and arrangement of the oxea, for the typical tetillid oxea are very long, straight and radially arranged, while the typical oxea of the Haploscleridæ are short, slightly curved and arranged in a reticulate fashion. There are, however, some Tetillids in which oxea of a second kind make their appearance. These are short and may be slightly curved, and they occur irregularly scattered through the choanosome (e.g. in *Cinachyra vuccinata* n. sp. q.c. and in many other species of *Cinachyra*). I am inclined to think that it was by substitution of such oxea as these for the long, radially arranged oxea, accompanied by the suppression of the triænes, that the Gelliinæ, the most primitive sub-family of the Haploscleridæ, were derived from tetillid ancestors.

The experience which I have recently gained in dealing with the Astrotetraxonida with regard to the part played by the loss of spicules in the evolution of sponges has decided me to follow Topsent in removing the old groups Tedaniinæ and Desmacellinæ (but not the Hamacanthinæ) from the family Haploscleridæ. They are, I think, better regarded as what may be termed "lipocheleous" Desmacidonidæ, i.e. Desmacidonidæ in which the chela have been suppressed. This leaves the Haploscleridæ a much more homogeneous group. The position of the Heteroxyinæ is more doubtful, but they seem too complex in structure to belong to this family and may also be removed for the time being to the Desmacidonidæ. The Merlinæ must follow the Hamacanthinæ, with which they seem to have distinct affinities.

#### Sub-family Gelliinæ.

Haploscleridæ with oxeote or stronglylote megascleres and microscleres in the form of sigmata or toxa or microxea.

This sub-family certainly seems to form the natural starting point for the evolution of the monaxonellid Sigmatotetraxonida. The Renierinæ have apparently originated from

the Gelliinae by loss of microscleres unaccompanied by any great development of spongin, the Chalininae by loss of microscleres accompanied by strong spongin development, the Philæodictyinae by the development of the fistular processes and rind, and the Desmacedonidae by evolution of the sigma into the remarkable chelate type of microsclere.

Genus *GELLIIUS* Gray [1867 F].

Gelliinae with little or no spongin, the main skeleton being formed by a reticulation of oxea.

11. *Gellius fibulatus* (Schmidt) var. *microsigma* Dendy.

(For literature and synonymy vide Dendy [1916 A].)

I refer to this variety a number of small specimens of irregular form from various localities. The spicular measurements are approximately as follows:—

R.N. LIII. 5 A. Oxea 0.185 by 0.0065 mm.; sigmata 0.018 mm. from bend to bend.

R.N. LIII. 12. Oxea 0.184 by 0.005 mm.; sigmata 0.01 mm. from bend to bend.

R.N. LVI. 4. Oxea 0.164 by 0.004 mm.; sigmata 0.01 mm. from bend to bend.

R.N. CXIII. 4. Oxea 0.2 by 0.008 mm.; sigmata 0.02 mm. from bend to bend.

R.N. CXIII. 6. Oxea 0.164 by 0.004 mm.; sigmata 0.02 mm. from bend to bend.

In view of the variation in spicular measurements it is doubtful whether this form can be distinguished even varietyally from the European *Gellius fibulatus*.

*Previously known Distribution of Species.* Adriatic (Schmidt); North Atlantic (Topsent); Gulf of Manaar, Ceylon Seas (Carter, Dendy); Okhamandal (Dendy).

*Register Numbers, Localities, &c.* LIII. 5 A, LIII. 12, Coelivy; LVI. 4, Coin Peros; CXIII. 4, 6, Egmont Reef.

12. *Gellius flagellifer* Ridley and Dendy.

*Gellius flagellifer* Ridley and Dendy [1886, 1887]. *Gellius flagellifer* Topsent [1896 B].  
*Desmacella porosa* Fristedt [1887]. *Gellius flagellifer* Lundbeck [1902].  
*Gellius flagellifer* Lambe [1896]. *Gellius porosus* Lundbeck [1902].

I identify with this species a well-preserved specimen considerably larger than the "Challenger" type. It has the form of a flattened crust, presumably detached from some substratum, but with practically uninjured lower surface. It is convex above and concave below. The upper surface is rather uneven, coarsely granular and slightly shaggy in places. It bears a few small, scattered vents. The texture is compressible and elastic, but rather fragile. The colour in spirit is light greyish brown. The specimen measures about 55 by 50 by 10 mm. The skeleton reticulation is very lax and irregular though the spicules are rather crowded. There is a good deal more spongin present than in the type (in which there is a little), and certain of the spicular fibres (both primary and secondary) have quite a thick coating of it.

The oxea are a little shorter and stouter than in the type, measuring say about 0.37 by 0.02 mm., but varying a good deal in thickness and usually more slender. The flagelliform sigmata are closely similar to those of the type but the hook at the narrower end frequently has a slight outward curve which I have not observed in the latter. The ordinary sigmata call for no special comment.

I hardly think that Lundbeck is justified in maintaining Fristedt's *Desmacella porosa* as a distinct species and I prefer to follow Lambe in regarding it as a synonym of *G. flagellifer*, which is evidently a somewhat variable form. The distribution of the species seems to be almost cosmopolitan.

*Previously known Distribution.* Off Marion Island (Ridley and Dendy); Davis Strait (Fristedt); Atlantic coast of Canada (Lambe); Gulf of Gascoyne (Topsent); Iceland (Lundbeck).

*Register Number, Locality, &c.* VII. 3, Saya de Malha, 6.9.05, C. 15, 55 fathoms.

13. *Gellius calyx* Ridley and Dendy var. *indica* nov.

*Gellius calyx* Ridley and Dendy [1886, 1887], not *Gellius calyx* Topsent [1892 C].

A single specimen from deep water at Saya de Malha may be regarded as representing a variety of this very elegant but little-known species, originally obtained by the "Challenger" from a depth of 600 fathoms off the mouth of the Rio de la Plata and, so far as I am aware, not met with since, for Topsent's supposed record has been shown by himself [1904 A] to be erroneous.

The "Sealark" specimen, like the type of the species, has very much the form of a crocus flower, but the transition from stalk to body is more gradual than in the type. The body is hollow and I think there can be little doubt that there was a single terminal osculum, but the upper part of the specimen is a good deal damaged. The stalk expands below into an attachment-plate, which seems to have run out into root-like processes. The total height of the specimen is about 45 mm. and the maximum diameter of the body 9 mm. The texture of the body is very soft and fragile, of the stalk stringy. The colour in alcohol is pale yellow.

The skeleton of the stalk consists principally of long fibres, composed of dense bundles of oxea, and these fibres extend throughout the body in the form of a loose reticulation with longitudinal meshes, in which numerous oxea are loosely scattered. The surface is so much macerated that I can say nothing about the dermal skeleton.

The oxea are long and slender, gradually and very sharply pointed; only slightly curved. They measure about 0.53 by 0.01 mm.

The sigmata are C-shaped, strongly curved, with sharply pointed extremities. They measure about 0.037 mm. from bend to bend, with a thickness in the middle of about 0.0027 mm.

This variety differs from the type of the species chiefly in the much more slender oxea and much larger sigmata. The sponge includes, as foreign bodies, numerous fragments of the skeleton of the hexactinellid *Aulocalyx serialis*, which was obtained from the same locality.

*Previously known Distribution of the Species.* Off the mouth of the Rio de la Plata, South Atlantic (Ridley and Dendy).

*Register Number, Locality, &c.* v. 3, Saya de Malha, 7.9.05, C. 20, 3—500 fathoms.

14. *Gellius torius* Topsent.

*Gellius torius* Topsent [1897 a].  
*Gellius torius* Thiele [1899].

*Gellius torius* Hentschel [1912].

This species is represented in the collection by two specimens. One (CXIX. 6 A) is a small crust, only about 10 mm. in diameter, growing upon a fragment of coral in association with numerous other organisms. The skeleton is an isodictyal or sub-isodictyal reticulation of mostly single oxea cemented together by spongin at their apices. The oxea are slightly curved, fairly gradually and sharply pointed, and measure about 0.14 by 0.005 mm. There are also numerous much more slender forms of about the same length, possibly young. The microscleres are moderately stout toxa, not at all sharply angulated and about 0.05 mm. in length. The other specimen (CVI. 1 c) is also a small crust, growing upon a bivalve shell. It resembles the first very closely in skeleton arrangement and spiculation and calls for no further comment.

*Previously known Distribution.* Bay of Amboina (Topsent); Celebes (Thiele); Aru Islands (Hentschel).

*Register Numbers, Localities, &c.* CVI. 1 c, Amirante, 13.10.05, E. 16, 39 fathoms; CXIX. 6 A, Salomon.

15. *Gellius petrosioides* (Dendy).

*Gelliodes petrosioides* Dendy [1905].

There is a single specimen of this species in the collection. It is apparently only a fragment of a larger specimen and has the form of a somewhat flattened lobe, with broadly rounded margin, measuring about 47 by 30 by 15 mm. A fair number of rather small vents occur scattered over the surface, chiefly on one side. In skeleton arrangement and spiculation the specimen agrees very closely with the Ceylon type. The colour in spirit is rather light brown. The texture is hard but brittle.

It appears to me now that this species falls better in the genus *Gellius* than in *Gelliodes*, for spongin, if present at all, is quite inconspicuous. In the presence of distinct oscula the "Sealark" specimen resembles Topsent's [1892c] *Gelliodes fayalensis* even more closely than does the type specimen, and future investigations may make it necessary to unite the two species. There appears, however, to be a good deal of difference in the form of the oxea, as figured, and I have seen none of the large "cellules sphéruleuses" which Topsent mentions.

*Previously known Distribution.* Ceylon Seas (Dendy).

*Register Number, Locality, &c.* XCVI. 2, Amirante, 13.10.05, E. 15, 39 fathoms.

Genus *GELLIODES* Ridley [1884 c].

Gelliinæ with much spongin, more or less completely enveloping, or even replacing, the megascleres and forming distinct fibres. Microscleres signata.

16. *Gelliodes carnososa* Dendy var. *laxa* nov.

(Plate 2, fig. 1.)

*Gelliodes carnososa* Dendy [1889, 1905].

There are two spirit specimens of this very elegant variety in the collection, both from the same locality (Cargados Carajos) and possibly parts of the same sponge. The most perfectly preserved is represented in Plate 2, fig. 1. It consists of a proliferous mass of slender, anastomosing tubes, with numerous short branches rising obliquely upwards from all over the sponge and each terminating in a circular vent. Each specimen measures about 85 by 40 mm.; the branches are about 4 mm. in diameter, the vents a little less. The texture (in spirit) is compressible and resilient, fairly tough; the colour light brown. There is a very similar dry specimen from Amirante.

The main skeleton is a sub-rectangularly meshed network of stout horny fibre, cored by the oxea. The dermal skeleton is an almost unispicular reticulation of oxea, held together and enveloped by a moderate amount of the pale-coloured spongin.

The oxea are slightly curved, gradually sharp-pointed at each end, measuring about 0.14 by 0.008 mm., but often more slender and sometimes a little stouter.

The sigmata are abundant; very slender; C-shaped or slightly contort; measuring about 0.02 mm. from bend to bend.

This variety differs from the typical form in the much less complete fusion of the tubular branches of which the sponge is composed.

*Previously known Distribution of Species.* Gulf of Manaar, Ceylon Seas (Dendy).

*Register Numbers, Locality, &c.* XLIV. 1, 2, Cargados Carajos, 31.8.05, B. 19, 28 fathoms; CXLVIII. Amirante.

Genus *TOXOCHALINA* Ridley [1884 c].

Gelliinæ with much spongin, more or less completely enveloping, or even replacing, the megascleres and forming distinct fibres. Microscleres toxa.

17. *Toxochalina robusta* Ridley.

*Toxochalina robusta* Ridley [1884 c].

*Toxochalina robusta* Dendy [1905].

*Toxochalina robusta* Ridley and Dendy [1887].

There are three fine specimens of this species in the collection, all closely resembling one another, being composed of repent, anastomosing branches, with rather large scattered vents on the upper surface. The oxea are more gradually sharp-pointed than figured for the type, but I suspect that this feature is exaggerated in Ridley's figure.

*Previously known Distribution.* Port Jackson (Ridley); off Bahia (Ridley and Dendy); Gulf of Manaar, Ceylon Seas (Dendy).

*Register Numbers, Localities, &c.* LXXVI. 1, 2, Amirante, 9.10.05, E. 1, 29 fathoms; XCVIII. 1, Amirante, 9.10.05, E. 3, 25 fathoms.

Sub-family *Renierinæ*.

Haploscleridæ with oxeote or strongylote megascleres and in which the microscleres have entirely disappeared and little or no spongin is developed.

Genus *RENIERA* Schmidt [1870].

Renierinae in which the skeleton is composed of a close reticulation of typically single megascleres, each forming one side of a rectangular, triangular or polygonal mesh. Spicules short, oxeote or strongylote, usually united together at the ends only by spongin cement.

This genus has apparently been derived from Gellius by loss of the sigmata.

18. *Reniera semitubulosa* (Lamarck?).

?*Spongia semitubulosa* Lamarck [1813].      ?*Pollina semitubulosa* Schmidt [1870].  
 ?*Halichondria semitubulosa* Lieberkühn [1859].      *Reniera semitubulosa* Keller [1878].  
 ?*Reniera semitubulosa* Schmidt [1862].

This species is characterized by its branching habit, slender spicules and absence of spongin. The "Sealark" specimens, though in a fragmentary condition, agree so closely with Keller's description and figures, especially as regards the spicules, that there seems a reasonable degree of certainty as to their specific identity with the form examined by him, but whether or not that form was correctly identified as Lamarck's *Spongia semitubulosa* is perhaps more doubtful.

The "Sealark" material consists of sub-cylindrical branches, ranging from about 1.5 to about 7 mm. in diameter. The largest fragment is about 48 mm. in length and itself unbranched, other fragments are sparingly branched and one shows anastomosis. The surface is even and has a coarsely porous appearance; there is no separable dermal membrane. The texture is very soft and compressible, fragile. No vents are recognizable but some fragments contain rather wide exhalant canals running lengthwise, while others are solid. The colour in alcohol is very pale yellow.

The skeleton is weakly developed and consists of a sub-isodictyal reticulation of slender oxea, in which many feebly developed, loose, plurispicular, longitudinal fibres can be recognized. There is no special dermal skeleton and little if any spongin.

The spicules are slender oxea, slightly curved or bent in the middle, rather abruptly sharp-pointed. They measure about 0.164 by 0.004 mm.

*Previously known Distribution.* Adriatic (Lieberkühn, Schmidt, Keller).

*Register Numbers, Localities, &c.* LXIV., Diego Garcia, 9 fathoms, 10.7.05; LXVIII. 6, Lagoon, Diego, 10 fathoms, 12.7.05.

19. *Reniera rosea* (Bowerbank).

*Isodictya rosea* Bowerbank [1866, 1874].      *Reniera rosea* Ridley [1884 c].  
*Isodictya rosea* Carter [1879 c].      *Reniera rosea* Topsent [1893].

Ridley and Topsent have already recorded this species from the Indian Ocean, a fact which encourages me in making the present identification. The "Sealark" specimens are, however, very fragmentary. They seem to have been irregularly massive, with occasional mammiform or digitiform processes. The vents, scattered on prominent parts of the sponge, measure about 4 mm. in diameter. Where uninjured the surface is covered by a very thin, transparent dermal membrane, containing the inhalant pores. The texture is compressible, very fragile and crumb-of-bread-like throughout. The colour in spirit is in most cases very pale yellow, in one specimen (R.N. XLVII. 7) light brown (but this is possibly due to staining by other sponges in the same jar).

The main skeleton is a close, sub-isodictyal reticulation of oxea. The meshes are triangular and for the most part unispicular, but they become very irregular in places and there are slight indications of the formation of multispicular lines. There is very little spongin.

The dermal membrane is not entirely devoid of skeleton, as one would conclude from Bowerbank's description, but there is a very imperfect unispicular reticulation of oxea.

The oxea are fairly stout, slightly curved, sharply and fairly gradually pointed. They measure about 0.155 by 0.008 mm., but, as usual in the genus *Reniera*, numerous much more slender forms also occur.

In spiculation this species agrees very closely with *Reniera tuberosa* n. sp., but is to be distinguished by its softer texture, paler colour and larger vents. The distinction between the two is very evident in the case of R.N. LXX. 1 and LXX. 1 A, the latter being a specimen of *Reniera rosea* encrusting the former, which is a specimen of *R. tuberosa*. Though so closely related the two specimens have failed even to adhere closely together.

*Previously known Distribution.* British Seas (Bowerbank); Kerguelen (Carter); Amirantes (Ridley); Seychelles (Topsent).

*Register Numbers, Localities, &c.* XLVII. 7, Praslin Reef; LXX. 1 A, 2, 3, Lagoon, Diego Garcia.

20. *Reniera cribriformis* Ridley [1884 c].

There is a somewhat damaged specimen from the Seychelles, attached to the test of an Ascidian, which in general form and spiculation agrees very closely with Ridley's description of the type specimen. It has the form of a very irregular, thin-walled sac, broadly attached below and with a few small scattered vents on the upper surface. The surface is granular rather than glabrous as described by Ridley, and the colour in spirit is pale yellow instead of "pale dull brown." The maximum diameter is about 20 mm. The skeleton is confused, without distinct primary and secondary lines or fibres. The spicules are slender oxea, ranging from sharply pointed to strongylote and measuring about 0.2 by 0.007 mm. These characters, taken in conjunction with the identity of habitat, convince me that this specimen really belongs to Ridley's species.

The species is evidently very closely related to *Reniera camerata*, and it may, I think, fairly be questioned whether the two ought to be kept distinct.

*Previously known Distribution.* Seychelles (Ridley).

*Register Number, Locality, &c.* CXXXII. 1, Seychelles, 20.10.05, F. 6, 44 fathoms.

21. *Reniera camerata* Ridley [1884 c].

I refer to this species a number of fragments from Salomon, consisting of thin, curved lamellae freely anastomosing with one another, and of a pale yellow colour and fragile consistency. The outer surface is smooth and granular, the inner thickly pitted by the minute openings of exhalant canals.

The skeleton is sub-isodictyal, but very confused and lax. The spicules are often associated in loose bundles, but with no regularity. They are rather slender, slightly curved oxea, usually and often abruptly sharp-pointed; measuring up to about 0.22 by 0.008 mm. but varying much in thickness.

The "Sealark" material seems to differ from the types of the species in its rather larger oxea and in their less, probably much less, definite association in multispicular tracts or fibres, but I do not think that these differences can be regarded as amounting to specific distinction.

*Previously known Distribution.* Seychelles and Amirante (Ridley).

*Register Number, Locality, &c.* CXX. 5, Salomon, 10—14 fathoms.

22. *Reniera cribriculis* n. sp.

(Plate 3, figs. 1 a, 1 b; Plate 12, fig. 1.)

There are two specimens of this species in the collection (Plate 3, figs. 1 a, 1 b), both from the same locality, of which R.N. LXXI. 10 A (fig. 1 a) may be regarded as the type. This specimen is irregularly sub-cylindrical, unbranched, broadly rounded off at each end. It has evidently grown horizontally and been attached along the greater part of one side to some smooth object. The length of the specimen is about 68 mm. and the average diameter about 15 mm. There are several large vents, each about 5 mm. in diameter, mostly on what was evidently the upper side of the sponge. They are rather shallow, but with cavernous walls owing to the numerous exhalant canals which open into them. Their margins are level with the general surface. The surface of the sponge is smooth, but appears distinctly reticulate even to the naked eye. This appearance is due to the presence of the very numerous, rounded or oval subdermal cavities, separated from one another by a network of trabeculae formed by the choanosomal tissue. Each subdermal cavity is about 1 mm. in diameter and is covered over by a minutely reticulate, transparent dermal membrane pierced by the inhalant pores, each pore being about 0.24 mm. in diameter. The texture of the sponge (in spirit) is very soft and compressible, but resilient, and the colour light pinkish brown\*.

The second specimen (fig. 1 b) is closely similar in general characters to the type, but is smaller and broken off short. It is incipiently divided into two very short, thick branches.

The main skeleton is a rather confused, sub-isodictyal reticulation of small oxea, with slender, plurispicular primary lines running at right angles to the surface. There are a great number of quite irregularly scattered spicules, especially in the deeper parts of the sponge. In many places the fibres, both primary and secondary, show a thick coating of spongin, but this is so pale in colour as to be readily overlooked at first sight. Beneath the surface the primary fibres break up into multispicular brushes of spicules with projecting apices.

A distinct dermal skeleton appears to be developed only in the thin dermal membrane which covers in the subdermal cavities, where it forms an irregular, rather wide-meshed reticulation of slender, plurispicular fibres, with no conspicuous spongin, echinated in places by tufts of projecting oxea.

The spicules are slender oxea (Plate 12, fig. 1), slightly curved and gradually and sharply pointed at each end, measuring about 0.17 by 0.006 mm.; with numerous more slender forms.

\* Possibly stained by an *Ictrochota* in the same jar.

This species is evidently intermediate between the genera *Reniera* and *Chalina*, and might, with almost equal propriety, be included in either. It is closely related to *Reniera topsenti* Thiele [1905], a South American species which I recently [1916 A] recorded also from Okhamandal on the Indian coast, but differs in the greater amount of spongin and in the distinct dermal reticulation of spicular fibre.

*Register Number, Locality, &c.* LXXI. 10 A, B, Amirante, 17.10.05, E. 21, 30 fathoms.

23. *Reniera tuberosa* n. sp.

(Plate 3, fig. 2; Plate 12, fig. 2.)

There are a considerable number of specimens and pieces of this sponge from Saya de Malha, all closely resembling one another in general appearance. The largest (R.N. VII. 3 A) may be regarded as the type of the species (Plate 3, fig. 2). It is very irregularly tuberos and has apparently lain at the bottom without any broad attachment. It is elongated and, with the addition of a fragment which has probably been broken off from it, measures about 85 mm. in length, while the maximum diameter of the transverse section varies from about 18 to about 40 mm. The surface is smooth but extremely uneven, and has a finely porous appearance under a pocket-lens. About a dozen small vents are scattered singly and quite irregularly over the surface; they are about 1.5 mm. in diameter and vary much in depth. The inhalant pores are scattered in the thin, translucent dermal membrane which occupies the meshes of the dermal reticulation.

The colour in spirit ranges from dull brownish yellow to light brown. The texture is firm, compact and incompressible, but friable.

The main skeleton is extraordinarily dense and confused, forming an almost solid mass of spicules between the moderately wide branches of the canal system. There is no distinctly separable dermal membrane, and in vertical section the dermal skeleton cannot be distinguished from the main skeleton, but a tangential surface section shows a close reticulation of multispicular fibre with small rounded meshes only about a spicule's length in diameter. There appears to be spongin.

The spicules are moderately stout, slightly curved oxea (Plate 12, fig. 2), sharply and fairly gradually pointed at each end, measuring about 0.15 by 0.008 mm. Numerous smaller, and especially more slender forms occur, possibly young.

This species appears to be fairly well distinguished by its external form, the extraordinarily dense and confused character of the main skeleton and the nature of the dermal reticulation.

*Register Numbers, Localities, &c.* VII. 3 (a considerable number of specimens, including 3 A); VIII. 6\*, Saya de Malha, 6.9.05, C. 15, 55 fathoms; LXX. 1, Lagoon, Diego Garcia, 8.7.05.

24. *Reniera tufoidea* n. sp.

(Plate 2, figs. 2, 2 a; Plate 12, fig. 3.)

This species (Plate 2, figs. 2, 2 a) is represented in the collection by two pieces which may possibly have formed parts of the same specimen. They are both flattened, cake-like and presumably encrusting, with slightly convex upper surface. There is a rather thick,

\* This specimen is stained purple owing to another sponge in the same jar.

separable dermal membrane, which for the most part lies closely upon the choanosome but sometimes overlies tubular canals (? both exhalant and inhalant) which in some places run parallel to and just beneath the surface while in others they approach the surface at right angles. Where it covers these subdermal canals the dermal membrane has a distinctly reticulate appearance when viewed under a pocket-lens. Occasionally, also, this part of the dermal membrane is pierced by a rounded aperture which looks like an osculum but which may be due simply to injury. It seems probable that in life the oscula are represented by sieve-membranes. Internally the sponge has much the appearance of some specimens of pumice-stone and is pierced by innumerable, ramifying, sub-cylindrical canals of very varying diameter, some of which, as already stated, lie immediately beneath the dermal membrane. The largest piece measures about 85 by 45 by 22 mm. The colour in alcohol is pale greyish yellow; the texture hard and incompressible, but friable.

The main skeleton is a rather loose, sub-isodictyal reticulation of oxea, the sides of the meshes being sometimes unispicular and sometimes plurispicular; it contains no distinct fibres. The dermal membrane contains a similar reticulation of similar spicules arranged tangentially, and is further strengthened by a coarse, irregular, subdermal reticulation of stout multispicular fibre, at any rate in places. I have not been able to detect any spongin.

The oxea (Plate 12, fig. 3) are moderately stout, slightly curved and fairly gradually sharp-pointed, measuring about 0.27 by 0.0123 mm.

This well-characterized species closely resembles *Reniera tufa* Ridley and Dendy [1886, 1887] both in general appearance and skeletal characters. It differs in the presence of the subdermal reticulation of fibre, in the considerably larger oxea and probably in having the vents covered over by the dermal membrane. Its hardness and the character of the skeleton are such as almost to justify its inclusion in the genus *Petrosia*, which cannot be sharply separated from *Reniera*.

*Register Number, Locality, &c.* XCIII., Amirante, 14.10.05, E 14, 280 fathoms.

25. *Reniera ligniformis* n. sp.

(Plate 4, fig. 1; Plate 12, fig. 4.)

This curious and well-characterized species is represented in the collection by a number of fragments which probably all belong to the same specimen. It is still possible to fit some of them together, but in the case of others there is some doubt of their exact position. The following description of the external form is taken from the best restoration which it was possible to make (Plate 4, fig. 1) and cannot be far from accurate. The sponge seems to have grown erect, in a tree-like fashion, with a slightly expanded base of attachment. From this base arise a main stem and a smaller stem, side by side. The smaller stem (if correctly identified amongst the pieces) was only about 30 mm. in height and 10 mm. in greatest diameter (near the top). The larger one, irregularly cylindrical but somewhat angular in form, rises to a height of 65 mm. without branching and then divides into three branches of very unequal length, coming off from one another at acute angles so that all three ascend nearly vertically. The longest reaches a total height, measured from the base, of 140 mm. (the total height of the sponge). All these branches are somewhat angular and also somewhat flattened, and they are widest at or near the extremity, which is broadly

rounded off. The largest has a maximum width of 18 mm. (at the end). The vents are rather small, about 2 mm. in diameter, but quite conspicuous, and scattered singly over the sides of the stem and branches without any definite arrangement. The surface of the sponge is smooth and even subglabrous (in spirit) where uninjured. It exhibits a very characteristic pattern, due to the presence of very numerous narrow, close-set, usually longitudinal grooves (subdermal cavities) covered over by a very thin, transparent dermal membrane. These grooves are separated from one another by intervals of about 1.5 mm.; while they themselves are only about 0.5 mm. wide. In some places, especially on the main stem, they run almost parallel with one another, with only occasional cross anastomoses; in other places they form a network. The delicate dermal membrane which covers them is reduced to a meshwork by the numerous inhalant pores. The texture of the sponge internally is crumb-of-bread-like. The whole sponge is fairly compact and rigid but very brittle and friable. The colour in spirit is light brown.

The main skeleton is a dense and confused, sub-isodictyal reticulation of small oxea, with a slight indication of slender primary lines running lengthwise and curving outwards to the surface. Between the subdermal cavities the more superficially placed spicules are disposed more or less at right angles to the surface, with slightly projecting apices, but there is no special dermal skeleton and over the subdermal cavities the dermal membrane is practically devoid of spicules.

The spicules are rather slender oxea (Plate 12, fig. 4); slightly curved and fairly gradually sharp-pointed; measuring about 0.14 by 0.0055 mm., with numerous more slender forms.

The specific name "*ligniformis*" has been given to this species in allusion to the curious resemblance, both in colour and texture, which the sponge (in its present condition) bears to water-worn fragments of driftwood.

*Register Number, Locality, &c.* LXI., Lagoon, Diego Garcia, 8.7.05.

Genus *PETROSIA* Vosmaer [1887 A\*].

*Renierinae* of hard or even stony texture, owing to the density of the skeleton, which is composed of an irregular reticulation of oxeote or strongly lute megascleres (usually short and thick), packed close together, sometimes in stout fibres.

26. *Petrosia seychellensis* n. sp.

(Plate 2, figs. 3, 4; Plate 12, figs. 5 a, 5 b.)

This well-characterized species is represented in the collection by two good specimens, of which I propose to regard R.N. CXXVIII. 1 as the type. This specimen (Plate 2, fig. 3) is massive, irregularly rounded, and attached to a mass of calcareous conglomerate by a broad base. It is rendered partially clathrous by a wide, irregular cavity which completely pierces it and opens on two sides. This cavity is now the abode of a bivalved mollusc, whose presence may have had something to do with its formation. The general surface is smooth and minutely granular. The vents are represented by five groups of small openings, each opening only about 1 mm. in diameter, and the largest group containing about 20 of

\* Name published in 1885.



them closely crowded together. The smallest group is surrounded by a raised and slightly contracted margin, forming a shallow cloacal cavity in the floor of which the vents open; some of the other groups may have exhibited a similar condition during life, the margin being now rubbed away. The specimen measures about 60 mm. in height by 54 mm. in greatest breadth. The texture is hard, compact and incompressible, the colour in alcohol is light brownish yellow. The second specimen (R.N. LXXII. 3) is about twice the size of the former and much more irregular in shape (Plate 2, fig. 4). It is also slightly clathrous, a condition which may be partly due to the presence of parasitic barnacles. The vents are grouped as before but none of the groups have (now, at any rate) raised margins. In places there is a very distinctly recognizable, minutely reticulate dermal membrane, overlying well-developed subdermal cavities (a similar structure is recognizable in places, but less conspicuous, in the type specimen). The texture is again hard and incompressible and the colour in spirit is pale yellow.

The main skeleton is a very dense, confused reticulation of the stout megascleres, intermingled with a smaller number of the slender kind. The dermal skeleton is a confused reticulation of both kinds of spicule arranged tangentially, but with a larger proportion of the slender forms (especially in R.N. LXXII. 3, where the latter preponderate heavily).

*Spicules*.—(1) Stout, slightly curved oxea (Plate 12, fig. 5 a), tapering fairly gradually towards the two ends but almost invariably more or less blunted at both; occasionally becoming stylote or strongylote; size about 0.43 by 0.026 mm.; (2) slender, slightly curved, gradually and very sharply pointed oxea (fig. 5 b), measuring, say, about 0.25 by 0.006 mm. but very variable in size and connected by intermediates with the larger kind. The above measurements are taken from the type specimen. In R.N. LXXII. 3 the large spicules are a good deal stouter, frequently as much as 0.04 mm. in diameter, but of about the same length.

This species seems to be well characterized by its external features and by the differentiation of its oxea into two fairly distinct categories. The latter character might be thought to justify its inclusion in the genus *Spongosorites*, but it is only an exaggeration of what may occur in other species of *Petrosia*, in which the more slender spicules are commonly regarded, probably quite rightly, as merely young forms.

*Register Numbers, Localities, &c.* R.N. LXXII. 3, *Amirante*, 11.10.05, E. 10, 22—85 fathoms; CXXVIII. 1, *Seychelles*, 20.10.05, F. 9, 37 fathoms.

27. *Petrosia mammiiformis* n. sp.

(Plate 12, fig. 6.)

Sponge consisting of short, thick-walled, tubular processes, rising from a basal crust and each ending in a wide, circular vent. The specimens, which all come from the same locality, are all more or less imperfect. R.N. CXXIV. 2 consists of an irregular crust, attached to a mass of nullipore, from which one or more processes have apparently been broken off. R.N. CXXIV. 3 is a complete tubular process which has perhaps been detached from the preceding. R.N. CXXII. 2 and CXXII. 3 are also short tubular processes, which may have been detached from the same specimen. The basal crust measures only about 21 mm. in maximum diameter and is very irregular in thickness. The largest mammiiform process is

16 mm. in length and 8 mm. in thickness in the middle, with walls about 2 mm. thick and terminal osculum about 3 mm. in diameter. The texture is not very hard and decidedly friable, easily crushing under pressure. The surface is smooth and appears faintly reticulate when viewed under a pocket-lens. The colour in alcohol is light brown.

The main skeleton is a close reticulation of stout, loose, irregular, multispicular fibre, with a fairly distinct differentiation into primary and secondary lines, and many spicules loosely scattered between the fibres. The dermal skeleton is a close reticulation of stout multispicular fibre, with rounded meshes in which lie the inhalant pores; the meshes being hardly a spicule's length in diameter.

The spicules are short, stout oxea (Plate 12, fig. 6) of very varying sizes, irregularly mingled together in both dermal and main skeleton. They are usually sharply and rather abruptly pointed, but not hastate, and often more or less bent or curved, sometimes quite strongly. The largest measure about 0.3 by 0.02 mm., the smallest about 0.08 by 0.012 mm., and numerous intermediates occur. There seems to be but little tendency towards blunting of one or both ends of the spicule, such as is so commonly met with in some species of the genus. A few slender oxea occur which may perhaps be regarded as young.

This species is evidently closely related to Schmidt's (? Nardo's) *Petrosia* (*Reniera*?) *dura* from the Adriatic, Carter's *Reniera crassa* (*Petrosia crassa* Lundbeck 1902) from the North Atlantic, Thiele's *P. imperforata* from Celebes, and my own *P. densissima* from Ceylon, especially as regards spiculation, but differs in its characteristic external form and in the arrangement of the vents.

*Register Numbers, Locality, &c.* CXXII. 2, 3, CXXIV. 2, 3, *Salomon*, 3.7.05, 75 fathoms.

Genus *HALICHONDRIA* Fleming [1828].

*Renierinae* (?) in which the skeleton consists of a confused reticulation of long and slender oxea (or strongyla) with little or no spongin; the spicules sometimes associated in ill-defined bands or fibres.

This is an unsatisfactory genus, which, as I have already pointed out [1905], may be of polyphyletic origin. The long, slender oxea suggest a possible origin from "epipolasid" *Astrotetragonida*, such as *Asteropus*, rather than from *sigmatotetragonid* ancestors.

28. *Halichondria panicea* Johnston, var.

(For literature, synonymy, &c., *vide* Ridley and Dendy [1887] and Dendy [1905].)

The single specimen which I refer to this widely distributed species is irregularly rounded, somewhat tuberous in form; about 56 mm. in length, 37 mm. in greatest breadth and 20 mm. in greatest thickness. The texture is unusually compact, slightly compressible and resilient, but rather friable. The surface is smooth, minutely granular, without any separable dermal membrane. There are two vents on what was presumably the upper surface, each about 2.5 mm. in diameter. The main skeleton is a confused reticulation of slender oxea without any distinct fibres, though the spicules tend to arrange themselves in loose wisps, the ends of which in places project more or less vertically from the surface, while deeper down in the sponge other loose wisps cross these at right angles. In other parts there is a dense dermal skeleton of tangentially placed oxea, crossing one another in all



directions without forming a regular network, and here the projecting spicules are absent. The spicules are slender oxea, slightly curved and fairly gradually sharp-pointed at each end; they measure about 0.6 by 0.014 mm.

*Previously known Distribution of the Species.* Almost cosmopolitan.

*Register Number, Locality, &c.* XLVII. 1, Praslin Reef.

29. *Halichondria retiderma* n. sp.

(Plate 2, fig. 5; Plate 12, figs. 7 a, 7 b.)

The single specimen (Plate 2, fig. 5) is massively lobose, undivided, and probably grew erect. It has been broken off below and is now about 80 mm. high by 55 mm. in greatest breadth and 35 mm. in greatest thickness, narrowing irregularly to a rounded summit. The surface is uneven, and covered everywhere by a thin, transparent, minutely reticulate dermal membrane, overlying extensive but shallow subdermal cavities and also covering over the ends of the wide exhalant canals, so that there are no visible vents. The dermal membrane is easily separable from the underlying choanosome, to which it is attached by numerous short, slender pillars of spicular fibre. The texture throughout is rather soft and very fragile, and cavernous owing to the presence of wide, cylindrical exhalant canals running vertically towards the summit of the sponge. The thin, transparent dermal membrane is of course perforated by numerous pores. The colour in spirit is yellowish grey.

The main skeleton is a very confused reticulation of rather slender oxea, for the most part scattered singly, but occasionally aggregated in loose wisps. Towards the surface they become aggregated in the ill-defined fibres which form the columns supporting the dermal membrane. The dermal skeleton is an irregular reticulation of tangentially disposed oxea, either of single spicules or of loose wisps. There is very little spongin.

The spicules are rather slender, slightly curved oxea (Plate 12, fig. 7 a), fairly gradually and sharply pointed at each end; measuring about 0.4 by 0.012 mm. when fully grown. An occasional stylote spicule (fig. 7 b) occurs amongst the oxea, of about the same dimensions.

This species is well-characterized by its very distinct, reticulate dermal membrane, with a well-developed dermal skeleton, and by the concealment of the oscula thereby. It might be included in Schmidt's genus *Pellina* [1870], but I do not see how the retention of that genus can be justified in view of the very varying extent to which a separable dermal membrane may be developed in different species.

*Register Number, Locality, &c.* XCVII. 1, Amirante, 18.10.05, E. 23, 16 fathoms.

30. *Halichondria nigra* n. sp.

(Plate 12, fig. 8.)

This species is represented in the collection by four fragments, two of which evidently fit together to form a tolerably complete specimen, which I regard as the type of the species, and from which the following description is taken. The sponge has apparently not been attached to the sea-bottom but has grown partially around the slender, cylindrical stem of some plant. It is irregularly cylindrical in form, with a very slight tendency to become branched; about 83 mm. in length and 27 mm. in maximum diameter. The surface is rather uneven, but subglabrous, with a rather thick, separable dermal membrane. The

vents are irregularly scattered on the broader end of the sponge, which was probably uppermost in life. They are more or less prominent, widely open, and up to 8 mm. in maximum diameter. The texture is compressible and fairly resilient, but friable and rather cavernous, with wide, cylindrical canals penetrating the interior and showing a strong tendency to run lengthwise just beneath the dermal membrane. The colour throughout is dark grey, almost black.

The skeleton arrangement is very confused, but shows loose, slender, multispicular primary and secondary fibres arranged in squarish meshes of very various sizes, the spaces between the fibres being crowded with irregularly scattered spicules. The dermal skeleton is a confused reticulation of tangentially placed oxea crossing one another in all directions, and doubtless with the inhalant pores scattered in the intervals, though these are hardly discernible now. A fair amount of spongin is present both in the dermal and in the main skeleton, but not as a continuous investment of the spicular fibre.

The spicules are slender, slightly curved oxea (Plate 12, fig. 8), usually more or less blunted at the extremities, and measuring about 0.22 by 0.0082 mm. Numerous much more slender forms, gradually sharp-pointed at each end, also occur; these are probably young.

The colour of the sponge is due to numerous minute, brown pigment granules, scattered through the dermal membrane and in the interior of the sponge.

This species is perhaps nearly related to my *Reniera pigmentifera* from Ceylon [1905], but differs considerably in several respects.

*Register Numbers, Localities, &c.* XLVII. 9, Praslin Reef (a small fragment); LIII. 5, Coetivy (the type specimen and another piece of irregular shape).

X 31. *Halichondria aphysinoides* n. sp. = *Axinyssa* a.

(Plate 3, figs. 3, 4, 5; Plate 12, fig. 9.)

The specimen (R.N. LXXVII. 2) which I regard as the type of this species is massive and compact, with evenly rounded contours. It is slightly compressed in a vertical plane and measures about 120 mm. in height by 103 mm. in greatest breadth and 70 mm. in greatest thickness (Plate 3, fig. 3). A considerable amount of very coarse calcareous debris is attached to the surface in places, especially at the much constricted base of attachment. Otherwise the surface is clean, faintly nodulated, and more or less covered with a minute reticulation of raised ridges, very variously developed in different parts. There is a large, shallow vent, receiving the openings of four large exhalant canals. This vent is situated on one side of the sponge, a little below the rounded summit; it is about 7 mm. in diameter and its margin is level with the general surface. Another much smaller, double vent occurs just below the summit on the other side, and possibly there may be a few more small ones not easily distinguishable. The inhalant pores are scattered in the interstices of the dermal reticulation. The colour (in spirit) is dark brown over the greater part of the surface, but this dark colour is confined to a thin superficial layer and the sponge is much lighter internally. The texture is compact, slightly compressible and resilient.

The skeleton is a rather dense and quite irregular reticulation of long oxea, occasionally associated in loose wisps but without any definite fibres. Stained sections show that these spicules are often cemented together, where they come into contact with one another, by

a considerable quantity of spongin. There is no true dermal skeleton, though the portions of the main skeleton lying just beneath the surface might sometimes be mistaken for such. Here and there the surface is slightly hispid from the projection of the ends of some of the oxen.

The oxen (Plate 12, fig. 9) are very like those of *Halichondria panicea*; long, rather slender, slightly curved and gradually sharp-pointed at each end. They vary considerably in size, measuring about 1.0 by 0.03 mm. when fully grown.

The histological structure of this sponge exhibits features of considerable interest, whereby it may readily be distinguished from such species as *Halichondria panicea*. The ectosome is composed of a thin fibrous (or fibrillar) layer (about 0.04 mm. thick) overlying a very thick layer of collenchyma. The fibrous layer is seen in tangential sections to be broken up into the characteristic dermal reticulation, with rounded meshes, by the presence of numerous irregular subdermal cavities roofed over each by a thin, cribriform dermal membrane. The collenchymatous layer is penetrated by the irregular subdermal cavities and cannot be sharply separated from the underlying choanosome, in which the larger canals are surrounded by a thick layer of similar tissue. The pigment is almost confined to the ectosome and is chiefly developed in the fibrous layer.

The flagellate chambers are confined to the irregular, granular-looking areas between the collenchymatous invasions of the choanosome. They are about 0.016 mm. in diameter. I have not been able to make out how they communicate with the rest of the canal system.

The most characteristic feature of this species appears to be the dermal reticulation, composed of a network of fibrillated bands of varying diameter, which gives to the surface an appearance resembling that of species of *Aplysina*.

There are a considerable number of specimens in the collection exhibiting this character and also agreeing pretty closely with the type of the species in skeleton arrangement and spiculation, while exhibiting a great deal of variation as regards external form and, to a less extent, colour. The most extreme variation is seen in R.N. LXXVIII. 7 (Plate 3, fig. 4) and R.N. CXXVIII. 3, which exhibit a slightly branched, digitate mode of growth, with branches averaging only about 10 mm. in diameter and with small scattered vents. The spicules are also decidedly smaller than in the type and show a stronger tendency to associate themselves in fibres, and were it not for the existence of specimens intermediate in form—some of them very irregular—I should have felt strongly inclined to place the two specimens referred to in a distinct species.

R.N. LIII. 6, which is an irregularly massive specimen, shows the tendency towards the development of loose spicular fibres very strongly, the fibres mostly running towards the surface. The same is true of R.N. CXXV. 1. R.N. XLII. 3 (Plate 3, fig. 5) and R.N. CXXV. 1 are infested by parasitic barnacles, deeply imbedded in the sponge and giving rise to a false appearance of numerous vents.

*Register Numbers, Localities, &c.* XLII. 3, Cargados Carajos, 30.8.05, B. 9, 30 fathoms; LIII. 1, 6, Coetivy; LXXI. 3, 4, Amirante, 17.10.05, E. 21, 30 fathoms; LXXVII. 2, Cargados, 30 fathoms; LXXVIII. 4, 7, Cargados Carajos, 28.3.05, B. 2, 30 fathoms; XCII. 2, Amirante, 18.10.05, E. 23, 16 fathoms; CX. 1, Egmont Reef; CXXV. 1, 23.8.05, > 100 fathoms; CXXVIII. 3, Seychelles, 20.10.05, F. 9, 37 fathoms.

### 32. *Halichondria tenuiramosa* nom. n.

*Halichondria reticulata* Baer [1905].

(Not *Halichondria reticulata* Lieberkuhn [1859].)

*Halichondria reticulata* Dendy [1916 A].

A fine specimen (all one) of this curious species, from Diego Garcia, appears to be very typical both in skeleton and histological features, and the external form differs from that of the Okhamandal specimens only in the greater preponderance of long, slender, comparatively straight branches and their less frequent anastomosis. The species appears to be a characteristic but not very common constituent of the sponge-fauna of the Indian Ocean.

*Previously known Distribution.* Zanzibar (Baer); Okhamandal (Dendy).

*Register Number, Locality, &c.* LXXXIII. 2, Barachois, Diego Garcia, 9.7.05.

### Sub-family Chalininae.

Haploscleridae with oxeote or strongylote megascleres and without microscleres. Skeleton a network of more or less strongly developed horny fibre cored by spicules and often with spicules scattered between the fibres.

It may well be doubted whether this large and apparently homogeneous sub-family is really a monophyletic group, for the chalinine condition may, with equal probability, be derived either from a renierine ancestry by addition of spongin or from a gelline ancestry (*Gelliodes* or *Toxochalina*) by suppression of microscleres. On the other hand the suppression of megascleres also in certain chalinine sponges seems to have given rise to pseudoceratose forms such as *Chalinopsilla* Lendenfeld [1888].

### Genus PACHYCHALINA Schmidt [1868].

Chalininae of various external form, lobose or digitate, but not tubular; with stout skeleton fibres containing very numerous spicules arranged multiseriately.

### 33. *Pachychalina subcylindrica* Dendy [1905].

(Plate 8, fig. 1.)

This species is represented in the collection by three pieces, which are perhaps all parts of the same specimen. The sponge consists of long, repent branches (Plate 8, fig. 1), averaging about 8 mm. in diameter and somewhat angular in transverse section, the upper surface forming a more or less prominent ridge on which the conspicuous vents are arranged uniseriately. The branches show some tendency to subdivide dichotomously and to anastomose with one another. The vents vary greatly in diameter, up to about 3 mm., and the larger ones have prominent margins. They lead out of deep, vertical oscular tubes. The largest piece is about 165 mm. in length. The surface is smooth and subglabrous, but minutely reticulate to the naked eye owing to the subdermal cavities showing through the dermal membrane. It has in many places a sandy appearance due to the inclusion of much foreign matter. The texture is rather hard and little compressible, somewhat fragile.

The main skeleton is a rather close but very irregular reticulation of stout, multispicular fibres, with much foreign matter both in and between the fibres and a fair amount of spongin.

Many spicules are scattered irregularly between the fibres. The dermal skeleton is a close-meshed network of similar multispicular fibre, with single spicules scattered tangentially in the meshes.

The spicules are slightly curved, gradually sharp-pointed oxea, measuring about 0.16 by 0.006 mm., but frequently much more slender.

The "Sealark" specimen appears to differ from the Ceylon types chiefly in the regular uniserial arrangement of the vents. The types also contain a considerable amount of foreign matter and probably more spongin than I originally supposed.

The species is evidently nearly related to the Australian *Pachychalina melior* Ridley and Dendy [1887].

*Previously known Distribution.* Ceylon Seas (Dendy).

*Register Number, Locality, &c.* XX. 1, Providence, 4.10.05, D. 3, 29 fathoms.

#### Genus CHALINA Grant [1861].

Chaliniæ of various external form; not tubular. Skeleton reticulation typically rectangular; fibres usually slender, with much spongin and few but usually well developed spicules.

#### X 34. *Chalina confusa* n. sp. *Acanthochalina* (Plate 3, fig. 6; Plate 12, fig. 10.)

Sponge (Plate 3, fig. 6) erect or pendent (?), sparingly branched, attached by an irregular, spreading base to a mass of calcareous débris. Branches long and slender, separating from one another at very acute angles, so that they lie almost parallel; diameter from about 2 to about 4 mm. Total length of specimen about 130 mm. Surface minutely rough and porous-looking. Vents numerous, but small and rather inconspicuous, arranged in longitudinal series. Texture rather soft, compressible and resilient, but fairly tough. Colour in spirit dark brown throughout, owing to the presence of numerous minute, scattered pigment granules and of abundant, rather dark-coloured spongin.

The skeleton is extraordinarily confused, owing chiefly to the very numerous loose spicules scattered irregularly between the fibres. A longitudinal section shows numerous sub-parallel, slender primary fibres, running in the main lengthwise but curving outwards towards the surface. These fibres are about 0.02 mm. in diameter. They contain a core of well-developed spicules, usually arranged in several series, surrounded by a thick coating of spongin, spongin and spicules being present in about equal proportions. They are connected crosswise by secondary fibres of the same character, but more slender and usually with only a single spicule in the axis. The intervals between the fibres are densely crowded with scattered spicules. There is no special dermal skeleton, and the outer part of the main skeleton becomes very irregular towards the surface.

The spicules are slightly curved oxea (Plate 12, fig. 10), usually very sharply but rather abruptly pointed, measuring when full grown about 0.15 by 0.006 mm. As usual, numerous much more slender forms occur, probably young.

This is a rather curious and well-characterized species, intermediate in skeletal characters between *Chalina* and *Halichondria*, with the external form of a *Chalina*.

*Register Number, Locality, &c.* LXXV. 3, Amirante, 11.10.05, E. 11, 25—30 fathoms.

#### Genus CERAACHALINA Lendenfeld [1887].

Chaliniæ of various external form; not tubular. Texture hard, owing to the great thickness of the skeleton fibres, in which the spongin is very strongly developed and the spicules much reduced in size and sometimes also in number.

#### X 35. *Ceraoachalina reticulata* Dendy [1905] var. *salomonensis* nov.

The single specimen in the collection is an irregularly sub-cylindrical, somewhat nodose sponge, probably repent in life. It seems likely that a branch has been broken off, but in its present condition it measures about 100 mm. in length by 10 mm. in average diameter. The surface is smooth but uneven, and beautifully reticulate under a pocket lens. The vents are numerous, about 2 mm. in diameter, sometimes with prominent margins and mostly arranged in longitudinal series. The texture is compressible and resilient, but stiff and tough. The colour is now light brown.

The main skeleton is a reticulation of stout, amber-coloured horny fibre, with triangular or sub-rectangular meshes sub-divided in places by an irregular secondary network of very slender fibres springing from the stout ones. The stout fibres average, say, about 0.14 mm. in diameter, the slender ones only about 0.025 mm. (The secondary reticulation was not mentioned in the description of the type of the species, but I find that it occurs there also.) Any of the fibres may contain vestigial spicules or may be without them, the numbers in which these occur varying greatly in different parts.

The dermal skeleton is a singularly beautiful reticulation of stout and slender horny fibre; the stout fibres, similar to those of the main skeleton, being arranged in triangular meshes, radiating from nodes which mark the ends of primary fibres of the main skeleton, and the slender fibres, of very various diameter, forming a secondary, small-meshed network between the stout fibres. Here again the number of spicules in the fibres varies greatly in different parts of the sponge, as also does the degree to which the spicules are developed individually, i.e. their diameter. In the stout fibres they are often so slender as to be barely recognizable, in the slender fibres they are stouter and there is usually one to each side of the small meshes.

The spicules are slender strongyla, usually slightly curved, about 0.078 mm. in length and up to about 0.002 mm. in diameter. In the interior of the sponge they occur scattered in the soft tissues between the fibres as well as in the fibres themselves.

The chief distinguishing character of this variety as compared with the type of the species seems to be the strongylote instead of oxeote character of the spicules.

*Previously known Distribution of the Species.* Gulf of Manaar (Dendy).

*Register Number, Locality, &c.* CXXI. 2, Salomon, 15 fathoms, 10.6.05.

#### 36. *Ceraoachalina differentiata* n. sp.

(Plate 3, fig. 7; Plate 12, fig. 11.)

This species is represented in the collection by two pieces, probably parts of the same specimen. The sponge (Plate 3, fig. 7) is composed of short, irregularly sub-cylindrical, somewhat nodose branches, with fragments of calcareous débris attached here and there; it

was probably repent on the sea-bottom in life. The largest piece is 52 mm. long and varies from about 8 to about 14 mm. in diameter. The smaller piece is apparently a detached branch. The surface is smooth and even glabrous. The numerous small, rounded subdermal cavities of varying size show clearly through the transparent dermal membrane, which itself appears minutely and very evenly punctate under a pocket lens. The vents, varying in diameter up to about 4 mm., are rather numerous and mostly scattered on what was evidently the upper surface of the sponge. Each leads out of a deep or shallow cloacal tube, whose walls are perforated by numerous apertures. The thin margins of the vents are only slightly prominent. The colour in spirit is light greyish brown, the texture rather soft, compressible and resilient.

The main skeleton is characterized by the sharp differentiation between primary and secondary fibres. The former run towards the surface in sub-parallel lines, bifurcating occasionally (but more frequently near the surface) at very acute angles. Each consists of a well-developed spicular core, about three spicules' width in diameter, surrounded by a thick coating of spongin; the total diameter of the fibre being only about 0.0287 mm., while the intervals between the fibres (except near the points of bifurcation) average about 0.2 mm. These primary fibres are connected by secondaries, which in places simply run across between the primaries like the rungs of a ladder, while in other places they form an irregular network. The secondary fibres are for the most part entirely devoid of spicules, but here and there a single spicule occurs in the axis. They vary in diameter from about 0.004 to about 0.025 mm.

The dermal skeleton is a close-meshed reticulation of horny fibre, with only occasional spicules in the axis of the fibre. The meshes are usually quadrangular and about 0.035 mm. in width, while the fibres range in thickness from about 0.004 to about 0.03 mm. The fibres are echinated at frequent intervals by small bundles of outwardly projecting oxea, to which is due the minutely punctate appearance of the surface.

The spicules are rather slender, very slightly curved oxea (Plate 12, fig. 11), sharply and rather abruptly pointed, measuring about 0.08 by 0.003 mm. A considerable number, especially more slender forms, occur between the fibres.

This species may be closely related to my *Ceraochalina reticulata* from Ceylon [1905], but differs considerably both in external form and in details of skeleton arrangement.

Register Number, Locality, &c. CVII. 1, Amirante, 14.10.05, E. 17, 12—18 fathoms.

#### Sub-family Phlœodictyinae.

Haploscleridae in which the ectosome forms a more or less sharply differentiated rind enclosing the often pulpy choanosome and produced into hollow tubular processes or fistulae. The megascleres, both of the ectosome and of the choanosome, are typical oxea (or strongyla), for the most part lying tangentially in the dermal layer and forming a reticulation, either fibrous or otherwise, in the deeper parts. This reticulation is usually concentrated to form a subdermal bast-like network of spicular fibre in the ectosome. Microscleres may be present in the form of sigmata or toxa but there are no chelae.

In my report on Professor Herdman's Ceylon sponges [1905] I included in this sub-family the genera Phlœodictyon, Oceanapia, Histoderma (= Coelosphaera), Sideroderma (Sidero-

dermella) and Amphistrella, thus associating those genera which possess chelae with those which do not, and those which possess diactinal megascleres in the form of tylota (or their derivatives) with those which have ordinary oxea or strongyla. Lundbeck [1910] dissents from this view and gives good reason for considering that the resemblance of such genera as Coelosphaera, Sideroderma and Amphistrella, to Phlœodictyon and Oceanapia is due merely to convergence. I am inclined to think now that Lundbeck is right and I therefore propose to include the former, together with certain obviously related forms, in a section of the Ectyoninae, for which the name Coelosphaeræ would seem to be the most appropriate, while retaining the sub-family Phlœodictyinae for the latter.

As to Schmidt's genus Rhizochalina [1870], in spite of the fact that Lundbeck [1902], who has examined the original types of Schmidt's species, has come to the conclusion that they are Chalininae, I do not feel at all convinced that they are not very closely related to Carter's Phlœodictyon, and consider that Schmidt's genus should at any rate be included in the same sub-family. Lundbeck, indeed, rejects the sub-family altogether, and, while relegating Rhizochalina to the Chalininae, places Phlœodictyon amongst the Renierinae and Oceanapia amongst the Gelliinae. I see no need for such a drastic proceeding and as the sub-family is certainly a very useful one I propose to retain it in the sense indicated above.

#### Genus OCEANAPIA Norman [1868].

Phlœodictyinae with microscleres in the form of sigmata or toxa, or both.

#### 37. *Oceanapia toxophila* n. sp.

(Plate 8, fig. 2; Plate 12, figs. 12a—c.)

There are three pieces of this sponge in the collection. Two of them (R.N. xx. 2), which were found in the same jar, almost certainly belong together and form practically an entire specimen (Plate 8, fig. 2), which may be regarded as the type of the species. The third piece (R.N. xxi. 3A) comes from the same locality (Providence) but was obtained at a different time and no doubt represents another specimen.

The type specimen consists of an irregularly fusiform, tuberous body, about 27 mm. long by 11 mm. in maximum diameter, tapering off at each end into a hollow cylindrical process, or fistula, about 4 mm. in diameter. One of these fistulae is quite short, only about 6 mm. long, and terminates irregularly, with a subterminal opening. It has apparently been damaged during life, possibly by rolling on the sea-bottom, for there is no indication of any attachment of the sponge to the substratum. The other is broken off short at a distance of about 9 mm. from the body, but the detached portion, already referred to as one of the three pieces, is about 55 mm. in length, of nearly uniform diameter throughout (about 4 mm.), but with an uneven, irregular surface and frayed out at what was evidently the distal end. The general surface ranges from finely granular, or even minutely hispid, to subglabrous. On the body are visible a number of subdermal canals, visible through the thin membrane which roofs them over. Some of these converge towards a group of very small vents, by which they open. The cavity of the longer fistula is continued for a long distance into the body, deeply penetrating the choanosome and giving off (or receiving?)

numerous small canals in its course. The cavity of the smaller fistula, on the other hand, runs into the body close beneath the rind, where it branches into subdermal canals. The differentiation into rind (ectosoma) and medulla (choanosoma) is sharply marked but the choanosoma is firm and compact and the ectosoma (about 0.5 mm. thick) is closely adherent to it except in the region of the subdermal canals. In the fistula the ectosoma alone is developed, forming the wall of the tube (about 0.7 mm. thick), and the whole fistula is stiff and rigid and rather brittle. The specimen has acquired a slight purple tinge from a specimen of *Iotrochota* in the same jar, otherwise it would doubtless be light yellowish brown in colour. The ectosoma, including the fistula-wall, has a characteristic translucent appearance as compared with the opaque choanosoma. Throughout the sponge occur a good many dark brown pigment granules, sparsely scattered in irregular groups (probably pigment-cells).

The main (choanosomal) skeleton is a very dense feltwork of oxea, not collected into fibres at all but interlacing with one another singly in all directions.

The ectosomal skeleton is rather peculiar. On the outside there is a thin dermal layer formed by a not very dense feltwork of tangentially disposed oxea. Beneath this is a layer, about 0.5 mm. thick, composed of a loose, sub-isodictyal reticulation of, for the most part, single oxea. In the fistula wall we find a similar arrangement of dermal and subdermal skeleton, with the addition of a large number of very stout longitudinal bands of multispicular fibre in the subdermal layer. These fibres are about 0.17 mm. thick. They occasionally branch and anastomose and evidently represent the so-called "bast layer." They are very feebly represented in the ectosoma of the body.

*Megascleres*. Slightly curved oxea (Plate 12, fig. 12 a), tapering more or less gradually to usually blunted extremities, size about 0.3 by 0.012 mm. Sharp-pointed forms seem to occur chiefly in the choanosoma, they are perhaps immature.

*Microscleres*. (1) Sigmata (fig. 12 b); slender, C-shaped or slightly contort; varying up to about 0.0164 mm. in length from bend to bend.

(2) Toxa (fig. 12 c) with short, straight, usually slender arms, diverging from one another sharply at an angle of about 135° and only slightly recurved at the apices; measuring up to about 0.057 mm. in a straight line from apex to apex but ranging down to a very small size.

Neither toxa nor sigmata can be said to be very abundant but they are quite sufficiently so to make it certain that they belong to the sponge, especially as they occur also in R.N. XXI. 3 A. In both specimens I have seen one or two minute amphidiscs but these are undoubtedly foreign and derived from specimens of *Iotrochota* in the same bottles.

The second specimen (R.N. XXI. 3 A) is a cylindrical fragment in a bad state of preservation. It is about 48 mm. long and 14 mm. in diameter. One end is broken off short; the other divides into two branches, one very short and with a wide and apparently natural opening at the end; the other may have been longer but has been frayed away almost completely, leaving an irregular opening. The interior of the sponge is divided into two or three wide longitudinal canals, one of which terminates in the opening at the end of the short branch. The colour in spirit is light brown. The spiculation agrees closely with that of the type.

This seems to be a very distinct species. I know of no other *Phlaeodictyine* which

possesses toxa and the blunting of the ends of the oxea and the arrangement of the ectosomal skeleton also seem to be very characteristic. R.N. XXI. 3 A was associated in the same jar with two fistulae of *Phlaeodictyon* (*fistulosum*?) with which it was at first confounded, but they are quite easily distinguished on microscopical examination.

*Register Numbers, Localities, &c.* XX. 2, Providence, 4.10.05, D. 3, 29 fathoms; XXI. 3 A, Providence, 3.10.05, D. 1, 39 fathoms.

#### Genus *Phlaeodictyon* Carter [1882 c].

*Phlaeodictyinae* without microscleres.

I am still doubtful whether this genus can be satisfactorily separated from *Rhizochalina* Schmidt [1870], but the differentiation of the fistulae in *Rhizochalina* into two distinct groups, ascending and descending, even if there is no generic difference in skeletal characters, which remains uncertain, may perhaps serve as a means of distinction.

It is obvious, on the other hand, that *Phlaeodictyon* has just as much claim to be separated from *Oceanapia* as *Reniera* has to be separated from *Gellius*, for it seems almost certain that *Reniera* and *Phlaeodictyon* have been derived respectively from *Gellius* and *Oceanapia* by loss of the microscleres; and as it is not improbable that this loss has taken place independently in several species of each genus it may well be that *Reniera* and *Phlaeodictyon* are of polyphyletic origin.

#### 38. *Phlaeodictyon seychellense* n. sp.

(Plate 8, fig. 3; Plate 12, fig. 13 a—b.)

Sponge (Plate 8, fig. 3) massive (? encrusting), with rounded surface giving off numerous rather short fistulae. Surface of body and fistulae alike smooth and glabrous. The fistulae average about 35 mm. in length and vary greatly in diameter, from about 5 to about 20 mm. Some of the smaller ones end blindly but these appear to be merely young stages of the larger ones, each of which terminates in a wide vent. The walls of the fistulae are very thin and flaccid and the cavity is partially sub-divided internally by irregular longitudinal septa. The body generally is covered with a thin rind which easily peels off as a "dermal membrane." Internally it is very soft, spongy and friable, and penetrated by numerous cylindrical canals, about 3 or 4 mm. in diameter, which run into the fistulae, sometimes many into a single fistula. The larger of the two specimens (R.N. CXXIX. 1) appears to be a fragment torn off from a large sub-spherical sponge. It measures about 120 mm. in height, 75 mm. in breadth and up to 35 mm. in thickness. It has a pale orange colour in spirit and the spirit containing it is deeply tinged with orange, and it seems probable that this colour is proper to the sponge. The second specimen (R.N. LI. 2) is closely similar but smaller, and of a pale grey colour without any trace of yellow.

The skeleton in the interior of the body consists of a very loose, irregular, wide-meshed network of multispicular fibre averaging about 0.016 mm. in diameter. The fibres are compact but there is no conspicuous spongin and very numerous loose spicules are scattered in the soft ground-substance between them. To the naked eye the reticulation of spicular fibres looks like a loose network of fine hairs inter-penetrating the soft choanosoma. Immediately beneath the surface lies an irregular bast-like reticulation of similar spicular fibre

which separates readily from the underlying main skeleton and thus comes away with the true dermal membrane when the latter is peeled off. Outside this, in the dermal membrane itself, is a fairly close feltwork of single spicules lying tangentially in approximately a single layer. The skeleton of the walls of the fistulae also consists of dermal and subdermal layers and exactly resembles that of the "rind."

*Spicules.* Slightly curved oxea (Plate 12, fig. 13 a—b) sharply and fairly gradually pointed at each end, sometimes hastate, measuring about 0.18 by 0.0082 mm.

This species seems to come near to *Pellina eusiphonia* Ridley [1884 c] from Port Darwin, and certainly suggests a close relationship between the genus *Phlaeodictyon* and the Renierinae. It should also be compared with my own *Oceanapia mollis* from near Port Phillip Heads [1895], from which it differs chiefly in the absence of sigmata and the stronger development of spicular fibres in the main skeleton, and with Topsent's *Oceanapia fragilis* from Amboina [1897 A].

*Register Numbers, Localities, &c.* LI. 2, Praslin Reef; CXXIX. 1, Seychelles, 20.10.05, F. 2, 31 fathoms.

39. *Phlaeodictyon porosum* n. sp.

(Plate 8, fig. 4; Plate 12, fig. 14.)

The single specimen (Plate 8, fig. 4) is cylindrical, truncated at right angles above and attached obliquely below to a mass of coral, the surface of attachment being very extensive. The upper, truncated surface is slightly depressed, with raised and rounded margin, sub-circular in outline. It is covered by a rather thick and fragile, pore-bearing dermal membrane, resembling, in its present condition, damp blotting paper, and easily peeling off. It is smooth, but finely granular and rather uneven, and bears no fistulae. This surface may evidently be regarded as a single very large pore-area (? inhalant or exhalant). The side of the cylinder bears a large number of cylindrical fistulae, arising at considerable intervals from one another and standing out more or less at right angles from the surface. Most of these have been broken off quite short, leaving circular openings, and the remainder are much damaged. They are rather thin-walled and there are clear indications that they were sometimes branched. Some of them seem to have terminated blindly, probably in porous areas, others may have been open, but there is no real evidence of this. They average about 6 mm. in diameter and the longest remaining is 28 mm. in length. The wall of the fistula measures up to about 1 mm. in thickness. Between the bases of the fistulae the surface of the sponge is smooth and has the appearance of being covered by a thin, slightly wrinkled cuticle, which can easily be peeled off in shreds, and is really a translucent, spicule-bearing dermal membrane. The total height of the specimen, on the longest side, is 100 mm.; on the shortest side, opposite to this, only 44 mm. The diameter at the upper, truncated end, is 65 mm. The texture is rather firm but compressible and resilient; fairly compact and fibrous internally, but with wide canals leading in from the fistulae and smaller ones terminating below the dermal membrane of the pore-area. Colour in spirit very dark grey, almost black; due to the presence of an immense number of pigment cells filled with black granules, which occur scattered abundantly throughout the sponge.

The skeleton of the body consists of a very irregular reticulation of coarse multi-spicular fibre, together with numerous loosely scattered spicules. The reticulation is fairly close, and the fibres, usually about 0.085 to 0.17 mm. in diameter, contain a large proportion of pale-coloured spongin. There is no differentiated subdermal reticulation distinguishable from the deeper skeleton. The dermal skeleton is a thin but fairly well-developed feltwork of oxea, lying tangentially in the thin dermal membrane.

The skeleton of the fistula wall is arranged in the same way except that, owing to the hollow character of the fistula, the main skeleton is reduced to a coarse subdermal reticulation of multispicular fibre.

In the large pore-area (and possibly also at the closed ends of the fistulae) the dermal skeleton is arranged differently, forming a close reticulation with small rounded meshes (about 0.086 mm. in diameter) containing small groups of pores. The spicular reticulation is very irregular and is echinated by numerous spicules projecting from it more or less at right angles.

*Spicules.* Slightly curved oxea (Plate 12, fig. 14), gradually or abruptly sharp-pointed; varying greatly in size, up to about 0.2 by 0.01 mm. The different sizes are much intermingled, the larger chiefly in the fibres of the main skeleton and the smaller in the intervening ground substance and in the dermal skeleton.

This is a very remarkable species and I know of nothing already described that comes at all near it.

*Register Number, Locality, &c.* LXXVII. 4, Cargados, 30 fathoms.

40. *Phlaeodictyon fistulosum* (Bowerbank).

(For References and Synonymy *vide* Dendy [1905].)

There is no complete specimen of this common species in the collection, but a number of fistulae, large and small, branched and unbranched, from various localities. The largest measures 106 mm. in length by 18 mm. in maximum diameter and is unbranched and open at each end. Another, which is practically perfect and slightly branched at the distal end, measures 100 mm. in length with a maximum diameter of 8 mm.; a small portion of the body of the sponge is attached to its basal end.

*Previously known Distribution.* West Australia (Bowerbank); Arafura Sea (Ridley, Hentschel); S.W. of New Guinea (Ridley and Dendy); Amboina (Topsent); Gulf of Manasar (Carter); Ceylon (Dendy); ? Ternate (Thiele); Azores (Ridley and Dendy, Topsent); ? off Bahia (Ridley and Dendy).

*Register Numbers, Localities, &c.* XLII. 8, Cargados Carajos, 30.8.05, B. 9, 30 fathoms; CXXVIII. 4, 5, 6, CXXXIII. 8, Seychelles, 20.10.05, F. 9, 37 fathoms; ? XXI. 3 B, C, Providence, 3.10.05, D. 1, 39 fathoms.

41. *Phlaeodictyon incrustatum* n. sp.

(Plate 12, fig. 15.)

This species is represented in the collection by five fistulae, all from Egmont Reef and very possibly from the same specimen. The lower portions of all the fistulae except the smallest, which has apparently been broken off short, are encrusted with very coarse sand.

small nullipore nodules, &c.; clearly indicating that the body of the sponge was buried in similar debris and left behind when the fistulae were collected, for all the fistulae have evidently been broken off at the bottom. The fistulae are of two kinds: three of them terminate each in a wide, sphinctrate vent; the other two end blindly and probably bear inhalant pores. One of the latter shows an incipient branching at the extremity; the remainder are quite unbranched. The three vent-bearing fistulae are considerably larger than the others and all of about the same size, the largest being about 74 mm. in length by 12 mm. in average diameter. The walls of all the fistulae are rather thin (about 0.5 mm.) and the cavities of the vent-bearing ones are more or less subdivided by longitudinal septa. The surface is finely granular and the colour in spirit dark brown.

The skeleton of the wall consists of a not very dense dermal feltwork of scattered oxea, lying tangentially and crossing one another in all directions. This is backed by a rather close-meshed reticulation of very stout spicular fibre, in which the multispicular fibres range up to 0.17 mm. in diameter. A few spicules project more or less at right angles from the surface and give it a minutely hispid character.

The soft tissues which form the septa in the interior of the fistulae contain loosely scattered oxea, often lying parallel with one another in long tracts, perhaps sometimes forming spicular fibres.

*Spicules.* Oxea (Plate 12, fig. 15); slightly curved, fairly gradually sharp-pointed; measuring about 0.21 by 0.0085 mm.

Though closely resembling it in skeleton arrangement and spiculation this species seems to be really quite distinct from *Phlaodictyon fistulosum*, which has a well rounded body almost if not quite free from the substratum and not encrusted with debris. There are probably also differences in the character of the fistulae, and the dark brown colour of our species may also prove distinctive. It probably comes nearer to my *Phlaodictyon* (*Oceanopica*) *phillipense* [1895] but has much larger spicules and again differs in its dark colour.

*Register Numbers, Locality, &c.* cx. 2, cxiii. 5, Egmont Reef.

X 42. *Phlaodictyon polysiphonia* n. sp.  
(Plate 8, fig. 5; Plate 12, fig. 16.)

The sponge (Plate 8, fig. 5) consists of a mass of slender, thin-walled tubes or fistulae rising vertically and close side-by-side from a common base. The tubes run approximately parallel to one another, anastomosing pretty freely and branching to a slight extent. Most, at any rate, of them are now open at the extremity, but the ends are a good deal damaged and some of them may have been closed in life. The diameter of the tubes is about 2 to 3 mm. and the length of the longest about 45 mm. The body of the sponge, which has mostly been left behind, seems to have been much mixed up with the very coarse sand upon which it grew; apparently it was enveloped, at any rate partially, in a thin rind, portions of which still appear as a continuation of the fistula-walls. The tubes are fairly stiff but flexible and resilient. The colour in spirit (after formalin) is very pale grey, nearly white. There are altogether about fifty of these tubes, partly adhering together, with fragments of the body, and partly broken away from one another.

The skeleton in the body of the sponge is a dense, confused mass of slender oxea,

occasionally collected in rather slender fibres. In the fistula-wall there is a bast-like subdermal layer of multispicular fibres about 0.04 mm. in diameter, arranged longitudinally but anastomosing with one another very obliquely to form a network with greatly elongated meshes. Outside this is a dermal layer composed of a loose feltwork of single spicules arranged tangentially.

*Spicules.* Slender, slightly curved oxea (Plate 12, fig. 16), fairly gradually sharp-pointed at the ends and measuring about 0.14 by 0.004 mm.

This species is distinguished by the slenderness of the fistulae, their great number and the way in which they are arranged, and by the small size of the spicules. It is unfortunate that the material does not show more clearly the character of the body. The specimen was originally preserved in formalin, which may account to some extent for its damaged condition.

*Register Number, Locality, &c.* LXXXIII. 1, Barachois, Diego Garcia, 9.7.05.

Sub-family *Merliinae*.

Haploscleridae with a calcareous basal skeleton perforated by crypts which are occupied by extensions of the choanosome. Siliceous skeleton composed of bundles of tylostyles, with microscleres in the form of clavidiscs, to which trichites (raphides) and sigmata may be added.

Were it not for the existence of the enigmatical basal skeleton, the genus *Merlia*, for which this sub-family was proposed, might perhaps be included in the Hamacanthinae, along with *Vomerula* and *Hamacantha*, for the characteristic clavidisc has much in common with the diancistrum and there seems to be no reason for regarding either as an aberrant chelate form. The *Melananchora* spicule, on the other hand, for which Topsent has proposed the name "Spherancistrum" and which has also been compared with the clavidisc, is evidently, as originally shown by Carter, a peculiar type of chela characterized by meeting and fusion of the opposite teeth of a tridentate isochela, and it seems to bear no close resemblance to the clavidisc.

Genus *MERLIA* Kirkpatrick (1908 D).

With the characters of the sub-family.

For a detailed account of this genus the reader is referred to Kirkpatrick's important memoir in the *Quarterly Journal of Microscopical Science* [1911]. Inasmuch as the genus is a very remarkable one, of which the only known recent examples were found at Porto Santos, near Madeira, the discovery even of isolated spicules in the "Sealark" collection assumes considerable interest. It is probable that it has a very wide range of distribution and is of considerable antiquity, for the highly characteristic "clavidisc" was described and figured by Hinde and Holmes [1892] from the lower tertiary strata of Oamaru in New Zealand many years before the genus *Merlia* was described, but this earlier work, in which the spicule is described under the name *Melananchora morlandi*, appears to have been overlooked by more recent observers.



43. *Merlia* sp.

(Plate 12, fig. 18.)

In a boiled-out preparation of the spicules of *Tedania reticulata* (R.N. cxx. 4), from Salomon, there occurs a very beautiful and perfect example of a clavidisc (Plate 12, fig. 18), the remarkable and very characteristic microsclere of the genus *Merlia*. Another example, broken but quite unmistakable, occurs in a similar preparation of the spicules of *Hymedesmia laevis* (R.N. cxxv. 6) from Mauritius. Both specimens agree very closely with the corresponding spicules of *Merlia normani* Kirkpatrick, except for their considerably larger size. The perfect example from Salomon might be described as diamond-shaped, with broadly rounded angles, so far as its general outline is concerned. It measures 0.0656 mm. in length and 0.041 mm. in breadth in the middle, while the clavidiscs of *Merlia normani* measure only about 0.045 by 0.03 mm. (Kirkpatrick). The clavidiscs of *Merlia normani* (which I have examined carefully) vary much in outline and are usually rather irregular, but diamond-shaped specimens are by no means uncommon. The broken example from Mauritius is evidently a fragment (about half, including one end) of a spicule closely resembling the Salomon specimen and very little inferior to it in size (the fragment is actually 0.0574 mm. long). It seems possible that these isolated spicules may represent an Indian Ocean species different from *Merlia normani*, and it is to be hoped that future collectors in this region will keep a careful look-out for this very remarkable and interesting sponge.

## Family Desmacidonidae.

Monaxonellid Sigmatotetraxonida with typically reticulate skeleton, often with much spongin. Megascleres usually, but not always, asymmetrically ended. Typical microscleres chelae of various forms, which are, however, frequently suppressed. Without discorhabds or derivatives thereof.

The very remarkable and characteristic chelae of this group may be regarded as derived from sigmata by the addition of teeth (flukes) or palms at the two ends. In development the typical chela passes through a sigma-like stage and amongst the great variety of fully-formed chelae some are to be found which depart comparatively little from the condition of typical sigmata\*. The teeth or palms evidently arise as outgrowths from the curved ends of the shaft, as shown clearly in some of Lundbeck's beautiful figures†.

The diversity of form exhibited by the chelae in different species appears to be almost endless, but I cannot agree with Levinsen and some other recent writers in drawing a sharp distinction between "chelae" and "ancorae." However useful these terms may be for purposes of description, the characters in question have to be used with great discretion when dealing with taxonomic problems, and to insist invariably upon the generic separation of species possessing "chelae" and "ancorae" respectively appears to me undesirable. We shall have occasion to return to this question later on in dealing with the "Sealark" material. In the meantime I may point out that the old and well-recognized distinction between tridentate and palmate chelae, though by no means absolute, seems to be of greater taxonomic value.

\* Vide Lundbeck's figure of the peculiar chelae of *Hymedesmia mucronata* [1910, Pl. x, fig. 3d].

† Vide Lundbeck [1905, Pl. xv, fig. 2g and Pl. xvi, figs. 2e and 3f].

There is now abundant evidence that a large number of species in various subdivisions of the Desmacidonidae have suffered reduction in their spiculation by loss of the cheke. I propose to term such species "lipochelous." It is a phenomenon precisely analogous to the loss of the tetract megascleres whereby the monaxonellid condition has arisen from the tetractinellid. It is of course not always easy to determine the affinities of such forms, but other characters generally remain which afford sufficient indications of relationship.

Exactly as in the case of the loss of triænes in the "epipolasid" Stellettidæ, however, a very difficult taxonomic problem arises in connection with these lipochelous forms. A considerable number of genera have been described which may now be recognized as consisting merely of lipochelous species derived from other, chela-bearing genera, and the question is how far the presence or absence of chelae can be used as a generic character. I shall have occasion to point out presently that the genus *Biemna* may be regarded as consisting of lipochelous species of *Mycale*, that *Desmacella* bears the same relation to *Esperella*, that *Aulospongia* and *Microciona*, *Crella* and *Yvesia*, form similar pairs, and so on. In other cases lipochelous species have been left in the same genus as chela-bearing forms, as, for example, in *Hymedesmia* (q.v.). It is impossible, in the present state of our knowledge, to be consistent in this matter, and each case has to be treated on its merits and a decision arrived at in accordance with what seems most likely to assist in the ultimate phylogenetic arrangement of the species. Premature conclusions as to genetic relationships are, however, likely to do more harm than judicious conservatism.

The loss of the chelae is, again, exactly comparable to the loss of the sigmata in the Renierinae and Chalininae, but it would by no means be expedient in this case to associate all the lipochelous forms together in one or two artificial sub-families. It is the absence of other distinguishing characters that renders such a course unavoidable, in the present state of our knowledge, when dealing with the Haploscleridae.

The evolution of the Desmacidonidae has been accompanied by the conversion, in the first instance, of the primitive, symmetrical, diactinal type of megasclere into an unsymmetrical, monactinal type (stylote or tylostylote), presumably by suppression, more or less complete, of one of the two primitive rays. This seems to have resulted from a definite orientation of the spicule in the sponge, whereby the growth of one end is impeded as compared with that of the other. In many cases, however, and notably in the Myxillinae and Ctenophoræ, the symmetrical condition has been more or less completely resumed by certain of the megascleres. This seems to take place when the spicule comes to lie tangentially in the dermal membrane, where its two ends are exposed to similar conditions, and it appears that such originally dermal spicules may migrate into the choanosome while still retaining their symmetrical or sub-symmetrical form (e.g. *Plumohalichondria*). Such spicules are sometimes referred to as diactinal, or secondarily diactinal, but it would perhaps be better to speak of them, and of all similar spicules of doubtful origin, simply as symmetrical or sub-symmetrical, without committing oneself to any opinion as to the number of primitive rays actually represented\*. It must always be remembered that the form of a megasclere may be largely dependent upon its position in the sponge; not necessarily its final position, but that which it occupies during its growth. In most

\* In many cases it is convenient to use the terms "oxeote" and "stylote" without any theoretical implication.



Desmacidonidæ the stylete (or even tylostylote) condition appears to have become fixed and constant for the megascleres of the main skeleton, but in the genus *Guitarra* it is hard to draw a distinction between styli and oxea, the one form passing into the other.

The Desmacidonidæ constitute one of the largest and most important families of sponges and for systematic purposes it is very desirable to subdivide it. One of the earliest attempts to do this was that of Mr Ridley and myself in the Report on the "Challenger" Monaxonida, published thirty years ago. A dual subdivision into Esperellinæ and Ectyoninæ was then proposed, but at the same time it was recognized that the line of demarcation between the two sub-families could not be satisfactorily defined. Topsent subsequently proposed an intermediate group, to be known as the Dendoricinæ. On the ground that the generic name *Mycale* has priority over *Esperella*, the sub-family Mycalinæ now replaces the Esperellinæ in the writings of most spongologists, while for a similar reason the name Myxillinæ is used in preference to Dendoricinæ. Lundbeck, however [1905], regards the Myxillæ, as he terms them, as a subdivision of the Mycalinæ.

As I shall show later on, there is no necessity to abandon the genus *Esperella* altogether in favour of *Mycale* and I therefore retain the sub-family Esperellinæ as proposed in the "Challenger" Report on the Monaxonida. I also retain the sub-family Ectyoninæ in the old sense. A very careful consideration of the facts, however, has convinced me that the Myxilline sponges, although, as Topsent pointed out, they form a very natural group, are not intermediate between the Esperellinæ and Ectyoninæ; on the contrary their characteristic symmetrical or sub-symmetrical dermal spicules and tridentate isochelæ indicate that they are a highly specialized group of Ectyoninæ, amongst which I accordingly place them as a special section under the name Myxillæ.

The so-called Axinellidæ have hitherto, by general consent, been kept apart from the Desmacidonidæ. They are, however, evidently, as at present understood, a very heterogeneous assemblage, amongst which the more typical genera are very possibly derived from Ectyonine ancestors. It seems desirable therefore to reduce this group to the rank of a sub-family of the Desmacidonidæ, which sub-family may at once be rendered more homogeneous by the removal of certain genera.

#### Sub-family Esperellinæ.

Desmacidonidæ without echinating megascleres and without specially differentiated, symmetrically or subsymmetrically ended dermal spicules.

The Esperellinæ are evidently less specialized sponges than the Ectyoninæ and it is amongst this sub-family that the link between the Desmacidonidæ and the Haploscleridæ, if any such exists, is likely to be found. As a matter of fact we have in the genus *Isodictya* a group of species which really do not differ greatly from species of *Gellius*. The megascleres are all oxea, evidently of a primitive diactinal type, and without constant orientation, and there is nothing in the arrangement of the skeleton to differentiate the two genera. This being so it is important to inquire into the character of the chelæ. These are palmate isochelæ of a rather peculiar form, which may clearly be regarded as sigmata, provided, in certain regions, with lateral fimbriæ, just as diancistra may be regarded as sigmata with fimbriæ developed in another plane. It is a very significant fact

that Bowerbank, in describing the isochelæ (anchorates) of *Isodictya palmata*, the type of the genus, clearly regarded them as modified sigmata (bihamates). He says [1866 B, p. 312] "The middle portion of the shaft is curved outward in the usual manner, and the two extremities are bent into hooks like a simple bihamate spiculum.... But this flexuous bihamate form has a further development; fimbriations appear on the sides of the shaft, especially towards the hamate extremities," &c.

The Esperellinæ are but poorly represented in the "Sealark" collection.

#### Section MYCALEE.

Typical megascleres stylote or tylostylote. Chelæ with well-developed palms, but not placocheleæ.

#### Genus MYCALE Gray [1867 F].

Megascleres smooth styli or tylostyli. Microscleres palmate anisochelæ, sigmata and trichodragmata. No toxa.

The type of this genus is Bowerbank's *Hymeniacidon (Raphiodesma) lingua*. I accept the genus for species whose spiculation conforms to that of the type, but this acceptance does not necessarily involve the rejection of the genera *Ægagropila* and *Esperella*, for the type of the former (*Halichondria ægagropila* Johnst. = *Desmacidon ægagropila* Bk.) possesses toxa but no trichodragmata, while that of the latter (*Spongia contarenii* Martens = *Esperia typica* Nardo) possesses neither trichodragmata nor toxa.

The number of species included in the genus *Mycale*, as employed by recent authors, renders it desirable to have some method of grouping them in smaller genera. This is a case where, especially in view of historical considerations, the presence or absence of toxa and trichodragmata may well be utilized for generic distinctions.

44. *Mycale crassissima* (Dendy).  
(Plate 5, fig. 1.)

*Esperella crassissima* Dendy [1905].

*Mycale crassissima* Hentschel [1912].

There are in the collection four specimens of this species which agree very closely with the Ceylon type both in external form and skeletal characters. The largest specimen (R.N. LXXXVII. 5) is massive, rounded, rising up into digitiform processes each bearing a conspicuous vent at its apex (Plate 5, fig. 1). Its colour now is light, dirty brown, but this may be due to staining by other specimens in the same tin. It measures about 70 mm. in height by 48 mm. in greatest breadth. In its lower portion there are clear indications of a coarsely clathrous structure of the entire mass, a character which is more strongly marked in R.N. XI. 1. The three other specimens are much smaller and white (or nearly so) in spirit.

Hentschel [1912] rightly mentions a small palmate anisochela as a constituent of the spiculation, 0.012—0.015 mm. in length. These are abundant in the "Sealark" specimens, usually about 0.0164 mm. long.

In my original description I spoke of small palmate "isochelæ" as being numerous in the dermal membrane. This was a slip and should read "anisochelæ." I have re-examined

the type and can find no isochelæ. In one of the "Sealark" specimens, however, (CXXXIV. 3) I have seen some three or four isochelæ of about the same size as the small anisochelæ. I have found none in the other specimens and doubt much whether they can be regarded as normal constituents of the spiculation.

In all the "Sealark" specimens the tylostyli are pointed at the apex, as in the type.

*Previously known Distribution.* Ceylon (Dendy); Aru Islands, Arafura Sea (Heuschel).

*Register Numbers, Localities, &c.* XL 1, S. de Malha, 7.9.05, C. 19, 29 fathoms; XXIX. 2, Cargados Carajos, 3.10.05, B. 24, 30 fathoms; LXXVII. 5, Cargados, 30 fathoms; CXXXIV. 3, Seychelles, 20.10.05, F. 9, 37 fathoms.

#### Genus BIEMNA Gray [1867 F].

Lipochelous Mycalea with stylote or tylostylote megascleres and signata and raphides (or trichodragmata) for microscleres, to which toxa may be added.

The type species of this genus is Bowerbank's *Desmacidon peachii* [1866, 1874]. A reference to the description and figures of this species in the *Monograph of British Sponges* shows that in addition to signata it also possesses raphides or trichites, probably originally grouped in trichodragmata. The following passages refer to these spicules and leave no doubt as to their nature.

"Tension spicula, acerate, varying greatly in length, and of extreme tenuity, dispersed, exceedingly numerous." "The tension spicula are thickly felted together on its surface [i.e. the surface of the interstitial membranes]; they are very minute and slender, and their length is frequently not more than a third or a fourth of that of one of the bilaminate retentive spicula. Among the short slender tension spicula there are frequently other acerate spicula of three or four times their length, and these are still more slender than the shorter ones."

Three years later [1870] Schmidt proposed his genus *Desmacella*, the type species of which is *Desmacella pumilio*, a species with tylostylote megasclerus and signata only for microscleres. At the same time he described a second species, viz. *Desmacella vajabunda*, with two so-called varieties, one of which has, in addition to the tylostyles and signata, "feine umspitzige Nadeln" which have since been shown to be toxa. Finally Schmidt included in his genus *Desmacella*, Bowerbank's *Hymedesmia johnsoni*, for which, on account of its remarkable diancistra, Gray [1867 F] had already proposed the genus *Hamacantha*.

An extraordinary confusion has arisen with regard to these genera in the writings of subsequent authors. Vosmaer, in his monograph on the Porifera in Bronn's *Klassen und Ordnungen des Thier-reichs* (p. 221) announced that *Desmacella* was a synonym of *Hamacantha* and in this he has been followed by Thiele [1903 B] and Wilson [1904]. This is obviously an erroneous conclusion, for *Hamacantha johnsoni* was not the type of the genus *Desmacella* and, indeed, was evidently regarded by Schmidt himself as a somewhat aberrant species.

The only question that can arise legitimately is whether or not *Desmacella* can be

\* Compare Ridley and Dendy [1887].

regarded as distinct from *Biemna*. As a matter of fact *Desmacella* was allowed for some time to replace *Biemna*, but Topsent [1890] proposed to revive *Biemna* (wrongly calling it *Biemma*) for species with tylostyles and signata only, or with tylostyles, signata and toxa. Subsequently [1892 c] he restricted it to forms with the structure of *Halichondria* and tylostyles and signata only, while accepting *Desmacella* for species with a fibrous structure and with a spiculation composed of tylostyles or styles, with signata or toxa (or both), to which trichodragmata may be added, for microscleres. Reference to the original types of these two genera shows that Topsent has exactly reversed their characters.

To make matters worse Thiele [1903 B] proposed the new genus *Tylodesma* for *Biemna* in Topsent's sense, and this has been accepted by Wilson [1904]. If there is one thing clear in the whole muddle it surely is that *Tylodesma* is a pure synonym of *Desmacella*!

If we are to regard *Desmacella* as a separate genus it can only be on the ground that it lacks the trichodragmata (or raphides) found in *Biemna*. For the present it appears to me advisable to recognize this distinction, especially as a precisely similar distinction may be used to separate *Esperella* from *Mycale*. In fact we may look upon *Biemna* as a lipochelous genus derived from *Mycale* and *Desmacella* as a lipochelous genus derived from *Esperella*. The presence or absence of toxa is another factor that will have to be taken into account in finally determining the relationships of these genera, but that is a question into which it is not necessary to enter now. [In revising this Report for press I find that Hallmann [1917 A] has proposed the new genus *Toxemna* for species with toxa, making *Biemna* (*Desmacella*) *tubulata* the type species. I reserve my opinion as to the desirability or otherwise of this proceeding.]

#### 45. *Biemna tubulata* (Dendy).

*Desmacella tubulata* Dendy [1905, 1916 A]. *Toxemna tubulata* Hallmann [1917 A].

There is one fragmentary specimen of this well-characterized species in the collection, agreeing closely with the Ceylon type both in external form and spiculation. It consists of a number of thin-walled tubes, running parallel with one another, branching and fusing with one another laterally. There is no evidence of the existence of any basal mass to which the tubes might have been attached. This is the third time I have received this sponge from the Indian Ocean, but, owing to its extremely fragile character, I have never yet seen a specimen sufficiently well preserved to be worth figuring for the external form.

*Previously known Distribution.* Gulf of Manaar, Okhamandal (Dendy).

*Register Number, Locality, &c.* XXI. 8, Providence, 3.10.05, D. 1, 39 fathoms.

#### Genus PARESPERELLA Dendy [1905].

*Esperellinae* with megascleres in the form of styli or tylostyli, and with microscleres in the form of palmate anisochelæ and serrated signata, to which others may be added.

Recent writers have shown but little inclination to accept the genus *Paresperella*, but in view of the number of species now known and the very well-defined peculiarity of the serrated signata I think it very desirable to maintain it. I am not aware that similar signata have ever been met with outside the genus.

46. *Paresperella* sp.

The genus is represented in the collection by a number of large, serrated, C-shaped sigmata, measuring about 0.12 mm. in a straight line from bend to bend. These spicules resemble the corresponding spicules of the Ceylon species, *P. serratohamata*, but seem to be less strongly serrated. It is quite possible, however, that they belong to that species. They occur in a preparation of *Rhabdermia pusilla* (R.N. cxvi. A) from Salomon.

## Section CLADOMIZEE.

Megascleres typically stylote or tylostylote. Chelæ provided with a varying number of teeth, not distinctly palmate.

## Genus AMPHILECTUS Vosmaer [1880].

Megascleres smooth styli or tylostyli. Microscleres isochelæ with three or more teeth at each end. External form without definite symmetry.

This genus, as originally proposed by Vosmaer, was a sort of zoological waste-paper basket, and was made to include a great variety of species. The type species, Bowerbank's *Isodictya gracilis* [1866, 1874], is very imperfectly known but I have endeavoured to frame a generic diagnosis in conformity with its characters. Nevertheless I am doubtful whether the species about to be described ought to be regarded as congeneric with *Amphilectus gracilis*. Its isochelæ are very peculiar and it may very likely become necessary in the future to propose a new genus for this and kindred forms, such as Kieschnick's [1900] *Esperiopsis viridis*.

X 47. *Amphilectus* (?) *unguiculatus* n. sp.  
(Plate 12, fig. 17 a—b.)

Sponge very thinly encrusting; the single specimen covering the broken-off branch of a coral (?). Surface smooth and subglabrous. Vents and pores not seen. Colour in spirit pale brown (buff). Texture soft, with a thin, translucent, readily separable dermal membrane.

The skeleton consists of loose wisps of slender tylostyles, ascending from the substratum and branching out into subdermal brushes. There is no special dermal skeleton.

*Megascleres*. Slender tylostyles (Plate 12, fig. 17 a); straight, with fairly well developed, usually oval heads; usually tapering gradually to sharply pointed apices which, however, are sometimes mucronate or blunted; size about 0.32 by 0.0055 mm.

*Microscleres*. Isochelæ (fig. 17 b) of peculiar and variable form. Shaft usually strongly curved, not alate, with a variable number (up to at least six) of claw-like teeth at each end. Sometimes there are only three teeth, and these may be reduced to slight, blunt protuberances; or the whole spicule may be reduced to a curved shaft with slightly thickened ends. Well developed specimens have a length of about 0.03 mm. with a shaft about 0.004 mm. thick.

The nearest approach to this curious species that I have been able to find in the literature is Kieschnick's [1900] *Esperiopsis viridis* (from Amboina or Torres Straits ?) which agrees closely in spiculation but differs much in external form.

Register Number, Locality. cxiii. 10, Egmont Reef.

## Sub-family Ectyoninæ.

Desmacidonidæ in which the main skeleton is typically echinated by acanthostyles or some form of megasclere derived therefrom. Frequently with specially differentiated, symmetrical or subsymmetrical dermal spicules.

The origin of the spiny echinating spicules which form such a characteristic feature of this sub-family is somewhat difficult to trace. I am inclined to think, however, that they originated in thin encrusting sponges such as *Hymenaphia* and *Microciona* and at first echinated the substratum (as they still do in some species) as a protection against animals which feed upon such crusts. In *Microciona* there is a strong tendency for the megascleres, both smooth and spined styli or tylostyli, to collect together in plumose columns which grow out at right angles to the substratum as the sponge crust thickens. In these columns the bases of the spicules become connected together by spongin. In either case the differentiation of the two ends of the spicule is apparently correlated with the different conditions to which they are exposed. From this starting point it is very easy to derive such genera as *Clathria* and *Plumohalichondria*. In *Clathria* the smooth and spined styli tend to segregate in two groups, the former more or less completely embedded in the strongly developed horny fibre, which now forms a reticulation, and the latter echinating the fibre at various angles.

The chelæ of *Microciona* and *Clathria* are minute palmate isochelæ, and toxa are also very frequently present. Amongst the *Esperellinæ* we find this combination of microscleres in *Artemisia suberitoides* Vosmaer [1885] in which the isochelæ are extraordinarily like those of *Microciona* and *Clathria*. This suggests a possible line of derivation of the *Ectyoninæ* from the *Esperellinæ*.

From *Microciona*, or some closely related form, two or three main lines of evolution seem to have branched out. One of these, initiated by the genus *Clathria*, seems to have retained the small palmate type of isochela and not to have developed any symmetrical dermal megascleres; while in the other, initiated by the genus *Plumohalichondria*, the isochela assumes the tridentate character and there is a very strong tendency to produce special symmetrical dermal megascleres, which attain their maximum of development in the *Cœlosphæreæ*.

As in the case of other spicule categories the echinating acanthostyles appear to have dropped out from the spiculation in certain cases, thus giving rise to forms which appear to be *Esperelline* rather than *Ectyonine*. This is probably the explanation of the fact that so many of the *Myxilleæ* lack special echinating spicules, a fact which formerly induced me to regard them as intermediate between the two sub-families\*.

## Section CLATHRIÆ.

*Ectyoninæ* of ordinary form and spiculation; without special symmetrical or subsymmetrical megascleres. Characteristic microscleres, small palmate isochelæ and (frequently) toxa.

\* Vide "Challenger" Report on the Monaxonida, p. 129.

Genus *MICROCIONA* Bowerbank [1864].

Sponge thinly encrusting. Main skeleton composed of plumose columns of spicules with their bases imbedded in spongin. Columns not united to form a reticulation. Megascleres styli (and modifications thereof) and acanthostyli (and modifications thereof). Microscleres palmate isochelæ and toxa.

48. *Microciona atrasanginea* Bowerbank.

(Plate 13, fig. 1 a—c.)

*Microciona atrasanginea* Bowerbank [1864, 1866, 1874].*Microciona atrasanginea* Carter [1875, 1880 v].

This common British species has already been recorded by Carter [1880 B] from the Indian Ocean. The "Sealark" material consists of a thin crust (now of a yellowish grey colour) extensively spreading over a madreporarian coral. It differs from British specimens which I have examined in the feebler development of the skeleton columns, the relatively fewer large subtylostyles (styli), and the more numerous small spined echinating spicules, and the absence, so far as I have been able to observe, of spination on the bases of all the large styli, which seldom, if ever, have distinct heads. It seems very doubtful whether Bowerbank's *M. armata* [1866, 1874] can be separated from *M. atrasanginea*.

For purposes of comparison with the British form the spiculation of the "Sealark" specimen is represented in fig. 1 a—e, Plate 13.

*Previously known Distribution.* British Seas (Bowerbank); Gulf of Manaar (Carter). *Register Number, Locality.* cx. 8, Egmont Reef.

49. *Microciona strepsitoxa* Hope var. *robusta* nov.*Microciona strepsitoxa* Hope [1889].

This species is represented in the collection by a small fragment which was found attached, perhaps accidentally, to the surface of the type specimen of *Barbozia primitiva* (R.N. LXXII. 1). It is of very irregular shape, consisting of a flattened portion measuring about 10 mm. in length by 5 in breadth and 2 in thickness, from which three short branches are given off, the largest of which is about 7 mm. in length by 1.5 mm. in diameter. It therefore can hardly have been thinly encrusting, like the type of the species. The appearance of sections of the flattened portion, however, suggests strongly the folding of a very thin sponge-lamina upon itself so as to form two free surfaces, with the surfaces which should be attached to the substratum now in close contact with one another in the middle.

The skeleton is rather complex in its arrangement and consists of the following parts: (1) short plumose columns of stout subtylostyles, springing from whatever represents the original substratum of the sponge (foreign bodies, &c.) and running at right angles to the surface; in some places these columns are reduced to two or three or even single spicules; (2) numerous acantho-subtylostyles taking part in the formation of the plumose columns and echinating the substratum between them; (3) numerous very well developed, radiate dermal brushes of slender subtylostyles; (4) wisps of similar but usually longer spicules

in the interior of the sponge; sometimes running longitudinally and sometimes at right angles to the surface, where they terminate in surface brushes, but the latter are not always connected with such wisps.

*Megascleres*.—(1) Stout subtylostyli of the plumose columns; slightly curved towards the base; tapering very gradually to the sharply pointed apex; very slightly enlarged at the broadly rounded base, which (alone) is covered with small, sharp or blunt spines. Size very variable, especially as regards length: up to about 0.86 by 0.026 mm.

(2) Short, stout acantho-subtylostyles; tapering gradually from the slightly, if at all, enlarged base to the finely pointed apex; covered all over with short spines, which, on the shaft, are sharp and slightly recurved, while on the base they are rather more numerous, often truncated, and tend to curve towards the shaft; size up to about 0.12 by 0.012 mm. exclusive of spines, not very variable.

(3) Long, slender subtylostyli; straight or nearly so; with very slightly developed oval heads which are usually minutely spined; of two principal sizes, but very variable, viz. about 0.16 by 0.004 mm. (characteristic of the dermal brushes) and about 0.5 by 0.008 mm. (characteristic of the wisps in the interior).

*Microscleres*.—(1) Toxa; identical with those of the type; very long and slender, with a spiral twist of about one turn in the middle; size commonly about 0.37 by 0.0014 mm. I have seen none of the shorter forms with minutely spined tips, described by Hope, but, on the other hand, the toxa in this variety seem to pass into long, slightly bent oxea, a good deal stouter than themselves but still very slender, measuring, say, about 0.8 by 0.002 mm. These modified toxa are not very common.

(2) Slender, palmate isochelæ, about 0.012 mm. long.

I think there can be no doubt that this is merely a robust variety of the British species.

*Previously known Distribution of Species.* English Channel (Hope).

*Register Number, Locality, &c.* LXXII. 1 A, Amirante, 11.10.05, E. 10, 22—85 fathoms.

Genus *Aulospongia* Norman [1878].

Skeleton of plumose columns of smooth and spined styli. No microscleres.

The single known species of this genus appears to be a lipochelous *Microciona* and it is very questionable whether the genus ought to be retained. As we shall see presently there are also lipochelous species of *Clathria*.

50. *Aulospongia tubulatus* (Bowerbank).*Haliphysma tubulatum* Bowerbank [1873 B].*Azinella tubulata* Dendy [1889].*Aulospongia tubulatus* Norman [1878].*Aulospongia tubulatus* Dendy [1905].

This species forms a very characteristic and conspicuous element of the Ceylon sponge fauna and it is extremely interesting to meet with it again so far afield as Amirante. Both as regards external appearance and skeletal characters the two "Sealark" specimens bear a close resemblance to those that I have seen from Ceylon, though the smooth megasccleres are more inclined to be swollen at the base. The larger of the two is massive, subspherical, with strongly conulose surface, and measures about 40 mm. in diameter.

Both specimens exhibit a histological peculiarity which occurs also in the Ceylon specimens, though it has not hitherto been mentioned. This is the presence in the mesogloea of immense numbers of small, thin-walled, subspherical vesicles, frequently with more or less crumpled walls, often morula-like in appearance. The vesicle has a yellow colour and may appear either empty or with granular contents. They vary in size, averaging say about 0.02 mm. in diameter. They often appear in clusters, as if multiplying by budding. I do not know what these vesicles may represent, but their constancy suggests that they are a normal constituent of the sponge.

The Ceylon specimens of this sponge are usually, if not always, infested by the tubicolous polychaete worm, *Polydora armata*\*, the presence of which led Dr Bowerbank to give a curiously erroneous account of the species and to refer it to the genus *Haliphysma*. I have found no traces of this worm in the "Sealark" specimens.

*Previously known Distribution.* Ceylon Seas (Bowerbank, Dendy).

*Register Numbers, Localities, &c.* XCII. 4, cv. 3, Amirante, 9.10.05, E. 2 and E. 6, 29 and 28 fathoms.

#### Genus *BUBARIS* Gray [1867 F.]

Lipochelous Clathriæ of usually encrusting habit. Skeleton consisting chiefly of large styli or tylostyli, projecting outwards either singly or in plumose columns, and with their bases implanted in a mass of usually crooked, symmetrically or subsymmetrically ended megascleres.

There are two very interesting species of this genus in the collection, both characterized by the possession of microscleres in the form of trichites or trichodragmata. In this respect they resemble certain species of *Sigmaxinella*, while differing in the possession of the basal or axial feltwork of crooked strongyla.

The subsymmetrical megascleres found in the interior of the sponge must be regarded as derived from the normal styli and the genus seems to be a derivative of *Microciona* or *Aulospongia*.

#### 51. *Bubaris conulifera* n. sp.

(Plate 7, fig. 3; Plate 13, fig. 2 a—f.)

The single specimen (Plate 7, fig. 3) forms a thin crust spreading over a mass of nullipore. From the older and more central portion of the crust a large number of independent but close-set conuli rise vertically upwards. All stages in the development of these conuli are to be observed, from minute papillæ to conical processes 4 mm. in height and rather more than 1 mm. in diameter at the base. The fully developed conuli taper gradually to sharply pointed apices. The entire surface of the sponge, including the conuli, is more or less strongly hispid with projecting spicules. There are no recognizable vents. The colour in spirit is light, dull orange.

The skeleton arrangement is that of a typical *Bubaris*. There is a dense basal mass of interlacing strongyla, continued up the conuli as a very stout axial skeleton. The basal feltwork and the axial columns alike are abundantly echinated by projecting styli of varying length, which in the conuli project outwards and upwards.

\* *Vide* Watson [1905].

*Megascleres*.—(1) Strongyla of the basal feltwork and axial columns (Plate 13, fig. 2 a). Usually rather stout, boomerang-shaped, rather sharply bent at or near the middle, evenly rounded off at both ends; sometimes more irregularly bent. Size variable, up to about 0.43 by 0.017 mm.

(2) Slender oxea (2 b), sharply bent in the middle and gradually and finely pointed at each end, measuring up to about 0.43 by 0.008 mm.; connected with the strongyla by intermediate forms (2 b'). A very few much larger oxea occur (2 c), up to 1.0 by 0.0227 mm.

(3) Comparatively short, stout styli (2 d); broadly rounded at the base, gradually and sharply pointed at the apex; more or less sharply bent near the base; size very variable, say about 0.6 by 0.023 mm. in a typical example.

(4) Very long, slender, almost straight styli (2 e); broadly rounded at the base, gradually and sharply pointed at the apex; measuring up to about 1.8 by 0.017 mm. Numerous intermediate forms between these and (3) occur.

*Microscleres*.—Trichodragmata (2 f). Short, compact, slightly curved, measuring about 0.026 by 0.004 mm. Very numerous, sometimes found breaking up into hair-like trichites.

*Register Number, Locality, &c.* XXI. 11, Providence, 3.10.05, D. 1, 39 fathoms.

#### 52. *Bubaris salomonensis* n. sp.

(Plate 13, fig. 3 a—b.)

There are several pieces of this sponge in the collection, all from the same locality and perhaps parts of one and the same specimen. The sponge forms a thin crust, of fairly uniform thickness, spreading over a mass of calcareous debris. The surface is almost even and more or less strongly hispid; without projecting conuli, and, in places at any rate, covered over by a thin dermal membrane. Vents and pores are not recognizable. The largest piece measures about 30 by 20 mm., with a thickness of about 2 mm. The colour in spirit is dull yellowish grey.

The skeleton consists of dense radial columns, so closely set as to be practically continuous. Each column consists of a stout axis of densely packed strongyla, from which stout styli of various dimensions project outwards almost at right angles to the general surface, which is rendered hispid by their apices. The skeleton columns are hardly distinguishable in places, so that the skeleton seems to consist of a basal mass of interlacing strongyla, from which a forest of styli project vertically, the bases of the styli being usually more or less deeply imbedded in the basal mass. There is no special dermal skeleton.

*Megascleres*.—(1) Strongyla of the basal feltwork and axial columns (Plate 13, fig. 3 a). Usually rather stout and irregularly bent, so as to be more or less crooked; evenly rounded off at both ends, but commonly with one end narrower than the other. Size very variable, especially as regards thickness; up to about 0.3 by 0.026 mm.

(2) Stout styli (fig. 3 b); frequently bent near the base, usually sharply pointed and tapering gradually from base to apex; varying greatly in size, especially as regards length, up to about 1.6 by 0.038 mm.; sometimes a little stouter but shorter; often only about as long as the strongyla, with which they are connected by intermediate forms.

*Microscleres*.—Trichites; slightly curved, about 0.06 mm. long; thickly scattered through the mesogloea; occasionally in very loose bundles.

This species is readily distinguished from *Bubaris conulifera*, the only other species known to me which contains trichites, by several characters, viz. the absence of the conuli on the surface, due to the more compact arrangement of the skeleton; the absence of the oxea; the less pronounced differentiation of the long, almost straight styli, and the absence of the compact trichodragmata.

A remarkable feature of the "Sealark" specimens is the extraordinary amount of erosion which many of the spicules have undergone while still *in situ* in the sponge, as seen in ordinary hand-sections mounted in Canada balsam (unstained). This erosion amounts in places to complete resorption of the silica, leaving the spicule-sheaths empty but still retaining the form of the spicules. It is evident that the erosion takes place both from the outer surface inwards and from the axial canal outwards. It is best seen in R.N. CXXIV. 1.

Register Numbers, Locality, &c. CXXII. 5, 6, 8, CXXIV. 1, Salomon, 3.7.05, 75 fathoms.

#### Genus CLATHRIA Schmidt [1862].

Sponge typically clathrous. Main skeleton a reticulation of spiculo-fibre with much spongin. Usually with dermal brushes of slender megascleres. Typical megascleres stout and slender styli (subtylostyli or tylostyli) and spined echinating styli. Microscleres minute palmate isochelæ and sometimes toxa or sigmata.

This genus is evidently very closely related to *Microciona*, differing chiefly in the more robust growth and the branching and anastomosing of the skeletal columns to form a reticulate skeleton. The plumose arrangement of the spicules characteristic of *Microciona* is also lost in most species, but not in all. The spiculation is practically identical.

#### 53. *Clathria procera* (Ridley). (Plate 2, figs. 6, 7.)

*Rhaphidophylus procerus* Ridley [1884 c].

*Echinonema gracilis* Ridley [1884 c].

*Rhaphidophylus spiculonus* Dendy [1889].

*Clathria spiculona* Dendy [1905, 1916 A].

*Clathria spiculosa* var. *ramosa* Dendy [1905].

*Clathria spiculosa* vars. *ramosa* and *muicilenta* [Hentschel 1912].

This species, so variable in external form but apparently very constant in spiculation, is well represented in the collection. Two very distinct forms are present; viz. the long, slender, sparingly branched form, of which R.N. LXXXIV. (Plate 2, fig. 7) is a very good specimen, and the clathrous form, of which R.N. LI. 1 (Plate 2, fig. 6) is a fine example.

Ridley's types of *Rhaphidophylus procerus* and *Echinonema gracilis* and my *Clathria spiculosa* var. *ramosa* are characterized by the former and my typical *Clathria spiculosa* by the latter habit. It was possibly the difference in external form which prevented me from identifying the latter with Ridley's species in the first instance, but, as I have already pointed out [1916 A], the two types of external form cannot be at all sharply distinguished, and there are two very irregular specimens in the present collection. In describing my var. *ramosa*, however [1905], I pointed out the resemblance which it bears to Ridley's *Echinonema gracilis*, but I failed to notice that that species is obviously identical with the same author's *Rhaphidophylus procerus*. In the description of the latter

the account of the spiculation is defective and does not agree with the figures. If allowance is made for this fact it is not difficult to understand why Ridley separated the two specimens not only specifically but even generically.

The characteristic features of the spiculation in this species appear to be the tylote bases of the smooth slender megascleres and the short, stout, imperfectly spined condition of the echinating spicule, but the latter closely resembles the corresponding spicule in *C. corallitincta*.

Previously known Distribution. Port Darwin, Providence Reef (Mascarene Islands) (Ridley); Gulf of Manaar, Ceylon Seas, Okhamandal (Dendy); Aru Islands, Arafura Sea (Hentschel).

Register Numbers, Localities, &c. Long, slender-branched form; XXVIII. Cargados Carajos, 31.8.05, B. 25, 32 fathoms; LXXXIV. Seychelles, 20.10.05, F. 4, 39 fathoms; CVIII. 2, Amirante, 9.10.05, E. 9, 24 fathoms; CXXIX. 4, Seychelles, 20.10.05, F. 2, 31 fathoms; CXXXIII. 5, CXXXIV. 2, Seychelles, F. 9, 37 fathoms; CXXXVIII. 2, Seychelles, 20.10.05, F. 3, 39 fathoms. Clathrous Form; LI. 1, Praslin Reef. Irregular Forms; LXXIII. 2, Amirante, 11.10.05, E. 14, 36 fathoms; XCVIII. 2, Amirante, 9.10.05, E. 3, 25 fathoms.

#### 54. *Clathria corallitincta* Dendy.

1 *Halichondria frondifera* Bowerbank [1875].

*Clathria corallitincta* Dendy [1889, 1916 A].

2 *Clathria frondifera* Ridley [1884 c].

*Clathria frondifera* Dendy [1905].

This species is represented in the collection by a number of typical, clathrous specimens. As in the Ceylon specimens the bases of the slender styli are sometimes minutely spined. These spicules vary very much in length. They seem to be characteristically devoid of tylote bases. I am not at all sure that the distinction between this species and *Clathria procera* can be maintained, and both may be merely varieties of *C. frondifera*.

Previously known Distribution. Gulf of Manaar, Ceylon, Okhamandal (Dendy).

Register Numbers, Localities, &c. VII. 1, S. de Malha, 6.9.05, C. 15, 55 fathoms; XI. 5, S. de Malha, 7.9.05, C. 19, 29 fathoms; XXI. 9, 12, Providence, 3.10.05, D. 1, 39 fathoms; CIV., Amirante, 13.10.05, E. 15, 35 fathoms.

#### 55. *Clathria spicata* (Hallmann).

(Plate 5, fig. 2; Plate 13, fig. 4 a—f.)

*Echinonema anchoratum* var. *lamellosa* Whitelegge [1901 A], not Lendenfeld [1888].

*Clathria spicata* Hallmann [1912].

There are in the collection three specimens from Cargados Carajos which agree well with the West Australian type of this species as described by Whitelegge and Hallmann. The largest and most perfect specimen (Plate 5, fig. 2) has been dried. It is erect, stipitate and flabellate. The stalk, about 9 mm. in diameter and 40 mm. in height, terminates below in an expanded base, and passes gradually above into the broad lamina. The latter soon subdivides irregularly into long, digitiform, more or less flattened branches, all lying in approximately the same plane. The surface of the sponge on both sides is rough and rugose, the larger ridges running longitudinally. In the dry specimen especially it has a coarsely porous appearance, perhaps due in part to inhalant canals and in part to

small, scattered vents, for no other vents can be seen. The total height of the dry specimen is about 300 mm. and the greatest breadth about 160 mm. The breadth of the separate branches varies much, averaging perhaps about 12 mm. The thickness of the lamina is about 6 mm. The colour, both dry and in spirit, is light brown, sometimes with a greyish appearance on the surface. The texture, both dry and in spirit, is compressible, resilient and tough.

The two spirit specimens are much smaller but essentially similar to the dry specimen in external characters.

The skeleton is of the usual *Clathria* type, a close, more or less irregular network of stout, brown, horny fibre, abundantly echinated by small acantho-subtylostyles, while the larger tylostyles commonly core and echinate the primary fibres very irregularly. The arrangement of the spicules in connection with the primary fibres is generally more or less plumose.

There is no well-developed dermal skeleton, but the superficial fibres of the main skeleton, both primary and secondary, are echinated by long, stout tylostyles whose apices project beyond the surface. There are also the usual long, straight, slender, dermal tylostyles, scattered tangentially or in tufts over the surface, and scattered to a much less extent in the deeper parts of the sponge, along with other megascleres.

*Megascleres*.—(1) Large, stout tylostyles (Plate 13, fig. 4 a); more or less curved; usually with well-developed, subglobular heads which are generally more or less roughened or covered with small spines; remainder of spicule usually quite smooth and tapering gradually to a sharp point; size variable, up to about 0.4 by 0.012 mm.

(2) Small acantho-subtylostyles (fig. 4 b); often slightly curved; with both base and shaft pretty uniformly covered with small, sharp spines; size about 0.08 by 0.0068 mm. This is the ordinary echinating spicule; it is connected by intermediate forms (fig. 4 c) with (1).

(3) Long, straight, slender, smooth tylostyles (fig. 4 d); with small, usually oval heads occasionally feebly spined at the base. Size very variable, up to about 0.37 by 0.004 mm.

*Microscleres*.—(1) Palmate isochelæ (fig. 4 e) of the usual *Clathria* type, about 0.014 mm. long.

(2) Very long, slender toxa (fig. 4 f), angulated in the middle but with the two arms extended almost in a straight line; about 0.24 mm. long. Very scarce.

This species is evidently very closely related to *Clathria whiteleggii* n. sp. The spiculation and skeleton arrangement agree very exactly but there is so much difference in external form that it seems desirable to keep them separate, at any rate for the present, and the external form also serves to separate it from *Clathria (Microciona) clathrata* Whitelegge [1907]. We have here a group of three species which certainly approach very nearly to the genus *Microciona*, as indicated more particularly by the tendency of the spicules to form plumose columns.

*Previously known Distribution.* Western Australia (Hallmann).

*Register Numbers, Localities, etc.* XLII. 4, XLV. 4, CXLIV., Cargados Carajos, 30 fathoms,

X 56. *Clathria whiteleggii* n. sp.

(Plate 7, fig. 1; Plate 13, fig. 5 a—f.)

There are several specimens of this species in the collection, all exhibiting a characteristic clathrous form, consisting, when fully developed, of vertically flattened lamellæ anastomosing with one another in an irregular, honeycomb-like fashion (Plate 7, fig. 1). The lamellæ are only about 2 mm. thick, while the diameter of the "cells" of the honeycomb averages perhaps about 7 mm., but is very variable. All the specimens appear to have been sessile and more extended in the horizontal than in the vertical plane. The largest measures about 108 mm. in maximum breadth by 53 mm. in maximum height. The surface of the lamellæ is slightly rough and hispid. Vents inconspicuous, not observed. Texture (in spirit) compressible, resilient, rather tough; colour light brown.

The main skeleton is an irregular to rectangular, close-meshed network of stout brown horny fibre. The primary lines are cored and echinated, in a somewhat plumose fashion, by the large, basally spined subtylostyli, which also form the surface hispidation. The secondary lines are typically neither cored nor echinated by these spicules, but both primary and secondary fibres are abundantly echinated by the small acantho-subtylostyles. The diameter of the primary fibres, exclusive of the echination, is about 0.6 and of the secondaries about 0.35 mm.

There is no well-defined dermal skeleton, but the hispidation is due to unusually large subtylostyli which seem to echinate the superficial portion of the network of horny fibres pretty indiscriminately. There are also, at any rate in places, numerous dermal and subdermal, long, slender tylostyli, scattered irregularly or in loose tufts.

*Megascleres*.—(1) Stout, slightly curved subtylostyli (Plate 13, fig. 5 a). The base is usually distinctly enlarged and covered with small spines, but may be smooth. The remainder of the spicule is almost or quite smooth (in the larger individuals) and tapers gradually to the sharply pointed apex, but in smaller individuals it is often very sparsely and minutely spined. These spicules measure up to about 0.46 by 0.02 mm. (near the head), but many smaller ones occur.

(2) Small acantho-subtylostyles (fig. 5 b), the ordinary echinating spicules; usually slightly curved; with feebly developed heads and gradually sharp-pointed apices; fairly uniformly and fairly thickly covered with small, sharp spines, which may be recurved on the shaft; size about 0.08 by 0.008 mm. Connected with (1) by intermediate forms (fig. 5 c).

(3) Long, straight, slender tylostyles (fig. 5 d); with feebly developed heads, often minutely spined at the base, and gradually and sharply pointed apices. Size variable, up to about 0.33 by 0.006 mm. The characteristic dermal spicule.

*Microscleres*.—(1) Minute, palmate isochelæ (fig. 5 e), of the usual *Clathria* type; about 0.012 mm. long.

(2) Very long and very slender toxa (fig. 5 f), angulated in the middle but with the two arms extended almost in a straight line; about 0.2 mm. long, sometimes in bundles.

This species is evidently very closely related to Whitelegge's *Microciona clathrata* [1907], differing in its non-stipitate, low-growing habit and in the measurement of certain



of the spicules. Hallmann [1912] has re-examined Whitelegge's species and shown that it is really a *Clathria*.

*Clathria whiteleggii* differs from the common Indian Ocean species, *C. procera* and *C. corallitincta*, in the usually well-developed and spiny heads of the stout megascleres and in the more uniform spination and slightly curved form of the small echinating spicules.

*Register Numbers, Locality, &c.* VIII. 1, xv., xci., Saya de Malha, 6.9.05, C. 15, 55 fathoms.

57. *Clathria madrepora* n. sp.

(Plate 5, fig. 3; Plate 14, fig. 1 a—d.)

Sponge (Plate 5, fig. 3) much ramified, Madrepora-like; presumably attached by a very narrow base; branches long, averaging about 8 mm. in diameter, diverging upwards at acute angles, with a tendency to lie in one plane and sometimes anastomosing with one another; with much corrugated and to some extent aculeated surface. The dermal membrane is fairly distinct and in places contains much sand. Vents not conspicuous. Texture compressible, resilient, fairly tough. Colour in spirit (after formalin) dark grey-brown. The largest piece measures about 180 mm. in total height and is made up of a large number of branches of very various lengths; a smaller piece in the same jar is probably part of the same specimen.

The main skeleton is a fairly close but very irregular network of dark brown horny fibre, very irregularly cored and echinated, in a more or less plumose fashion, by large, stout tylostyles, and with only a very few small acantho-subtylostyles.

The dermal skeleton consists of numerous slender tylostyles scattered in the dermal membrane. Both stout and slender tylostyles also occur abundantly scattered in the mesoglea in the interior of the sponge.

*Megascleres*:—(1) Large, stout tylostyles (Plate 14, fig. 1 a), with subglobular heads which are usually roughened or minutely spined. The remainder of the spicule is perfectly smooth, slightly curved, and tapers gradually from its junction with the head to the sharply pointed apex. These spicules ordinarily measure up to about 0.24 by 0.024 mm.; larger forms being met with only exceptionally. More slender forms of about the same length are possibly young (fig. 1 a').

(2) Acantho-subtylostyles (fig. 1 b); short, straight, gradually and sharply pointed at the apex; with numerous small spines on the slightly enlarged head, more sparsely spined elsewhere; spination altogether feeble. Size about 0.1 by 0.0068 mm. Very scarce.

(3) Straight, slender tylostyles (fig. 1 c) with small oval heads often minutely spined at the base; tapering very gradually to an often abruptly pointed apex. Size about 0.2 by 0.004 mm. The characteristic dermal spicule.

*Microscleres*:—Small, slender isochelæ (fig. 1 d), sometimes slightly contort, with palms and fimbriæ almost completely suppressed, so that they closely resemble sigmata. Measuring about 0.014 mm. from bend to bend. Abundant, both in the dermal membrane and in the interior of the sponge. I at first mistook these spicules for true sigmata, but the characteristic sharp angulation at the bends and the faint traces of palms and fimbriæ, reveal their true nature.

Very few species of *Clathria* are known to contain sigmata. In *C. spongodes*, however, they appear to be the only microscleres. The latter species is evidently very closely related to *C. madrepora*, but the sigmata are well rounded at the bends and readily distinguishable from the ordinary *Clathria* isochelæ, even in side view. Such facts as these suggest very forcibly that the chela is merely a modified sigma, a view which is supported by the occasional occurrence of contortion, like that of a contort sigma. This is well seen in the isochelæ of *Microciona acerato-obtusa*, as figured by Hentschel [1911 A]. The latter species also closely resembles *Clathria madrepora* in certain features of its spiculation, especially in the stout, basally spined tylostyles, and it is very difficult to see where the boundary line between *Clathria* and *Microciona* should be drawn.

*Register Number, Locality, &c.* cxxx., Seychelles, F. 9, 37 fathoms.

58. *Clathria spongodes* n. sp.

(Plate 6, fig. 1; Plate 14, fig. 2 a—d.)

Sponge (Plate 6, fig. 1), massive, lobose, irregular, sessile. Surface cauliflower-like, thickly covered with small, rough conuli, each about 2 mm. in height and 1 mm. in diameter, commonly grouped in bunches. Dermal membrane conspicuous only in places. Vents of moderate size, inconspicuous, scattered in the depressions between the bunches of conuli. The largest piece measures about 55 by 38 by 28 mm. A smaller piece has probably been detached from it. Texture firm, fairly rough, resilient; very sandy. Colour in spirit (after formalin) dark brown.

The skeleton is an irregular reticulation of stout, dark brown, horny fibre, abundantly echinated, in a more or less plumose fashion, by large, basally spined tylostyles and small acantho-subtylostyles. There is no special axial core of spicules and the fibres themselves appear to be pretty free from foreign matter, though there is a great deal of sand scattered in the mesoglea between them.

The dermal skeleton is not very well developed, but a large number of smooth, slender tylostyles occur scattered irregularly in the dermal membrane.

*Megascleres*:—(1) Large, stout tylostyli (Plate 14, fig. 2 a), with distinct subglobular heads usually thickly covered with small, sharp spines; the remainder of the spicule is perfectly smooth, usually slightly curved and tapering gradually from its abrupt junction with the head to the finely pointed apex. These spicules vary much in size, measuring up to about 0.47 by 0.02 mm.

(2) Small, straight acantho-subtylostyli (fig. 2 b); spined all over except near the apex; size about 0.094 by 0.008 mm.

(3) Straight, smooth, slender tylostyli (fig. 2 c), with small oval heads and finely and gradually pointed apices; size about 0.24 by 0.003 mm. The characteristic dermal spicule.

*Microscleres*:—Very slender sigmata (fig. 2 d); well rounded at the bends, may be slightly contort; measuring about 0.014 mm. from bend to bend.

*Register Number, Locality, &c.* lxxix. 2, Amirante, 11.10.05, E. 4, 36 fathoms.



59. *Clathria chelifera* (Hentschel).

(Plate 14, fig. 3 a—e.)

*Spanioplon cheliferrum* Hentschel [1911 A].

There are two specimens of this curious species in the collection. One of them (R.N. CVI. 6) consists of a massive, cavernous body, growing amongst calcareous debris and extending in the form of two slender, subcylindrical processes, which are enlarged and cavernous at the base. The maximum diameter of the main body is about 18 mm. The longer of the two processes, exclusive of its enlarged base, is about 41 mm. in length by 2 mm. in diameter. It is not tubular, but to some extent cavernous, and hispid on the surface. The enlarged basal portion measures about 14 by 8 mm. The other process has an enlarged basal portion of about the same size, but the slender cylindrical attachment measures only about 5 by 1.5 mm. The texture in spirit is soft, compressible and resilient, the colour pale greyish yellow. A few moderate-sized vents occur in the basal portions of the sponge.

The second specimen (R.N. CVIII. 3) consists of a few irregular, slender branches, occasionally anastomosing with one another and in two places enlarging to form an irregular, nodular mass, one of which has grown over the branches of a Polyzoon and bears two or three small vents.

The main skeleton is a loose, irregular reticulation of spicular fibre, containing a large amount of very pale coloured spongin. In the slender processes the main lines run lengthwise. The fibres are abundantly cored by styli and sparsely echinated by acanthostyles. The dermal skeleton consists of slender strongyla, mostly arranged in loose brushes.

*Megascleres*.—(1) Styli (Plate 14, fig. 3 a); rather slender, slightly curved, evenly rounded off at the base, rather abruptly pointed at the apex. Sometimes entirely smooth, always smooth for the greater part of the length, but frequently with a few minute spines at the base and sometimes also close to the apex. Size about 0.19 by 0.0068 mm.

(2) Acanthostyles (fig. 3 b); usually slightly curved, rather sparingly spined, except at the base. Spines of moderate size, on the shaft recurved, thorn-like. Apex gradually and sharply pointed; size about 0.12 by 0.0082 mm.

(3) Strongyla (fig. 3 c); straight or slightly crooked. Ends rather abruptly truncated, not enlarged, with a few small terminal spines. Size about 0.22 by 0.005 mm.

*Microscleres*.—Palmate isochelæ of two sizes. In the larger ones (fig. 3 d) the tips of the palms may be turned slightly outwards and sometimes appear slightly thickened in side view; the shaft is very slender; length about 0.024 mm. The smaller ones (fig. 3 e) are typical "naviculiform" *Clathria* isochelæ, about 0.01 mm. long. Both forms are numerous and intermediate sizes also occur.

The above account of the skeleton arrangement and spiculation is based upon R.N. CVI. 6. The spiculation of R.N. CVIII. 3 differs in no essential respect, but the development of spines on the principal styli and on the strongyla appears to be even less pronounced.

The "Sealark" specimens appear to differ from Hentschel's type in the not infrequent partial spination of the principal styli, and in the fact that the larger isochelæ are sometimes twice as long.

Hentschel, while referring this species doubtfully to the genus *Spanioplon*, remarks that it may be best regarded as a *Clathria* in which the dermal spicules have become converted into "amphistrongyla," a view with which I entirely agree. It differs from *Spanioplon* in the presence of microscleres and probably in other respects, and it seems best to refer it to the genus *Clathria* for the present, though it may be necessary to propose a new genus for it at some future time.

*Clathria australiensis* var. *spinulata* Hentschel [1911 A], in which the principal styli are also spined at the base and apex, serves to connect this species with the more typical *Clathrias*.

*Previously known Distribution*. West Australia (Hentschel).

*Register Numbers, Localities, &c.* CVI. 6, Amirante, 13.10.05, E. 16, 39 fathoms; CVIII. 3, Amirante, 9.10.05, E. 9, 34 fathoms.

Genus *ECHINOCLATHRIA* Carter [1885—6].

Sponge clathrous, typically a honeycombed mass of flattened, anastomosing trabeculae. Skeleton reticulate, composed of spongin fibres echinated by smooth styli and usually cored by either styli or strongyla. Palmate isochelæ may occur.

The only species of this genus in the collection is one of those that have been placed in Thiele's genus *Echinocalina* [1903 B], but I am unable to see any sufficient grounds for separating this supposed genus from *Echinoclathria*.

60. *Echinoclathria intermedia* Whitelegge.

(Plate 2, fig. 8.)

*Thalassodendron viminalis* Whitelegge [1901 A] *Echinoclathria intermedia* Whitelegge [1901 B].  
(not Lendenfeld [1888]). *Echinocalina intermedia* Hallmann [1912].

I identify with this little known species a single specimen (Plate 2, fig. 8) which differs from the type in two chief respects. In the first place, to judge from the descriptions given by Whitelegge and Hallmann, the trabeculae which form the clathrous, massive sponge seem to be less robust, and the entire specimen is more compact, with smaller interspaces, than I should gather is the case with the type. At its upper end the sponge is especially compact and terminates in a number of short, rounded proliferations. In the second place the slender coring and interstitial spicules seem to be all strongyla; I have not been able to find a single one that is not rounded off at both ends, while in the type they are usually hastately pointed at one end and rounded at the other, rarely truly strongylate. These spicules vary so much in other species, however, that I am not disposed to attach much importance to this difference. The smooth, stout, echinating styli are usually slightly narrowed at the base and subtylote, they measure about 0.11 by 0.007 mm. The strongyla measure about 0.2 by 0.003 mm., which also agrees fairly closely with Hallmann's measurements. There is a large amount of spongin in the skeleton fibres, whereas in the type the fibres are said to be comparatively poor in spongin. The specimen measures about 72 mm. in height by 35 mm. in maximum transverse diameter.

*Register Number, Locality, &c.* XXVII., Cargados Carajos, 30.8.05, E. 17, 20—25 fathoms.

Genus *RASPAILIA* (Nardo) Schmidt [1862].

Of elongated, slender, branching habit. Skeleton composed of a dense central axis of spicular fibre containing much spongin, from which bundles or tufts of spicules radiate to the surface. Typical megascleres, smooth styli and acanthostyles (echinating). No microscleres.

61. *Raspailia* sp.

A single very small specimen, which I am unable to identify specifically, represents this genus in the collection. It was found in association with *Plocamnia elegans*, to which it was probably attached, and consists of a short, cylindrical stalk dividing into two branches. The whole specimen measures only 15 mm. in height, and the diameter of stem and branches is about 1.5 mm. The colour in spirit is nearly white. The skeleton is arranged in a perfectly typical manner. A reticulation of stout horny fibre, cored chiefly by slender styli in longitudinal tracts, forms a skeletal axis from which short columns of stout styli, held together by spongin, radiate to the surface. Echinating acanthostyles occur in the axial part of the skeleton, but are scarce. The dermal brushes of straight, slender subtylostyles are very well developed.

*Megascleres*.—(1) Smooth, stout styli, evenly rounded off at the base, gradually sharp-pointed at the apex; size variable, up to about 0.45 by 0.016 mm. (? occasionally oxeote).

(2) Acanthostyles: sharply pointed, fairly strongly spined; measuring about 0.07 by 0.006 mm.

(3) Very long, straight, slender subtylostyli of the interior of the sponge (also sometimes projecting from the surface), measuring about 0.37 by 0.004 mm.

(4) Shorter, slender subtylostyli of the dermal brushes, measuring about 0.17 by 0.002 mm.

This form is evidently nearly related to the European *Raspailia hispida*.

*Register Number, Locality, &c.* LXXXIX. 3, Cargados Carajos, B. 29. 1.9.05, 45 fathoms.

Genus *ECTYON* Gray [1867 F].

Clathriæ in which the skeleton is a network of stout horny fibre, echinated, and sometimes cored, by more or less verticillately spined styli. No other spicules.

It appears to me that Gray's name *Ectyon* must replace the name *Agelas* by which this genus is generally known. Duchassaing and Michelotti's genus *Agelas* [1864] is really quite unrecognizable, while there can hardly be any mistake about Gray's, which was founded upon a very characteristic figure in Bowerbank's *Monograph of British Sponges*, Vol. 1. Pl. XVII, fig. 289.

This genus is very interesting on account of the suppression of all the spicules except the acanthostyles, and the very strong development of the horny fibre, indicating a possible origin for some of the pseudoceratose sponges.

62. *Ectyon ceylonica* (Dendy).

(Plate 6, fig. 2.)

*Agelas ceylonica* Dendy [1905].

The single specimen in the collection (Plate 6, fig. 2) consists of about half a dozen short, digitiform branches, rising up vertically side by side from a basal crust and subdividing to a slight extent, the subdivisions being incompletely separated from one another. The branches are subcylindrical and about 5 mm. in diameter. They terminate bluntly and their surfaces are thickly covered with small, sharp and blunt conuli. The total height of the specimen is about 27 mm., the greatest width just about the same. Vents are apparently represented by rounded apertures of varying size in the translucent dermal membrane stretched between the conuli. The colour in spirit is dark brown, but there were many other specimens in the same jar, so that this colour is possibly due to staining; the type specimen from Ceylon, however, was also brown. The texture is compressible and elastic.

The specimen agrees very closely with the type as regards skeleton arrangement and spiculation. I may add, however, that in addition to the characteristic verticillately spined styli there are a few smooth styli, connected with the former by intermediate forms, and the same is true of the type. The size of the spicules is very variable, up to about 0.32 by 0.024 mm. (at the base, inclusive of spines).

*Previously known Distribution.* Ceylon (Dendy).

*Register Number, Locality, &c.* LXXVIII. 15, Cargados Carajos, 23.3.05, B. 2, 30 fathoms.

Genus *ECHINODICTYUM* Ridley [1881].

Skeleton a network of spicular fibre, containing oxea and echinated by acanthostyles. Smooth styli may also occur. No microscleres.

The presence of apparently primitive oxea as the principal megascleres in this genus is somewhat remarkable; long, smooth styli may, however, also occur. One can only observe that oxea and styli appear in many sponges to be almost interchangeable and wait for further light upon its relationships.

63. *Echinodictyum clathratum* Dendy [1905].

There are half a dozen specimens of this sponge in the collection, most of which attain a much larger size than the original Ceylon type, measuring up to about 105 by 50 mm. They agree closely in appearance with Thiele's figure of *E. cavernosum* from Celebes [1899] and Hentschel's figure of *E. fruticosum* from S.W. Australia [1911 A], and I cannot help suspecting that all these forms, and also perhaps *C. asperum* Ridley and Dendy [1887] from Tahiti, may really belong to one and the same species. At present, however, *E. clathratum* may still be distinguished on account of its large styli, which have not yet been found in any of the others. Otherwise the spiculation agrees very closely with the accounts given by Thiele and Hentschel. The oxea range from about 0.2 by 0.008 to 0.3 by 0.012 mm.; more slender forms being probably young. The smooth slender styli usually measure only about 0.4 by 0.004 mm. and sometimes occur in surface brushes. The larger styli, which

occur scattered in the interior of the sponge, may measure as much as 1.7 by 0.012 mm. The acanthostyles are somewhat shorter than those of the type and more distinctly blunted at the apex. They measure about 0.09 by 0.008 mm. The spicular measurements were taken from R.N. XLV. 1.

There appear to be no microscleres in any of the specimens, so that there can be no reasonable doubt that those which I observed in the type were, as suspected at the time, foreign.

The colour of the "Sealark" specimens ranges from light brown to purplish black and is due to the presence of numerous pigment granules.

*Previously known Distribution.* Ceylon Seas (Dendy).

*Register Numbers, Localities, &c.* XLII. 2, XLV. 1, Cargados Carajos, 30 fathoms; LXVII. 1, LXVIII. 7, Diego Garcia, 10—12½ fathoms; CXX. 15, Salomon, 10—14 fathoms; CXLIX., Barachois, Diego, 12.7.05.

#### Section COLLOSCLEROPHOREÆ.

Ectyoninæ which, in addition to spicules of the usual chemical composition, possess colloscleres composed of gelatinous silica. Apparently derivatives of the genus *Clathria*.

I propose this section for the two genera *Collosclerophora* Dendy [1916 E] and *Colloclathria* n. gen. Although agreeing in the possession of the very remarkable colloscleres these two genera differ somewhat widely in other respects. *Colloclathria* is evidently a direct derivative of *Clathria*, but *Collosclerophora* is a sand sponge with greatly reduced spiculation. It is not improbable that the colloscleres may have arisen independently in the two genera by the loss of certain factors whose cooperation is necessary for the development of perfect spicules [cf. Dendy 1917], but it is convenient to keep the two together in one section for the present.

#### Genus COLLOCLATHRIA n. gen.

Sponge cylindrical, ramose (?always). Skeleton arrangement and spiculation as in *Clathria*, with the addition of colloscleres resembling grains of rice.

There can be no doubt about the close relationship of this genus to *Clathria*, from which it is distinguished only by the presence of the colloscleres. These remarkable gelatinous spicules have hitherto been found only in one other sponge—*Collosclerophora arenacea* [Dendy 1916 E], from Southern Australia, which has perhaps been derived from some such form as *Colloclathria* through the replacement of the greater part of the proper skeleton by sand.

X 64. *Colloclathria ramosa* n. sp.

(Plate 7, fig. 2; Plate 14, fig. 4 a—h.)

Sponge (Plate 7, fig. 2) probably prostrate or semi-prostrate; consisting of long, slender, subcylindrical processes, branching and anastomosing sparingly and in a very irregular fashion. The branches vary from about 2 to 4 mm. in diameter and the longest is about 140 mm. in length. They terminate bluntly and may be somewhat nodose. No main stem can be distinguished. Vents small and scattered, few in number. Surface rather uneven but nearly smooth, though very minutely hispid under a pocket-lens. Colour in spirit light brown. Texture compressible and resilient, tough.

The main skeleton is a rather irregular network of fairly stout horny fibre, cored and echinated by the megascleres in the usual *Clathria* fashion. The primary fibres are about 0.05 mm. in diameter; they run longitudinally in the interior of the sponge and curve outwards towards the surface, where they terminate in brushes of spicules. They are connected by secondary fibres little, if at all, more slender than themselves. The spicular coring and echination of the fibres is very irregular and numerous megascleres occur scattered in the mesogloea between.

The dermal skeleton is not strongly developed and consists of rather sparsely scattered brushes of megascleres. Some of these mark the terminations of the primary fibres and these contain stout styli as well as slender forms. Others, more numerous, and more or less independent of the main skeleton fibres, though perhaps really branching off from them, project from the surface between the extensive subdermal cavities; these consist of slender forms only.

*Megascleres*:—(1) Stout, smooth styli (Plate 14, fig. 4 a); slightly curved, broadly rounded at the base and tapering gradually to a finely pointed apex. Size about 0.3 by 0.019 mm., but variable. These occur chiefly as coring spicules in both primary and secondary fibres.

(2) Acantho-subtylostyles (fig. 4 b); very short, stout, straight, with abruptly and sharply pointed apex; abundantly covered with rather small, sharp spines, except at the apex and sometimes for some distance above the slightly enlarged base. Size about 0.07 by 0.008 mm. (exclusive of spines). These are the characteristic echinating spicules, developed chiefly, but not exclusively, on the primary fibres as the latter curve outwards to the surface. There are no forms intermediate between these and the large, stout, smooth styli (1).

(3) Long, straight, slender styli, subtylostyli or tylostyli (fig. 4 c); varying greatly in size up to about 0.4 by 0.0082 mm. Often minutely spined at the base. These spicules occur chiefly in the surface tufts (the smaller forms) but are also abundant as coring spicules in the primary fibres, and scattered in the mesogloea.

*Microscleres*:—(1) Small, palmate isochelæ (fig. 4 d), of the usual *Clathria* type, up to about 0.016 mm. long; may be abundant.

(2) Excessively minute forms (fig. 4 g), only about 0.004 mm. long; probably isochelæ, but only visible as a slender shaft with an enlargement at each end. Also numerous in some specimens.

(3) Slender toxa (fig. 4 h), varying greatly in form and size, as shown in the figures. Up to about 0.2 mm. long. Numerous in some specimens.

(4) Colloscleres (fig. 4 f) small, sausage- or kidney-shaped bodies, more or less constricted in the middle; of just about the same size and proportions as the palmate isochelæ, usually about 0.012 by 0.004 mm. Enormously abundant, scattered through the sponge like grains of rice. Forms intermediate in appearance between these and the ordinary isochelæ occur (fig. 4 e), so that it is difficult to believe that the two are not homologous. Indeed, until I found that the colloscleres swelled up on addition of water I had no doubts on this point and regarded them merely as palmate isochelæ with the space between shaft and palms filled in with silica.

The behaviour of these bodies on addition of water is identical with that observed in the colloscleres of *Collosclerophora arnacea*, except that while the swelling reaction was beautifully manifested on the addition of water to material in 70% alcohol it could not be observed when water was similarly added to material in absolute alcohol. It would appear, therefore, that in this case complete dehydration destroys the capacity for absorbing water, which is evidently not the case in *Collosclerophora*, in which the swelling took place after dehydration and preservation for more than twenty years in Canada balsam. Owing, doubtless, to their becoming swollen and disorganized, these bodies are entirely missing in spicule preparations boiled out in the usual manner in acid.

The above account of the spiculation is taken from R.N. CXXXVIII. 1, except that the experiments with the colloscleres were made upon R.N. CVIII. 1.

I have also been able to make some observations concerning the canal-system and histology in the case of CVIII. 1, which I have studied by means of paraffin sections and teased preparations stained with paracarmine. The extensive subdermal cavities are covered over by a thin dermal membrane, pierced, no doubt, by the inhalant pores, but these I have been able to detect only occasionally. The canal-system is more or less lacunar throughout. The flagellate chambers, which occur scattered throughout the whole of the mesoglaea beneath the subdermal cavities, are spherical, about 0.02 mm. in diameter, and eurypylous. The colloscleres are most abundant just beneath the subdermal cavities, where they are associated with dense masses of small, granular, spherical cells, about 0.008 mm. in diameter. These cells are probably the scleroblasts (silicoblasts), similar to those described by me in *Collosclerophora*, but much smaller in accordance with the smaller size of the colloscleres. I have not been able to make out the development of the colloscleres, nor have I found them lying in vesicles as in *Collosclerophora*.

Register Numbers, Localities, &c. LII. 4, Coetivy; CVIII. 1, Amirante, 9.10.05, E. 9, 34 fathoms; CXXXVIII. 1, Seychelles, 20.10.05, F. 3, 39 fathoms.

#### Section PLOCAMIEÆ.

Ectyoninæ in which the main skeleton is a reticulation of dumb-bell or sausage-shaped megascleres, usually more or less spiny.

I propose to group together in this section the genera *Plocamia* Schmidt [1870], *Damirin* Keller [1891], *Lithoplocamia* n. gen. and *Plocamiopsis* Topsent [1904 A].

#### Genus PLOCAMIA Schmidt [1870].

The characteristic megascleres are dumb-bell or sausage-shaped, usually more or less spiny (acanthostrongyla), in addition to which styli or tylostili of various forms also occur. Echinating acanthostyles may be present and sometimes slender tylota. Typical microscleres palmate isochelæ and sometimes toxa.

#### 65. *Plocamia coriacea* (Bowerbank).

*Isodictya coriacea* Bowerbank [1874].

*Plocamia coriacea* Hanitsch [1894].

*Dirrhopulum coriaceum* Ridley [1881].

*Plocamia ridleyi* Hentschel [1912].

This species is represented in the collection by a small, thin crust, attached to a large dry Lithistid (R.N. CXLVII, *Taprobane herdmanni*).

I have had the advantage of comparing the spiculation of an Irish specimen from the Dublin museum and have no doubt of the identification, though the megascleres in the "Sealark" specimen attain a considerably larger size. The spiculation is as follows:—

*Megascleres*:—(1) Large subtylostyli; curved; measuring up to 0.65 by 0.0164 mm.

(2) Slender tylostyli; with oval heads; measuring up to 0.43 by 0.0027 mm.

(3) Acanthostyli; up to 0.23 by 0.01 mm.

(4) Acanthostrongyla; about 0.12 by 0.012 mm., most richly spined at the extremities.

*Microscleres*:—(1) Palmate isochelæ; about 0.016 mm. long.

(2) Toxa: large and small, the large ones measuring up to 0.2 by 0.0027 mm. and spined at the extremities.

Ridley, in his account of the spiculation, does not mention the slender tylostyles, nor are they figured by Bowerbank, but they occur in the Dublin specimen and I have no doubt are characteristic of the species. Hentschel's *Plocamia ridleyi* is obviously a synonym of this species, which he seems to have overlooked.

*Previously known Distribution.* British Seas (Bowerbank); Aru Islands, Arafura Sea (Hentschel).

Register Number, Locality, &c. CXLVII. (4), Amirante, 11.10.05.

#### 66. *Plocamia elegans* (Ridley and Dendy).

*Plocamia coriacea* var. *elegans* Ridley and Dendy [1887].

*Plocamia coriacea* var. *elegans* Topsent [1892 c, 1904 A].

This pretty little sponge is represented in the collection by a large number of fragments. It must have resembled very closely the specimen of *Plocamia coriacea* var. *elegans* figured in the "Challenger" Report, but on a smaller scale, consisting of very slender and rather short, cylindrical branches, ramifying irregularly and occasionally anastomosing with one another. The diameter of the branches does not exceed 1.5 mm. It is curious how completely the specimen has been broken up in the dredge, for although there is a good deal of it altogether the largest fragment is only about 16 mm. in length. It is evidently very fragile. The surface is minutely hispid; the colour in spirit pale yellow.

The main skeleton is a close, sub-isodictyal reticulation of acanthostrongyla and acanthostyli, occupying about five-sixths of the total diameter of the sponge and surrounded by a comparatively thin zone penetrated by radially arranged spicules, which form the outer part of the skeleton and give rise to the hispidity of the surface. The radiating spicules comprise long, stout styli, arranged singly; very slender subtylostyli, which tend to arrange themselves in loose brushes which are frequently more or less flattened down against the surface, and acanthostyli, which may be said to echinate the outer surface of the main skeleton taken as a whole. In the main skeleton occasional longitudinal bands of spicular fibre occur, in which all the megascleres may figure. There is very little spongin.

*Megascleres*:—(1) Acanthostrongyla; moderately stout, slightly curved, abundantly covered all over with small, sharp spines; size about 0.07 by 0.005 mm., exclusive of spines.

(2) Acanthostyli; more or less curved, tapering gradually to a long, fine point: abundantly covered with small, sharp spines towards the base, but the spination becoming

more or less obsolete on the distal portion, until the apex is quite smooth. Size about 0.147 by 0.005 mm., but rather variable and perhaps usually a little less.

(3) Long, stout styli or subtylostyli; slightly curved towards the base, gradually and finely pointed at the apex; base often very minutely spined, otherwise quite smooth. Size about 0.45 by 0.0082 mm.

(4) Very slender subtylostyli; straight or nearly so, with feebly developed oval heads and very fine points. Size about 0.3 by 0.002 mm. Intermediate forms between 3 and 4 occur.

*Microscleres*.—(1) Slender, palmate isochelæ; Clathria-like; about 0.014 mm. long.

(2) Short, slender, strongly curved toxa; about 0.044 mm. long. Very scarce.

In spite of its fragmentary condition the material is well preserved, so that it is possible to make out a good deal as to the canal-system. There are extensive, shallow subdermal cavities and the canal-system as a whole is lacunar. Flagellate chambers occur throughout the entire thickness of the sponge beneath the subdermal cavities. They are spherical, eurypylous and about 0.028 mm. in diameter.

This specimen differs from the "Challenger" specimen chiefly in the extreme rarity of the toxa, which I could not for some time find at all. In view of its characteristic external form and wide distribution it seems desirable to raise the variety *elegans* to specific rank, especially as the typical *P. coriacea* seems to enjoy an equally wide distribution.

*Previously known Distribution*. Azores (Ridley and Dendy, Topsent).

*Register Number, Locality, &c.* LXXXIX. 2, Cargados Carajos, B. 29, 1.9.05, 45 fathoms.

X 67. *Plocamia massalis* n. sp. 2722ya  
(Plate 14, Fig. 5 a—c.)

The single specimen is a compact, massive sponge, with convex upper surface. The lower portion of the sponge has apparently been torn off from a broad attachment. The vents are rather numerous and irregularly scattered on the somewhat uneven upper surface. They measure up to about 3 mm. in diameter and sometimes have strongly projecting margins in the form of short cylindrical tubes; cylindrical exhalant canals, of the same diameter as the vents, penetrate far into the interior of the sponge. The texture of the sponge is firm, dense and incompressible; rather friable. It contains a good deal of sand, especially in the deeper portions. The colour in spirit is dark chocolate brown throughout\*, apparently due to the presence of an immense number of brown pigment granules, especially conspicuous in the dermal membrane, where they are grouped in rounded masses about 0.016 mm. in diameter. The specimen measures about 65 mm. in maximum breadth by 35 mm. in maximum thickness.

The main skeleton is a very dense, sub-isodictyal but irregular reticulation of more or less curved acanthostrongyla, occasionally with ill-defined spicular fibres composed largely of the characteristically dermal tylota.

The dermal skeleton consists of long and rather slender tylota, scattered tangentially in the dermal membrane.

\* All the other sponges in the same jar, and the label, were stained brown, but this specimen appears to have been the source of the pigment.

*Megascleres*.—(1) Acanthostrongyla (Plate 14, fig. 5 a); more or less curved; with the spines most abundantly developed towards the two ends and sometimes showing a tendency to be arranged in whorls; spines small and sharp, numerous. Very frequently one end shows a central point, which seems to represent the apex of the spicule rather than a mere spine and probably indicates that the spicule is really a modified acanthostyle. Size about 0.185 by 0.0082 mm., but rather variable.

(2) Tylota (fig. 5 b); with long, smooth, slightly curved shaft and small, subspherical or oval heads, usually minutely spined all over. Size about 0.37 by 0.008 mm.

*Microscleres*.—Palmate isochelæ (fig. 5 c); Clathria-like; with very slender, rather strongly curved shaft; length about 0.0164 mm. Very scarce but no doubt proper to the sponge.

This is not a very typical *Plocamia*. The usual echinating acanthostyles are not recognizable, unless they are represented by the unsymmetrically ended acanthostrongyla described above. Also, there are no dermal tylostyles or subtylostyles, such as often occur in the genus; though here I was at first misled by the presence of a thinly encrusting suberitid sponge, with tylostyles, which covers a large part of the surface.

*Register Number, Locality, &c.* CXXV. 2, Mauritius, 23.8.05, > 100 fathoms.

#### Genus LITHOPLOCAMIA n. gen.

The main skeleton is a dense, sub-isodictyal reticulation of acanthostrongyla, with which are associated smooth diactinal and monactinal spicules. There are no echinating spicules and no microscleres.

This genus is perhaps to be regarded as derived from *Plocamia* by loss of microscleres. The general arrangement of the skeleton resembles closely that of *Plocamia massalis*, in which also the echinating spicules have disappeared. It is also probably related to the genus *Damiria* of Keller [1891], in which the spicules are all tylota (or strongyla) with the ends alone spined.

#### 68. *Lithoplocamia lithistoides* n. sp.

(Plate 14, fig. 6.)

Sponge massive, encrusting; with uneven, more or less nodular surface, minutely rough and sometimes sparingly and very minutely hispid. Vents minute, inconspicuous.

Texture very hard, compact and incompressible. Colour in spirit pale greyish yellow\*.

The specimen which I regard as the type of the species (R.N. CXXXVII. 2) is hemispherical (or shortly columnar), with a broad, flat, slightly expanded base of attachment. The surface is broken up into small, irregular areas by a network of grooves, probably all covered over in life by a thin, transparent dermal membrane, portions of which remain. The height of the specimen is 16 mm., the maximum diameter of the base 20 mm. The second specimen (R.N. CXXXVII. 2) is a good deal larger and has the form of a nodulated crust, on which the surface grooves are scarcely at all developed. It measures about 35 mm. in maximum breadth and 10 mm. in average thickness.

\* R.N. CXXXVII. 2 has a purplish tint, but this is probably due to staining by another sponge in the same jar.

The main skeleton is a very dense, sub-isodictyal reticulation of acanthostrongyla.

These spicules make up very nearly the entire skeleton, but here and there ill-defined bands of smooth styli can be seen running towards the surface.

In R.N. CXXXVII. 2 I have been able to find no dermal skeleton, the dermal membrane, where still preserved, being practically without spicules. In R.N. CXXXVII. 2, however, the dermal membrane, which is more extensively present, contains numerous very slender, long, curved, smooth oxea, scattered or in very loose, radiate tufts, which sometimes seem to be associated with the ends of the bands of smooth styli. Similar slender oxea occur scattered in the deeper parts of the sponge.

*Spicules*:—(1) Acanthostrongyla (Plate 14, fig. 6); stout, short, slightly curved, with strong, sharp spines pretty evenly distributed all over. Size usually about 0.17 by 0.02 mm. (exclusive of spines).

(2) Stout, smooth styli or subtylostyli; slightly curved, sharply and fairly gradually pointed; size variable, commonly about 0.35 by 0.018 mm.

A few much longer, smooth spicules, especially styli, also occur, and in R.N. CXXXVII. 2, as already observed, slender oxea are abundant in the dermal membrane, where they measure about 0.4 by 0.004 mm. In R.N. CXXXVII. 2 oxea, at any rate of this type, are extremely rare, if present at all.

In R.N. CXXXVII. 2, however, a few extraordinarily elongated sigmata occur, of a type which I have never seen before, resembling long slender oxea with recurved ends. At present I regard these as foreign.

The two specimens described above ought, perhaps, to be regarded as at any rate varietally distinct. In addition to the differences already mentioned I find that the acanthostrongyla are decidedly more slender in R.N. CXXXVII. 2 than in the type, but the entire spiculation appears to be very variable in details and it is useless to multiply names until we know something of the range of this variation.

The sponge bears an extraordinary resemblance in general characters and in skeleton arrangement to a monorepid Lithistid. It is even conceivable that monorepid desmas may have originated from such acanthostyles, and the curious way in which ill-defined bands of smooth, slender megascleres run through the main skeleton is strongly suggestive of Lithistid affinities.

*Register Numbers, Localities, &c.* R.N. CXXXVII. 2, Mauritius, 23.8.05, 100 fathoms; R.N. CXXXVII. 2, Seychelles, 20.10.05, F. 4, 39 fathoms.

#### Section HYMEDESMIEÆ.

Ectyoninæ usually of thinly encrusting habit. The principal megascleres typically echinating the substratum. Chelæ when present tridentate (sometimes palmate?). Without well-differentiated symmetrical dermal megascleres.

As a matter of convenience I propose to associate together in this section a number of Ectyonine genera of somewhat doubtful affinities, which may or may not be nearly related to one another. Only three of these are represented in the "Sealark" collection, viz. Hymedesmia, Hymeraphia and Rhabdermia. Hymedesmia appears to be closely related to the Myxilleæ. Most of the others are evidently lipochealous.

#### Genus HYMEDESMIA Bowerbank [1864].

*Leptostia* Topsent [1892 n]; not *Hymedesmia* Carter [1880 n], Topsent [1900], Dendy [1905].

Sponge usually thinly encrusting. Main skeleton composed of usually spined monactinal megascleres, echinating the substratum or arranged in short, plumose columns. Dermal skeleton of bundles or fibres of spicules breaking up into loose brushes at the surface; dermal spicules slender monactinal or more or less symmetrical forms. Microscleres tridentate isochelæ (chelæ arcuatæ or isancoræ) to which sigmata may be added. The microscleres may be absent by reduction.

This extensive genus has been very carefully revised by Lundbeck [1910], who enumerates about 70 species, mostly described by himself. I agree with his conception of the genus in most respects, but I cannot recognize the necessity for separating the forms with so-called "isancoræ" from those with "chelæ arcuatæ," and therefore do not accept his genus *Hymenancora*, though it is to this comparatively small section that the only chela-bearing species of the genus in the "Sealark" collection belongs.

The occurrence of lipochealous forms in this genus is extremely interesting and forms a close parallel to the case of the epipolacid Stellettidæ\*. The loss of chelæ has taken place in several different species, probably independently, and cannot well be used here as a generic distinction. The "Sealark" collection affords a very beautiful instance of two very closely related species (*H. lavissima* and *H. lipochela*), one with chelæ and the other without.

Lundbeck includes the genus Hymedesmia in his Ectyoninæ, a group which corresponds pretty closely to my Clathriæ, but the strong tendency of the dermal megascleres in some species to become symmetrically ended indicates a close affinity with the Myxilleæ. In fact the genus appears to represent a transition between these two sections of the subfamily.

#### 69. *Hymedesmia lavissima* n. sp.

(Plate 15, fig. 1 a—c.)

Sponge thinly encrusting; where intact covered by a thin, translucent dermal membrane, containing numerous inhalant pores, sometimes at any rate grouped in irregular pore-sieves. Vents apparently rather small, scattered. Surface very minutely hispid. Texture very soft and yielding. The type specimen (R.N. CXXV. 6) covers a large area on an irregular mass of calcareous debris. It is of a dark chocolate brown colour in spirit, but as everything in the same jar, including the label, was stained of the same colour, it is very doubtful how far it is natural to this sponge†. I think, however, that it may be so to some extent, for the specimen contains innumerable brown granules which are probably pigment granules. A second specimen (R.N. CXXXVII. 5), from a different jar, has also a deep brown colour, though of a much redder tint, but this again may be due to staining by another sponge in the same jar.

\* Cf. Dendy [1916 a, p. 235; 1916 b, p. 41].

† The colour is probably due, chiefly at any rate, to a specimen of *Plocamia massalis* in the same jar (vide p. 78).

The main skeleton consists of smooth, stout subtylostyli, echinating the substratum and the foreign bodies in the interior of the sponge, and sometimes arranged in short, plumose columns. There are also loose wisps of slender tylostyli, mostly running towards the surface, where they break up into very loose brushes; a good many of these spicules are scattered tangentially in the dermal membrane and none of them seems to project very far beyond it.

*Megascleres*:—(1) Entirely smooth, stout subtylostyles (Plate 15, fig. 1 *a*); usually very slightly curved; usually with a feebly developed, subglobular head; very gradually sharp-pointed at the apex; size very variable, especially as regards length, up to about 0.66 by 0.02 mm.

(2) Smooth, slender tylostyles (figs. 1 *b*, 1 *b'*); straight; with fairly well developed, but often irregular, oval heads; apex various, commonly abruptly truncate with small central mucro. Size up to about 0.4 by 0.006 mm. The characteristic dermal spicule.

*Microscleres*:—Tridentate isochelæ (isancoræ) (fig. 1 *c*); with lateral teeth well separated from shaft; shaft stout, strongly curved, with lateral fimbriæ; length about 0.0287 mm. These spicules are very numerous and very uniform in size and shape.

In boiled out preparations a very few small, slender acanthostyles were observed. I have not been able to find them *in situ* and they are altogether so scarce that I am constrained to regard them as foreign. They are almost entirely absent in the type. Of course other foreign spicules also occur.

Of previously described sponges the species that comes nearest to this one appears to be Hentschel's *Hymenancora lundbecki* [1912]; but in that species the stout tylostyles are basally spined and sigmata are present in addition to the isochelæ. Hentschel describes the dermal spicules as tornostromyia, but his figure shows that they are really bluntly pointed tylostyles. As far as I am aware the entirely smooth character of the megascleres distinguishes *H. levissima* from all previously known species of Hymedesmia (including Hymenancora) and I was strongly tempted to propose a new genus based on this character. The intermediate condition of the stout tylostyles in *H. lundbecki*, however, finally decided me against such a course. *H. levistylus* Lundbeck [1910] is another species in which the acanthostyles are almost smooth.

*Register Numbers, Locality, &c.* CXXV. 6, CXXVII. 5, Mauritius, 23.8.05, 100 and > 100 fathoms.

70. *Hymedesmia lipochela* n. sp.

(Plate 6, fig. 3; Plate 15, fig. 2*a*—*b*.)

The sponge as a whole (Plate 6, fig. 3) is massive, proliferous, coarsely cauliflower-like in its mode of growth. It contains a great deal of coarse, calcareous sand, much of which appears on the surface, more or less covered over by the thin, translucent dermal membrane. Vents represented by a few rather small, scattered, circular openings in the dermal membrane. Inhalant pores scattered in the dermal membrane, sometimes in indistinct rounded areas. Colour in spirit brownish grey. The entire specimen measures 57 mm. in greatest breadth and 30 mm. in height in the middle. Its habit suggests an encrusting sponge modified by growing upon loose, coarse sand instead of upon a compact,

solid substratum, and thus affords a good illustration of Lundbeck's remark concerning the external form characteristic of the genus—"Sometimes, on account of the manner of growth, assuming a massive appearance, but also then in reality incrusting."

The main skeleton consists of stout, smooth subtylostyli, partly echinating the coarse sand-grains in the interior of the sponge and partly in short, plumose columns running towards the surface. The sand itself is arranged in more or less well defined but irregular tracts. Beneath the surface loose wisps of slender tylostyles run towards the dermal membrane, where they break up into very lax, irregular brushes, with single spicules scattered tangentially in the dermal membrane itself.

*Megascleres*:—(1) Stout, entirely smooth subtylostyles (Plate 15, fig. 2 *a*); sometimes quite straight, usually slightly curved; the base slightly enlarged to form a feebly developed, subglobular head; the apex sharply and very gradually pointed. Commonly measuring about 0.43 by 0.017 mm., but often shorter.

(2) Slender tylostyles (fig. 2 *b*); straight; with fairly well-developed oval heads; tapering very gradually to the apex, which is smoothly and more or less finely pointed; size about 0.37 by 0.0068 mm.

*Microscleres*:—Absent.

Except for the absence of the microscleres and the non-mucronate apices of the slender tylostyles this species agrees very closely in skeleton arrangement and spiculation with *H. levissima*, the only other species of the genus known in which all the megascleres are completely smooth. There can be no doubt that the two are very closely related and in all probability *H. lipochela* has been derived from some form practically identical with *H. levissima* by loss of the chelæ. Lundbeck enumerates several other species without chelæ but they are all forms with acanthostyles. Both as regards the smoothness of the megascleres and the loss of chelæ, as well as, to a less extent, in its massive habit, *H. lipochela* constitutes an extreme deviation from the typical condition of the genus and suggests a possible origin for some of the so-called Axinellid sponges. The tendency of the stout subtylostyli to arrange themselves in plumose columns, both in *H. lipochela* and *H. levissima*, is very suggestive in this connection.

*Register Number, Locality, &c.* XLIV. 3, Cargados Carajos, 31.8.05, B. 19, 28 fathoms.

Genus HYMERAPHIA Bowerbank [1864].

Sponge thinly encrusting. Skeleton composed of (1) very long styli or tylostyli arranged vertically and projecting beyond the surface, (2) comparatively short, variously spined acanthostyles arranged perpendicularly on the substratum, (3) smooth styli or oxea in wisps, variously arranged. No microscleres.

The only species of the genus identifiable in the "Sealark" collection is the curious British form described by Bowerbank as *Hymedesmia radiata*. This species formed the type of Gray's proposed genus *Epicles* [1867 F] but it seems really to be a Hymeraphia, as pointed out by Hanitsch [1894].



71. *Hymenaphia radiata* (Bowerbank).

*Hymedesmia radiata* Bowerbank [1866, 1874, 1882].  
*Myzilla radiata* Topsent [1892 c].  
*Hymenaphia radiata* Hanitsch [1894].  
*Epicles radiatus* Gmy [1867 f].

The material in the collection forms a very thin crust upon some flat fragments of molluscan shell (?). The colour in alcohol is grey. The surface is strongly hispid and the hispidation is of two kinds, (1) long, due to the large tylostyles, which project for a long distance beyond the surface but singly and at considerable intervals; (2) short, due to the projection of the radiate brushes of oxea which surround the large tylostyles.

The skeleton arrangement is highly characteristic. In the first place the substratum is echinated by close-set acanthotylostyles, which project from it more or less at right angles. In the second place the surface is hispidated by the strongly developed, radiate brushes of large oxea, well separated from one another and each typically with a single huge tylostyle projecting outwards from its centre.

*Spicules*:—(1) Acanthotylostyles; straight, with rather well-developed spherical heads and abruptly sharp-pointed apices; thickly covered, almost up to the extreme apex, with moderate-sized, sharp, thorn-like spines, those on the shaft curved towards the head and those on the head curved towards the shaft. Size very variable, up to about 0.33 by 0.017 mm. (exclusive of spines).

(2) Smooth tylostyles; very long, nearly straight; base enlarged to form a well-marked spherical head; apex rounded off very bluntly. These spicules are very apt to be broken off short, but I have measured them (entire) up to 2.75 mm. in length, with a shaft-thickness of 0.046 mm.

(3) Oxea: smooth; straight or nearly so; with both ends fairly gradually and sharply pointed; one end perhaps a little thicker than the other, but not conspicuously asymmetrical. Size about 0.83 by 0.017 mm.

This sponge differs from the British form described by Bowerbank only in slight details as to the shape and possibly as to the size of the spicules. Thus the large styli or subtylostyli of the British form are represented here by tylostyles with well-developed heads. The blunting of their apices is also perhaps a distinguishing feature. Again, the spines on the acanthotylostyles appear to be much more strongly developed in the Indian Ocean form. The arrangement of the skeleton is probably identical in the two cases, although very imperfectly described by Bowerbank, who worked on dry material in which the projecting character of the large styli was apparently no longer recognizable. There is no sufficient reason for separating the Indian Ocean form specifically from the British one.

I am very doubtful, however, whether the sponge referred to by Topsent [1892 c] as *Myzilla radiata*, and identified by him with Bowerbank's species, really belongs to this species at all.

*Previously known Distribution*. British Seas (Bowerbank). ? North Atlantic (Topsent).

*Register Number, Locality, &c.* XIII. 2, Saya de Malha, 4.9.05, C. 3, 123 fathoms.

## Genus RHABDEREMIA Topsent [1892 c].

Encrusting or massive Ectyoninae in which the principal megascleres are styli with strongly bent base, shaped like a hockey-stick, and the principal microscleres are contorted sigmata. There are no chelae and the echinating spicules are greatly reduced or absent.

72. *Rhabderemia pusilla* (Carter).

*Microciona pusilla* Carter [1876].  
*Microciona minutula* Carter [1876, Description of Pl. xvi].  
*Microciona pusilla* Topsent [1889].  
*Rhabderemia pusilla* Topsent [1892 c].

This species is represented in the collection by a small fragment found attached to a specimen of *Spongosorites salomonensis* (R.N. cxvi.), in the form of a shred of membrane containing the characteristic spicules of the species. Carter's original description leaves much to be desired and his type specimen is unfortunately not to be found in his cabinet of microscopic preparations. Topsent, although he has re-described and figured the spiculation, gives no measurements. It seems desirable, therefore, to give particulars as to the spiculation of the "Sealark" specimen. All the spicules agree very closely with Topsent's figure.

*Megascleres*:—(1) Styli ("Rhabdostyles" of Topsent); smooth (or very nearly so), stout, perfectly straight except at the base, which is very abruptly bent to one side in a spiral of about half a turn; stoutest at the commencement of the spiral, which preserves an almost uniform thickness to the rounded basal end; tapering gradually from the commencement of the spiral to the sharply pointed apex. Size rather variable, say about 0.2 by 0.011 mm., and thus agreeing well enough with Carter's figure, though not with his measurement.

(2) Long, slender styli or subtylostyli; straight or nearly so, perhaps very slightly roughened; measuring about 0.164 by 0.0013 mm.

*Microscleres*:—Strongly and irregularly contorted sigmata; rather slender; measuring up to about 0.0164 mm. in greatest length in a straight line from bend to bend.

A number of large sigmata, showing serration and probably belonging to a species of *Paresperella*, also occur in the preparation, together with a number of short, stout oxea. All these I regard as foreign bodies.

*Previously known Distribution*. Tropical Seas? (Carter); Campeachy Bank, Gulf of Mexico (Topsent).

*Register Number, Locality, &c.* cxvi. A, Salomon B, 3.7.05, 60—120 fathoms.

## Section MYXILLÆ.

Ectyoninae in which the megascleres are more or less sharply differentiated into two categories—deep and dermal. The deep megascleres form the main skeleton and are usually monactinal. The dermal megascleres, which need not be confined to the surface, are typically symmetrical or subsymmetrical. The typical microscleres are tridentate (or polydentate) isochelae.

It appears to me that the group Myxillæ as accepted by Lundbeck [1905], for example, is far too comprehensive.

The presence of more or less symmetrically ended dermal megascleres alone cannot form a sufficient justification for forming such a heterogeneous assemblage, as such spicules may very well have arisen over and over again in the course of phylogeny. If, however, we associate with this character the presence of tridentate (or polydentate) isochelæ and exclude from the group those genera in which either of these characters is wanting (except of course secondarily), we are left with a compact and fairly homogeneous section of the Ectyoninae.

Genus *PLUMOHALICHONDRIA* Carter [1876].

Main skeleton composed of plumose columns of acanthostyles, which may form a reticulation, with or without spongin. More or less symmetrically ended megascleres are present, most typically in the axis of the skeleton columns, sometimes also in surface brushes or scattered. Typical microscleres tridentate isochelæ.

This genus is evidently very closely related to *Myxilla*, differing only in the arrangement of the megascleres in plumose columns or fibres cored by the smooth symmetrical or subsymmetrical forms.

The type species of the genus is Carter's *P. microcionides* [1876], which, as Thiele [1903 A] has shown, is almost certainly identical with Schmidt's *Desmacidon neptuni*. Hallmann [1912] has suggested that the microscleres of *P. microcionides* may be really "ancoræ," while those of Lendenfeld's genus *Clathris* are "chelæ arcuatæ," and that on this ground these two genera may be kept distinct. It appears to me that we have here an illustration of the difficulty which is likely to result from the attempt made by some recent authors to draw a sharp line of distinction between these two types of spicule. I have never been able to satisfy myself as to the validity of this distinction; it appears to be mainly a question of the extent to which the lateral tooth is cut away from the shaft. I find from examination of Mr Carter's type slide that there are two kinds of chelæ in *P. microcionides*, large and small. In both the lateral teeth are well cut away, which would certainly seem to bring them within the category of "ancoræ."

*P. microcionides* is a deep sea form and its spiculation, as might be expected, has peculiarities, but at present I can see no reason why a separate genus should be made for the shallow water species.

73. *Plumohalichondria clathroides* n. sp.

(Plate 4, fig. 2; Plate 15, fig. 3 a—d.)

There are three specimens of this sponge in the collection. The largest (R.N. CLII.), which must be regarded as the type of the species, has been dried (Plate 4, fig. 2). It is stipitate and flabellate, both stem and lamina being made up of a great number of anastomosing trabeculae which for the most part run longitudinally and project on the surface as prominent ridges. The entire sponge is flattened in one plane, and the lamina has an almost circular outline. The total height of the sponge is about 280 mm.; the maximum breadth about 220 mm.; the average thickness of the lamina about 15 mm. The stem is short, thick and irregular, and has several points of attachment below. Vents and pores not recognizable. Colour rather dark brown; texture tough and fibrous.

A second specimen (R.N. XLII. 14) is also lamino-clathrous but not nearly so much in one plane, while the margins tend to run out into short branches. Colour in spirit pale greyish yellow; texture compressible, resilient, very tough.

A third specimen (R.N. XLI) encrusts extensively the branches of a red Alcyonarian, but is beginning to grow out into a lamino-clathrous structure in one place.

The main skeleton is an irregular network of stout horny fibre, abundantly echinated by acanthostyles and typically cored by the smooth, subsymmetrical megascleres. The extent to which the coring spicules are developed, however, varies greatly, so that while they are very numerous in some places they may be entirely absent in others in the same specimen. The fibres may be as much as 0.26 mm. thick: they often pursue a sinuous course and often have the plumose appearance characteristic of the genus.

There is no well-defined dermal skeleton but numerous spicules, chiefly tornota, occur scattered in the dermal membrane.

R.N. XLII. 14 contains a considerable quantity of sand, which shows a tendency to be arranged in more or less definite tracts.

*Megascleres*:—(1) Tornota (Plate 14, fig. 3 a); smooth, slender, straight or slightly crooked; ends typically hastate; usually (? always) slightly unequal, with one a little swollen; one or both may be slightly mucronate; size about 0.176 by 0.004 mm.

(2) Acanthostyles (fig. 3 b); straight or nearly so; fairly strongly and uniformly spined except for the apical portion, which is smooth and drawn out to a fine point; size variable, up to about 0.16 by 0.008 mm.

*Microscleres*:—Tridentate isochelæ (chelæ arcuatæ) of the usual *Myxilla* type (fig. 3 c); with stout, strongly curved shaft and short teeth; about 0.025 mm. in total length. Numerous smaller and especially more slender isochelæ also occur (fig. 3 d). These are of exactly the same type as the larger ones and should perhaps be regarded merely as very feebly developed examples.

The robust, clathrous external form and the very strong development of spongin may perhaps be regarded as distinguishing features of this species. Except for the presence of the microscleres it closely resembles *Clathria indica*, a common Ceylon species [Dendy 1889, 1905] which should probably be referred to the genus *Plumohalichondria*, rather than *Clathria*, as a lipochelous form.

*Register Numbers, Localities, &c.* XLII, XLII. 14, Cargados Carajos, 30.8.05, 30 fathoms; CLII., Seychelles.

74. *Plumohalichondria gardineri* n. sp.

(Plate 2, fig. 9; Plate 15, fig. 4 a—d.)

The single specimen in the collection (Plate 2, fig. 9) has the form of a thick, erect, sessile lamella, which appears to have grown vertically upwards from a narrow, elongated base, which has been discontinuously attached to the substratum. The margin of the sponge is comparatively thin and crest-like, but well rounded off, while the middle of the lamella is very much thicker, owing chiefly to a large swelling on one side, which may indicate a tendency to proliferation. The entire lamella has a somewhat undulating character, especially obvious along the margin. The surface is nearly smooth, but uneven and granular. The vents are minute and inconspicuous; a few occur in small, irregular groups

along the margin. The inhalant pores are apparently in sieve-membranes covering over the small subdermal cavities, which are thickly scattered over both surfaces of the lamella. The texture is compact and solid, only slightly compressible. Colour in spirit, dull yellowish grey. The maximum breadth of the specimen is 62 mm.; maximum height about 42 mm.; maximum thickness about 24 mm.; thickness at a distance of 5 mm. from the margin about 8 mm.

The main skeleton consists of stout, close-set, plumose columns of large and small acanthostyles, with their bases imbedded in spongin. These columns run approximately at right angles to the surface, branching as they go. They are occasionally connected by short, transverse anastomoses which are echinated, chiefly on the outer side, by acanthostyles, so that nearly all the acanthostyles point outwards. There appear to be no spicules lying in the axes of the columns, but a considerable number of long, slender, smooth styli and oxea are found lying parallel to the spicular columns in the intervening mesogloea.

There is a special dermal skeleton composed of radiate tufts of long, slender oxea, projecting beyond the surface for the greater part of their length.

*Spicules*.—(1) Large acanthostyles (Plate 15, fig. 4 a); stout, curved near the base like a hockey-stick, tapering gradually to the sharply pointed apex. Base usually slightly tylote. Spines stout, recurved, confined to the distal portion of the spicule, where they are abundant and extend from the apex for  $\frac{1}{3}$  to  $\frac{1}{2}$  of the total length. Occasionally a very few small spines occur at the base. These spicules measure about 0.29 mm. in length, with a maximum diameter of about 0.016 mm. They are by far the most abundant and most characteristic spicules in the sponge.

(2) Small acanthostyles (fig. 4 b); similar in shape to the large ones, but usually measuring only about 0.1 by 0.006 mm., and with the spines less rigidly confined to the distal portion. Intermediate forms of course occur, but they are not very numerous.

(3) Very long, slender, smooth styli (fig. 4 c); slightly curved; measuring about 1.0 by 0.012 mm. Scarce.

(4) Long, slender, smooth oxea (fig. 4 d); slightly curved; usually gradually and finely pointed at one end and blunt or tornote at the other, but sometimes gradually and finely pointed at both ends. Size about 0.45 by 0.007 mm.

There are no microscleres.

This species appears to be a lipocheulous Plumohalichondria and might therefore be mistaken for an Echinodictyum; the plumose skeleton, however, and the apparently secondarily symmetrical character of the "oxea" indicate that its true affinities are with Plumohalichondria. The same remarks apply to my *Echinodictyum gorgonioides* from Okhamandal [1916 A], which should be known as *Plumohalichondria gorgonioides*.

*Register Number, Locality, &c.* CIII. 1, Amirante, 18.10.05, E. 25, 44—20 fathoms.

#### Genus MYXILLA Schmidt [1862].

The spicules of the main skeleton are acanthostyles, some of which may be echinating. The skeleton fibres are not cored by the smooth, more or less symmetrical, dermal spicules. The characteristic microscleres are tridentate isochelae.

#### 75. *Myxilla incrustans* (Johnston).

- |  |  |
|--|--|
| <i>Halichondria incrustans</i> Johnston [1842] ( <i>fid.</i> Bowerbank). | <i>Demucidon incrustans</i> Vosmaer [1880].<br>Not <i>Halichondria incrustans</i> Carter [1884 f].                 |
| <i>Halichondria saburrata</i> Johnston [1842] ( <i>fid.</i> Bowerbank).  | <i>Dendoryx incrustans</i> Topsent [1888 n, e].<br><i>Dendoryx incrustans</i> var. <i>typica</i> Topsent [1888 e]. |
| <i>Halichondria incrustans</i> Bowerbank [1866, 1874].                   | <i>Dendoryx incrustans</i> var. <i>viscosa</i> Topsent [1888 e, 1892 c].   |
| <i>Halichondria incrustans</i> Schmidt [1866].                           | <i>Myxilla incrustans</i> Levison [1893].  |
| <i>Dendoryx incrustans</i> Gray [1867 f].                                | <i>Dendoryx incrustans</i> var. <i>australis</i> Topsent [1901].<br><i>Myxilla incrustans</i> Topsent [1913].      |

(For other possible synonyms *vide* Johnston [1842] and Topsent [1901].)

This widely distributed and very variable species is represented by a considerable amount of material which forms a very extensive but thin crust spreading over an agglomeration of lamellibranch shells and other objects from Praslin Reef. There is a thin, glabrous dermal membrane, through which numerous small, rounded, subdermal cavities can be seen, the roofs of which form pore-sieves, but there are no raised pore-areas. Vents? Colour in spirit pale, greyish yellow. Texture soft and compressible.

The skeleton arrangement and spiculation do not seem to differ in any important respect from those of the typical European form except that the isochelae seem to be all much smaller than that figured by Bowerbank. It will be desirable, however, to describe the spiculation in detail.

*Megascleres*.—(1) Acanthostyles; most abundantly spined at the base, smooth at the apex, which is gradually and sharply pointed. Straight or very slightly curved. Size about 0.16 by 0.008 mm. These spicules are partly arranged in a sub-isodictyal network with plurispicular meshes, partly in long, loose, plurispicular primary lines; but the whole skeleton is very irregular.

(2) Straight, slender strongyla or tornota, either rounded at the ends or simply mucronate, size about 0.16 by 0.003 mm. The characteristic dermal spicule.

*Microscleres*.—(1) Tridentate isochelae (isancorae), varying up to about 0.02 mm. in length; scarce.

(2) Slender sigmata; simple and contort; varying greatly in size, up to about 0.032 mm. from bend to bend; very numerous.

The unimucronate terminations of the dermal spicules would place this form in Topsent's var. *typica*, which appears to be the form described by Johnston and Bowerbank, but the species is evidently a very variable one and requires careful comparative investigation of forms from different parts of the world.

*Previously known Distribution.* North Atlantic, European Seas (Johnston, Bowerbank, Topsent, &c.); Antarctic (var. *australis*, Topsent).

*Register Number, Locality.* XLVI., Praslin Reef.

#### 76. *Myxilla arenaria* Dendy [1905, 1916 A].

There is a single specimen of this sponge in the collection. It is remarkable in that the sand, with which it is densely charged, is entirely or almost entirely calcareous, so that the entire sponge has an opaque white appearance. As the sand disappears on treatment

ment with acid it is easy to get clean spicule preparations; otherwise it would not be easy to find the echinating acanthostyles, which are very rare and were entirely overlooked at first. The spiculation agrees very closely with that of the Ceylon type.

*Previously known Distribution.* Gulf of Manaar, Ceylon Seas, Okhamandal (Dendy).

*Register Number, Locality, &c.* XLIV. 4, Cargados Carnjos, 31.8.05, B. 19, 28 fathoms.

#### Genus HAMIGERA Gray [1867 F].

The main skeleton is composed of smooth monactinal megascleres. Typical microscleres tridentate isochelæ.

The genus was proposed by Gray for Schmidt's *Cribrella hamigera*, the name *Cribrella* being preoccupied. Schmidt's description of the species is not very satisfactory and leaves one in some doubt about the character and arrangement of the symmetrically ended (dermal) megascleres, but it is extremely unlikely that the species differed in this respect from *Myxilla*. Schmidt also does not say that the megascleres are smooth, but the presumption is that he would have mentioned it had they been otherwise, and Vosmaer [1880] accepts them as such. If these views be accepted it is quite clear that Topsent's genus *Lissodendoryx* [1892 c] must be suppressed in favour of *Hamigera*.

It may well be doubted whether *Hamigera* ought to be separated from *Myxilla*, for all gradations between smooth and spined styli occur in these sponges, as Lundbeck [1905] has pointed out, but I think it will facilitate the arrangement of the species if we keep them distinct for the present.

As to Lundbeck's contention (*loc. cit.*) that *Lissodendoryx* can be distinguished from *Myxilla* by the fact that its cheke are "cheke arcuatae," while those of *Myxilla* are "ancorre," I need add nothing to what I have already said on this subject.

#### 77. *Hamigera papillata* n. sp.

(Plate 15, fig. 5 a—c.)

Sponge massive, compact, cushion-shaped, sessile, attached to a *Stelletta*\*, which it almost concealed. Upper surface rather thickly covered with low, rounded, flattened papillæ, up to about 1.5 mm. in diameter, irregularly scattered. These are raised pore-areas; they are frequently blocked by an accumulation of sand-grains. Vents rather small, scattered, not prominent. The single specimen measures about 44 mm. in transverse diameter and 30 mm. in thickness. The lower surface contains much coarse sand. The texture is soft and compressible, not very resilient. Colour in spirit greenish grey.

The main skeleton is a very irregular reticulation of very lax, ill-defined spicular fibre and single spicules, the fibres running towards the surface. In the deeper parts of the sponge the spicules are smooth styli, which give place to loose wisps of tylota towards the surface.

The dermal skeleton consists of tylota, scattered tangentially in the dermal membrane between the pore-areas, but arranged in radial tufts both in and around the pore-areas themselves, in such a manner that these areas are subdivided by the tufts into smaller areas in which the pores lie.

\* R.N. XIX. 5, a hitherto undescribed species which escaped observation when I was dealing with the other "Sealark" *Stellettid*s.

*Megascleres*.—(1) Smooth tylostyli (Plate 15, fig. 5 a); moderately stout; usually slightly curved towards the base and with fairly well developed, oval heads; rather abruptly sharp-pointed at the apex. Size about 0.35 by 0.01 mm.

(2) Slender tylota (fig. 5 b); straight or nearly so; with fully developed oval heads; entirely smooth; size about 0.3 by 0.005 mm.

*Microscleres*.—Tridentate isochelæ (cheke arcuatae) (fig. 5 c), with stout, strongly curved shaft. Length about 0.023 mm.

This species would undoubtedly fall into Topsent's genus *Lissodendoryx*, both as originally defined by that author and as understood by Lundbeck [1905]; that is to say, it possesses perfectly smooth styli and "cheke arcuatae." It is distinguished from some species of that genus by the presence of raised pore-areas and the absence of sigmata, but in both these characters it agrees with Schmidt's *Cribrella hamigera*, the type of the genus *Hamigera*.

*Register Number, Locality, &c.* XIX. 1, Providence, 4.10.05, D. 4, 50—78 fathoms.

#### Genus FORCEPIA Carter [1874].

*Myxillæ* in which the typical megascleres are smooth styli and tylota. Microscleres tridentate isochelæ and forcipes, to which sigmata may be added.

The presence of the essentially dermal tylota and the tridentate isochelæ suggests that this genus should be placed near *Myxilla*. It is evidently very closely related to Topsent's *Leptolabis* [1904 A], which still retains acanthostyles, and it is extremely interesting to notice that Lundbeck [1905, p. 208] has actually found acanthostyles in the embryo of *Forcepia thalei*, though there appear to be none in the adult, which seems to indicate quite clearly the Ectyonine origin of the genus.

#### 78. *Forcepia stephensi* n. sp.

(Plate 15, fig. 6 a—e.)

The sponge forms a very thin crust growing amongst other organisms on the surface of a fistula of *Phleodictyon*. Its boundaries are indistinguishable by the naked eye but apparently it extends over a considerable area. The colour in spirit is light yellowish grey.

The skeleton consists of loose fibres and wisps of megascleres, some running towards the surface, where they spread out into ill-defined surface brushes, and some parallel with it, the whole very lax and irregular, with numerous spicules scattered between the wisps and fibres.

*Megascleres*.—(1) Tylostyli (Plate 15, fig. 6 a); straight, very slender, usually bluntly pointed at the apex and with feebly developed oval heads; with much eroded axial canals; size about 0.2 by 0.002 mm. These spicules appear to be almost vestigial; they occur scattered and in loose fibres or wisps.

(2) Tylota (fig. 6 b); equal-ended, with long and rather slender shaft and well-developed heads broadly rounded at the ends; entirely smooth; size about 0.28 by 0.004 mm. These spicules are more numerous and better developed than the tylostyles; they occur chiefly in loose fibres or wisps, also scattered in the dermal membrane and elsewhere.

*Microscleres*:—(1) Tridentate isochelæ (chele arcuatæ) (fig. 6 c) of peculiar form. The whole spicule is very short; the shaft is very broad and strongly curved, expanding at the two ends, which are semicircular in outline and bear each three very short teeth. Total length about 0.015 mm.; breadth at the two ends 0.01 mm.; breadth of shaft in middle 0.007 mm. These spicules closely resemble those of *Forcepia crassanchorata* as figured by Carter but the teeth seem to be rather shorter and the shaft perhaps rather broader.

(2) Signata (fig. 6 d); small, slender, perhaps always more or less contort but sometimes only very slightly so; of quite ordinary form; measuring about 0.014 mm. from bend to bend.

(3) Forceipes (fig. 6 e); very slender, hairpin-like, with the two arms closely approximated towards the point of junction and more widely divergent towards the extremities; very slightly roughened, ends sharply pointed; length of the arms about 0.057 mm. These spicules are extremely abundant but the two arms are usually broken apart at the very sharp bend so that they look like simple trichites or raphides. I have already [1896] recorded a similar phenomenon in the case of the forceipes of my *Forcepia carteri* from near Port Phillip Heads.

This species is evidently very nearly related to Carter's *Forcepia crassanchorata* [1895] from southern Australia. The latter, however, is a large, massive sponge and there are probably well-marked differences in spiculation. Thus it is extremely doubtful whether *Forcepia crassanchorata* contains signata, while it is almost certain that it possesses a second form of isochela.

I have much pleasure in naming this species after the well-known Dublin spongologist Miss Jane Stephens, in recognition of her excellent work.

*Register Number, Locality, &c.* LXXXII. A, Cargados Carajos, 3.8.05, B. 19, 23 fathoms.

#### 79. *Forcepia* (?) sp.

In a boiled out spicule-preparation of *Cinachyra providentia* n.sp. occur two very fine forceps-spicules closely resembling those of *Forcepia fabricans* and *F. topsentii* as figured by Lundbeck [1905]. The arms are stout, covered with recurved spines, and terminate in well-developed hemispherical discs. The bend of the spicule is well rounded and the arms do not diverge very widely. The larger of the two spicules measures 0.06 mm. in length of arm and 0.008 mm. in thickness at the bend; the diameter of the terminal discs, which appear to have slightly toothed margins, is about 0.009 mm.

*Register Number, Locality, &c.* XXI. 1 A, Providence, 3.10.05, D. 1, 39 fathoms.

#### Section CRELLEE.

Ectyonine which are characterized chiefly by a more or less dense skeleton of tangentially placed acanthostyles or acanthoxea. Smooth, symmetrically or asymmetrically ended megascleres are commonly present in the choanosome. Tridentate isochelæ may be present.

I include in this section the genera Pytheas Topsent [1890], Yvesia Topsent [1890], Crella Gray [1867 F], Crellina Hentschel [1914] and Pseudoclathria Dendy [1897], which seem to form a fairly natural group closely related to the Myxilleæ. Most of them are

lipochealous but tridentate isochelæ are present in Pytheas and Yvesia. The invasion of the dermal membrane by acanthostyli and acanthoxea, apparently derived from echinating acanthostyles, is very remarkable. Typical echinating acanthostyles remain in Pytheas and Crellina, and in some species (of Yvesia at any rate) the transition from acanthostyli to acanthoxea is clearly seen. I cannot, therefore, agree with Topsent [1892 c] and Lundbeck [1910] in placing such genera amongst the Esperellinae (Myxalinae).

The smooth megascleres of typical Crellinae, which may be either symmetrically or asymmetrically ended, seem to be homologous in some cases with the dermal spicules of the Myxilleæ, though they are now found chiefly in the interior of the sponge.

The occurrence of circular raised pore-areas in some species of Crellinae also suggests affinity with the Myxilleæ, in which such structures frequently occur.

#### Genus YVESIA Topsent [1890].

With a well-developed dermal skeleton composed of tangentially placed acanthostyli or acanthoxea. The characteristic choanosomal spicule is a smooth, slender, stylote or oxeote form. Tridentate isochelæ are present.

This genus was established by Topsent with Bowerbank's *Halichondria albula* [1866, 1874] as the type species. In that species the dermal spicules are acanthostyli, but, according to Bowerbank's figure, they already show, in the symmetrical curvature of the spicule and the narrowing of the base, signs of passing into acanthoxea. They are probably derived from the echinating spicules of more typical Ectyoninae. In other species, such as that about to be described, the acanthostyli are completely, or almost completely, replaced by acanthoxea, the symmetrical form having probably arisen as a result of the new position of the spicule in the dermal membrane, as in the case of the smooth megascleres which seem to have been the original dermal spicules.

The Ectyonine affinities of the genus are further indicated by the isochelæ, which closely resemble those of Myxilla.

#### 80. *Yvesia spinulata* (Hentschel).

(Plate 3, fig. 8.)

*Grazzella spinulata* Hentschel [1911 A].

This very remarkable species was recently described by Hentschel from S.W. Australia. There can, I think, be no doubt about the identification, but the "Sealark" specimens are evidently much finer than those examined by Hentschel and merit a fresh description. The external form (Plate 3, fig. 8) ranges from digitate to flabellate, with or without long digitiform processes. The largest specimen (R.N. XLII. 1) has the form of a vertical lamella, giving off irregular digitiform processes, mostly from the margin. It measures about 165 mm. in greatest breadth and 130 mm. in greatest height, with an average thickness of 6 or 7 mm. It has been attached to the substratum at several points along the lower margin by slightly expanded bases. The lamella is fenestrate in several places, owing apparently to the incomplete fusion of ascending branches. The next largest specimen (R.N. XLIII. 1 A; fig. 8) is of about the same height but much narrower. It forms an almost continuous lamella, with an indented upper margin but no digitiform processes, and with one conspicuous oval

fenestra. Its width diminishes gradually below to a narrow base of attachment. A third specimen (R.N. XLIII. 1 B) is very irregular, partly encrusting and partly digitate; sparingly branched. A fourth (R.N. XXXVII.) is apparently very young and encrusts the stem of an alga. All the specimens have a dull red colour in spirit (Hentschel observes that his specimens were either orange-red or grey-violet in alcohol). The texture is fibrous, tough, compressible and resilient. The surface is glabrous.

The extremely characteristic circular and usually slightly raised pore-areas are irregularly scattered on both surfaces of the lamellar specimens; in R.N. XLIII. 1 A they are extremely numerous, but they vary much in number and conspicuousness in different parts of the same specimen. They also vary a good deal in size, being commonly about 2 mm. in diameter. Though typically closed in by the delicate, sieve-like pore-membrane, they often show a single wide opening, evidently due to rupture and contraction of the membrane. This fact has led Hentschel into an obvious error, for he has interpreted these relatively large apertures as probably vents.

The vents are really marginal and situated each on a small conical papilla (Plate 3, fig. 8). An extensive system of subdermal exhalant canals can be seen through the thin dermal membrane, ramifying and anastomosing between the pore-areas and then converging towards the vents.

The main skeleton consists, in the first place, of a very wide-meshed, irregular network of very stout spicular fibre. The fibres are not very well defined and consist of dense wisps of smooth and spined oxea intermingled. They contain no conspicuous spongin. Between these fibres there is a close, sub-isodictyal reticulation of acanthoxea, single or in bundles.

The dermal skeleton consists, in general, of a dense interlacement of acanthoxea, lying tangentially in the thin dermal membrane. Around the pore-areas, however, and again around the vents, this gives place to a fringe of smooth, radially arranged tornotoxea. The actual sieve-membrane of the pore-areas is almost completely free from spicules, with the exception of isochelæ.

*Spicules*.—(1) Tornotoxea; usually straight; long, slender, smooth, sharply but sub-hastately pointed at each end, with no marked asymmetry; size about 0.34 by 0.005 mm.

(2) Acanthoxea; slightly curved, gradually sharp-pointed at each end; fairly thickly and uniformly covered with short, sharp spines; size about 0.13 by 0.0045 mm. Usually these spicules are quite symmetrically ended, I have only once or twice seen one rounded off at one end so as to become stylote.

(3) Tridentate isochelæ (chelæ arcuatae); characteristic of the pore-sieves; varying much in numbers and in size. I have found them largest and most numerous in the smallest specimen (R.N. XXXVII.), where they measure about 0.025 mm. in length. In the larger specimens they are a good deal smaller.

It thus appears that the spiculation is identical in every respect with that of Hentschel's specimens, and as he has given good figures of the spicules, it is not necessary for me to do so.

*Previously known Distribution*. Sharks Bay, S.W. Australia (Hentschel).

*Register Numbers, Locality, &c.* XXXVII., Cargados Carajos, 31.8.05, B. 19, 28 fathoms; XLII. 1, Cargados Carajos, 30.8.05, B. 9, 30 fathoms; XLIII. 1 A, B. Cargados Carajos, 30.8.05, B. 13, 30 fathoms.

# Genus CRELLA Gray [1867 f].

With a well-developed dermal skeleton composed of tangentially disposed acanthoxea (or acanthostyli?). The characteristic choanosomal megascleres are smooth monactinal spicules (styli or subtylostyli) passing into more or less symmetrical forms. No microscleres.

This is a very curious genus, of, at first sight, somewhat doubtful affinities. The sponges comprised therein, devoid of microscleres and with their characteristic acanthoxea, might almost be placed in the genus Higginsia, but at the same time they agree so closely with certain species of Ynesia, such as *Y. (Grayella) gelida* (Lundbeck) [1910] and *Y. spinulata* Hentschel (*vide p. 93*), in which tridentate isochelæ are present, that one can only conclude that the absence of these spicules in Crella is secondary.

Lundbeck [1910] accepts Carter's genus Grayella in preference to Crella, but, as Vosmaer indicated long ago in Bronn's *Klassen und Ordnungen des Thierreichs*, Grayella must be regarded as a synonym.

X

## 81. *Crella cyathophora* (Carter) var. *acuata* nov.

(Plate 15, fig. 7 a—b.)

*Grayella cyathophora* Carter [1869, 1870, 1881 g]. *Grayella cyathophora* Lundbeck [1910].  
*Grayella cyathophora* Keller [1889]. *Grayella cyathophora* Topsent [1913].  
*Ynesia cyathophora* Topsent [1892 c].

There are in the collection two small specimens of this curious sponge, both coming from Egmont. They agree very closely in most respects with Carter's original description of the Red Sea type, differing chiefly in the fact that the styli, or subtylostyli, are gradually and sharply pointed, instead of being bluntly pointed, and also show a slight but frequent tendency to become polytylote.

The larger of the two specimens (R.N. CXII. 3) is irregularly lobular, and has attached to its surface a few calcareous foreign bodies; it measures only about 25 mm. in maximum diameter. The surface is deeply and irregularly wrinkled, but this wrinkling is probably due to contraction throwing the dermal membrane into folds. There are two distinct, raised pore-areas, similar to those of the type, and two or three small, conical elevations which may bear vents. The second specimen is very similar, but smaller and more fragmentary; it bears no distinct vents or pore-areas. In both the texture is compressible, resilient and soft, and the colour (in spirit) pale yellowish grey.

The main skeleton consists partly of loose multispicular wisps or fibres, running towards the surface and breaking up as they approach it, and partly of very numerous spicules irregularly scattered in the ground-substance between. The styli or subtylostyli appear to predominate in the fibres and the spined oxea in the intervals between them.

The dermal skeleton is a thin but dense feltwork of spined oxea arranged tangentially.

The spicules are of only two kinds: (1) Styli, or subtylostyli (Plate 15, fig. 7 a) with slightly developed, ovoid heads; long, straight or nearly so, slender; gradually and sharply pointed at the apex; size about 0.3 by 0.005 mm.; (2) Acanthoxea (fig. 7 b), slightly curved, fusiform, gradually and sharply pointed at each end, uniformly beset with short, sharp spines; size about 0.12 by 0.005 mm. (exclusive of the spines).

The polytylote character of the styli, though very faintly developed, is especially interesting, because it occurs also in two other related species, viz. *Crella* (*Yvesia*) *carinosa* Topsent [1904 A] and *Yvesia* (*Grayella*) *gelida* Lundbeck [1910], but in both these cases the spicule is diactinal (tornote).

*Crella cyathophora* was originally described by Carter from material in which the remarkable wart-like, raised pore-areas were much better developed. Since then it has been recorded only by the same writer from the Cape of Good Hope (Port Elizabeth). There are in Mr Carter's cabinet several preparations of the species, some of which evidently come from the type, while one (a dry fragment measuring about an inch square, stuck on a glass slip) must, I think, be from the Cape specimen. The latter differs from the type in its much stouter and more distinctly hastate styli, and may, I think, be regarded as variety distinct. It is interesting to observe that the styli in this variety occasionally became tornote. Neither in the type nor in the Cape variety have I observed any indication of a polytylote character in the styli. The species is probably very closely related to Schmidt's *Cribrella elegans* [1862] from the Adriatic, the type of the genus.

*Previously known Distribution of the Species.* Gulf of Suez and Cape of Good Hope (Carter).

*Register Numbers, Localities.* CXII. 3, Egmont Lagoon; CXIII. 11, Egmont Reef.

#### Section IOTROCHOTÆ.

Ectyoninae in which the typical microsclere is a birotulate isochela (so-called amphidisc). More or less symmetrically ended dermal megascleres are usually present. The sponge is without fistular processes.

I propose to associate with *Iotrochota* in this section the genera *Hymetrochota* Topsent [1904 A] and *Microtylotella* Dendy [1896]. The former includes thinly encrusting sponges which still retain their acanthostyles and may possibly indicate the origin of the typical genus *Iotrochota*. The latter is a sand sponge with reduced spiculation, in which the microtylota are supposed to represent birotulate isochelæ. Lundbeck has suggested that my genus *Amphiastrella* [1896] should be associated with *Iotrochota*, if not actually synonymous, but, for the present at any rate, I prefer to leave it amongst the *Cælosphærea*. It must be remembered in this connection that the birotulate isochela (amphidisc) has certainly arisen independently in more than one genus (it is present, for example, in *Axoniderma* Ridley and Dendy [1887]) and it seems more likely that it has arisen independently in *Amphiastrella* than that this genus is very nearly related to *Iotrochota*.

#### Genus IOTROCHOTA Ridley [1884 C].

Sponge usually of dark purple or brown colour. Skeleton reticulate. Megascleres styli (sometimes oxeote), to which more or less symmetrically ended forms may be added, especially towards the surface. No echinating spicules. Microscleres birotulate isochelæ.

#### 82. *Iotrochota purpurea* (Bowerbank).

*Halichondria purpurea* Bowerbank [1875].

*Iotrochota purpurea* Dendy [1905].

*Iotrochota purpurea* Ridley [1884 C].

*Iotrochota purpurea* Hentschel [1912].

*Iotrochota purpurea* Topsent [1897 A].

There are several excellent specimens of this species in the collection. They agree very closely, even down to their brown colour in spirit, with the Ceylon specimens collected by Professor Herdman, but I have not seen any of the "pipette" spicules which sometimes occur in the dermal brushes of the latter. R.N. CXXIX. 3 shows very clearly a character which also occurs in the Ceylon material, though I do not think it has previously been recorded in this species, viz. a minute reticulation of the dermal membrane due to the presence of bands of fibrillar tissue dividing it up into small rounded pore-areas, each of which, however, seems usually to contain only a single pore.

*Previously known Distribution.* Straits of Malacca (Bowerbank); Aru Islands (Hentschel); Amboina (Topsent); Torres Straits, Albany Island, Port Molle (Ridley); Amirante Group (Ridley); Ceylon Seas (Dendy).

*Register Numbers, Localities, &c.* CIII. 2, Amirante, 18.10.05, E. 25, 44—20 fathoms; CXXIX. 3, Seychelles, 20.10.05, F. 2, 31 fathoms.

#### 83. *Iotrochota baculifera* Ridley [1884 C].

(For Literature and Synonymy vide Dendy [1916 A].)

This widely distributed species is represented in the collection by three small specimens; LXXIII. 1 is thinly encrusting, spreading over a mass of calcareous debris, the other two are more massive.

*Previously known Distribution.* North Australia and Mascarene Islands (Ridley); Gulf of Manaar, Ceylon Seas, Okhamandal (Dendy); Seychelles, Amboina (Topsent); Coast of Cochin China (Lindgren), Celebes, Ternate (Thiele); Christmas Island (Kirkpatrick); S.W. Australia, Aru Islands (Hentschel).

*Register Numbers, Localities, &c.* XX. 4, Providence, 4.10.05, D. 3, 29 fathoms; LXXI. 6, LXXIII. 1, Amirante, E. 21 and E. 14, 30 and 36 fathoms.

#### Section ACARNEÆ.

Ectyoninae with echinating grapnel spicules (cladotylota) and typically with tylota. Characteristic microscleres palmate isochelæ and toxa.

The genus *Acarinus* is at present the sole representative of this section, but it seems probable that my *Acarinus tenuis* [1896] may represent a distinct lipochealous generic type. The genus is excluded from the Myxillæ by the form of the isochelæ and from the Clathriæ by the presence of symmetrically ended, dermal megascleres. The highly characteristic grapnel spicule is, of course, merely a slightly modified echinating acanthotylostyle.

#### Genus *Acarinus* Gray [1867 F].

The main skeleton spicules are smooth styli and echinating grapnel spicules (cladotylota). The typical dermal spicules are tylota and the typical microscleres palmate isochelæ and toxa.



X 84. *Acarinus topsenti* n. sp.

(Plate 4, fig. 3 a, b; Plate 15, fig. 8 a—c.)

The external form of the sponge ranges from simply digitate (R.N. XLII. 12) to compressed, flabellate, giving off longer or shorter digitiform processes (Plate 4, fig. 3 a, b). One of the two largest specimens measures about 85 mm. in height by the same in maximum breadth, and consists of five more or less compressed, digitiform processes branching off from one another in the same plane. The average thickness of the processes and of the lamellar portions formed by their union is about 5 mm. The surface is minutely and closely conulose and, where it has been abraded, the conuli appear fused in a meandriniform pattern. A thin, translucent dermal membrane is visible between the conuli in uninjured places. The vents are rather small and mostly on the margins of the branches. One specimen (XLII. 7) shows stellately arranged grooves on one of the flat surfaces and similar grooves running to the margins. These probably indicate subdermal exhalant canals surrounding vents. The texture is compressible, resilient, fibrous, fairly tough. The colour, in spirit, ranges from dull grey to distinctly reddish or purplish, but there is a possibility of staining by other specimens in the same jar in the latter cases.

The main skeleton consists, in the first place, of fairly stout longitudinal main fibres, curving outwards to the surface, where they terminate in tufts of spicules in the surface conuli. These fibres branch freely, at acute angles, on their way to the surface, and the branches may anastomose with one another. They are composed of spongin, very irregularly cored by styli, tylota and grapnel spicules, and echinated by grapnel spicules. The styli are frequently, and especially towards the surface, arranged in a plumose fashion, with their bases embedded in the axis of the fibre and their apices projecting very obliquely. The echinating grapnel spicules usually project more or less at right angles from the surface of the fibre. The primary fibres are also connected, crosswise, by short secondary fibres composed entirely, or almost entirely, of spongin. The diameter of the primary fibres is about 0.08 mm., of the secondaries about 0.025 mm., but they are, of course, variable. The secondary fibres may branch and anastomose, forming a network between the primaries. There is no special dermal skeleton. A few megascleres, mostly tylota, also occur scattered between the fibres.

*Spicules*.—(1) Styli or subtylostyli (Plate 15, fig. 8 a); tapering gradually from base to sharply pointed apex; straight or slightly curved; sometimes very minutely and sparingly spined at the base, but usually smooth, size about 0.24 by 0.0082 mm. Very slender forms of this spicule occur which are probably young.

(2) Grapnel spicules (clado-acanthostyli) (fig. 8 b); straight, tapering gradually from base to apex. Apex provided with usually four (sometimes more) strongly recurved, sharp hooks; shaft, except for a short distance behind the apex, covered with short, sharp, mostly recurved, thorn-like spines; base not itself enlarged but with four or five larger spines curved towards the apex; size about 0.1 by 0.0041 mm. (exclusive of spines).

(3) Tylota (fig. 8 c); long, straight, slender; with fairly well-developed oval heads which are sometimes very minutely spined; size about 0.225 by 0.002 mm. (in the middle).

(4) Isocheke (fig. 8 d); palmate, "navicular," very minute, about 0.012 mm. long; may be very abundant.

(5) Toxa (fig. 8 e); smooth, strongly arcuate, sharply pointed at each end; very variable in size, commonly about 0.16 by 0.003 mm., often much smaller.

A very large amount of foreign matter occurs in the mesoglea between the fibres and in some of the fibres themselves, while in other parts the fibres are quite free from it.

This species is evidently closely related to Topsent's *Acarinus tortilis* [1892 D, 1897 A, 1904 A] but differs chiefly in the flabello-digitate external form and the strongly developed horny fibre. The latter character is also exhibited by a very poor, apparently encrusting specimen from Okhamandal which I [1916 A] identified with *A. tortilis*. The spiculation of the Okhamandal specimen, however, agrees more closely with that of *A. tortilis* than with that of *A. topsenti*, and the identification may perhaps stand. In *A. topsenti* the megascleres are decidedly shorter than in *A. tortilis* (the styli very much so) and the grapnel spicule is somewhat different, as will be seen by comparison with Topsent's figures. I lay most stress, however, for the purpose of distinguishing the species, upon the characteristic external form, for, so far as I am aware, *A. tortilis* is always simply encrusting.

*Register Numbers, Localities, &c.* XXX. 2, XLV. 3, Cargados Carajos, 29.8.05, B. 8, 30 fathoms; XLII. 7, 12, Cargados Carajos, 30.8.05, B. 9, 30 fathoms.

#### Section TEDANIEÆ.

Lipochelous Ectyoninae without echinating spicules. With well differentiated, symmetrically or subsymmetrically ended dermal megascleres. Microscleres raphides.

I think there can be little doubt that these are reduced ectyonine sponges. The presence of the characteristic dermal megascleres has led to their inclusion amongst the Myxillæ by Lundbeck [1910] but I think they deserve to rank as a separate section, of which the characteristic raphides form the chief distinguishing feature of a positive nature.

#### Genus TEDANIA Gray [1867 F].

With smooth styli for the megascleres of the main skeleton and variously ended but more or less symmetrical megascleres representing the dermal skeleton. The only microscleres are long raphides.

This genus appears to be connected with the Myxillæ by Topsent's genus *Acheliderma* [1892 D], which seems to differ from *Tedania* only in the presence of echinating acanthostylostyles and toxa.

Topsent [1912] has proposed the term "onychete (onychètes)" for the characteristic *Tedania* raphis, but this appears to me to be hardly necessary.

X 85. *Tedania digitata* (Schmidt) [1862].

(For Literature and Synonymy vide Ridley [1884 c] and Ridley and Dendy [1887].)

This widely distributed species has already been recorded from the Indian Ocean by more than one writer. It is represented in the present collection by five specimens, or pieces, of which R.N. xciv. is an unusually fine example of the species, with a remarkable

external form. It is, as a whole, massive, sessile, with a broad base, and appears as if made up of a large number of more or less completely fused, contorted trabeculae, which appear on the surface as a number of meandering ridges, with more or less deep sulcae between them. The whole colony has grown up around a large cloacal cavity, with an enormous vent at the top about 22 by 6 mm. in diameter, with an incomplete membranous margin, like a narrow diaphragm. The entire specimen measures about 65 mm. in height by 70 mm. in breadth at the base. The texture in spirit is soft and compressible; the colour dull yellowish grey.

The spiculation appears to be perfectly typical, as described by Ridley. The minute roughening of the ends of the tylota is very feebly developed, but quite recognizable. The slender raphides are hardly, if at all, roughened, and have no bulbous dilatation. The styli are slightly bent, rather abruptly and fairly sharply pointed. The approximate measurements are as follows:—Styli, 0.2 by 0.006 mm.; tylota, 0.2 by 0.004 mm. (in the middle); raphides, 0.14 by 0.001 mm.

The other specimens call for no special comment, they all appear as if made up of anastomosing trabeculae.

*Previously known Distribution.* Almost cosmopolitan.

*Register Numbers, Localities, &c.* XXX. 1, XLV. 2, Cargados Carajos, 29.8.05, B. 8, 30 fathoms; LXXV. 1, Amirante, 11.10.05, E. 11, 25—30 fathoms; XCIV., Amirante, 11.10.05, E. 13, 20—25 fathoms.

#### 86. *Tedania reticulata* Thiele [1903 B].

I identify with this species two specimens which occur as thin crusts of a yellowish grey colour upon lamellibranch shells. One of them (CXX. 4) shows quite distinctly the minutely reticulate dermal membrane described by Thiele, pierced by the close-set inhalant pores. The spiculation agrees very closely with that of the type, except that the styli are decidedly more slender, measuring about 0.25 by 0.006 mm., as against 0.27 by 0.009 mm. The most characteristic feature of the species appears to be the presence of unusually stout, distinctly roughened, unequal-ended raphides. The knobs of the tylota are well developed and more or less distinctly spined terminally.

*Previously known Distribution.* Ternate (Thiele).

*Register Numbers, Localities, &c.* XLIV. 5, Cargados Carajos, 31.8.05, B. 19, 28 fathoms; CXX. 4, Salomon, 10—14 fathoms.

#### Genus TEDANIONE Wilson [1894].

The styli are completely suppressed, the megascleres being exclusively tylota (or strongyla). The microscleres are raphides, which may sometimes be so stout as to resemble slender oxea and be classed as megascleres.

This genus was proposed by Wilson for a sponge (*Tedanione fetida*) which he found growing on the roots of the mangrove, in the Bahama Islands, and of which he gives a detailed anatomical account, accompanied by observations on the development. So far as I am aware this is the only species of the genus hitherto described.

In his generic diagnosis Wilson states that the spicules are "mostly oxeas, with

microscleres of same pattern, and a very few tylotes." In his description of the type species he speaks of "stout skeletogenous oxeas  $\frac{3}{8}$  mm. long and often slightly bent"; unfortunately he does not mention the diameter of these spicules, but his fig. 100 shows that they are really very slender spicules and I have no doubt that they are homologous with the "microscleres of same pattern" (raphides). This view is supported by his fig. 101, showing a "modified oxea" with mucronate apex, a condition which is frequently found (but with more elongated and sharper mucro) in the Indian Ocean species about to be described.

Hallmann [1914] has recently proposed the genus Hemitedania for Carter's *Amorphina anonyma*, in which the only megascleres are apparently genuine oxea, while the microscleres are raphides with a bulb-like dilatation near one end. This peculiar type of raphis is found in some species of Tedania and also occurs in the Indian Ocean species of Tedanione, a fact which strongly supports the view that all three genera, in spite of the differences as regards their megascleres, are closely related.

#### X 87. *Tedanione wilsoni* n. sp. (Plate 16, fig. 1 a—b').

The single specimen forms a rather thin but extensive crust growing over another sponge (an undetermined Axinellid). The surface is smooth but rather uneven, and under a pocket-lens exhibits a very minutely reticulate appearance. The inhalant pores are scattered in a thin dermal membrane, which is not easily separable and only appears distinctly where it passes over the small, scattered, rounded subdermal cavities. The vents are small, few and scattered (only two recognized), without prominent margins. The texture in spirit is rather soft and compressible, but fairly compact; in places a good deal of calcareous sand is imbedded in the tissues. The colour now is dull greyish yellow.

The main skeleton consists of more or less dense wisps of tylota (or strongyla), with intermingled raphides, running irregularly towards the surface, with a multitude of loose spicules scattered between. There is no properly defined dermal skeleton but the dermal membrane contains numerous scattered tylota (or strongyla) and raphides, lying tangentially.

*Megascleres*:—Strongyla, or tylota with very feebly developed heads (Plate 16, fig. 1 a); straight or nearly so, and rather slender; quite smooth all over. The proportions of these spicules, which are very abundant, vary somewhat, but they usually measure about 0.29 by 0.0041 mm.

*Microscleres*:—Raphides (figs. 1 b, 1 b'); nearly straight or slightly bent, very finely pointed at each end, divided into two very unequal portions by a slight bulbous enlargement, the shorter portion measuring about  $\frac{1}{4}$  to  $\frac{1}{2}$  of the longer, the apex of the shorter piece often with a very slender, elongated mucro. These spicules appear to be quite smooth. They occur scattered abundantly throughout the sponge and are of two principal sizes, the larger measuring about 0.18 by 0.002 mm. and the smaller about 0.05 by 0.0008 mm. The bulbous dilatation occurs in the smaller as well as in the larger individuals and appears to be a very constant feature.

This species is probably fairly closely related to Wilson's *Tedanione fetida* from the

Bahamas [1894] but differs in several important particulars. The "skeletalogenous oxæas" of Wilson's species, which I interpret as homologous with the larger raphides of *T. wilsoni*, are much longer than in the latter (0.35 mm.) but at the same time evidently very slender, and none of the raphides appear to have bulbous dilatations. The tylota, again, are very rare, while in our species they are very abundant.

Register Number, Locality, &c. xx. 6, Providence, 4.10.05, D. 3, 29 fathoms.

#### Section CÆLOSPHÆRÆ.

Ectyoninæ with a strongly differentiated ectosome containing tangentially disposed megascleres and forming a more or less easily separable rind enclosing the often pulpy choanosome. The ectosome is produced into hollow, cylindrical fistulæ. Typical megascleres tylota, which may be replaced by some other more or less symmetrically ended form and supplemented by monactinal forms. Echinating spicules usually absent or vestigial. Microscleres typically including chelæ, which may, however, be suppressed.

For reasons already given (p. 45) I have decided to keep this group of sponges distinct from the Phlæodictyinae and to regard the resemblance between the two as due to convergence. I derive the name of the section from Wyville Thomson's genus *Cælosphæra* [1873]. This important genus was proposed for the reception of a remarkable sponge (*Cælosphæra tubifex*) collected by the "Porcupine" expedition. A brief description, together with an admirable figure of the external form, was published in that well-known work *The Depths of the Sea*\*.

In 1874 Carter described his "*Histoderma appendiculatum*, n. gen. et sp.," actually from the "Porcupine" material. Why he ignored Wyville Thomson's earlier description and name is to me a complete mystery, for there can be no doubt that he was acquainted with them. He refers to Wyville Thomson's *Depths of the Sea* in his own paper, and a type slide of "*Histoderma appendiculatum*" in his cabinet bears the alternative name "*Cælosphæra tubifera* [sic] Wy. Thomson," with a reference to Thomson's description. Indeed, in the last of his papers on the "Porcupine" sponges, published some two years later [December 1876, p. 472], he actually gives, though with a quite unnecessary query, *Cælosphæra tubifex* Wy. Th. as a synonym of *Histoderma appendiculatum*.

Almost more remarkable is the fact that no one has ever since, so far as I know, noticed this very obvious synonymy. Carter's name has been very generally, if not universally accepted, but I think there cannot be the least doubt that the laws of nomenclature require that we should revert to *Cælosphæra* for the name of the genus and *tubifex* for that of the type species. According to Carter a large style ("acuate") forms part of the spiculation of this species, but an examination of his preparations has driven me to the conclusion that if such a spicule occurs at all its presence is abnormal.

An interesting discussion of the genera which may be assigned to this section is given by Lundbeck [1910, pp. 25, &c.], who seems, however, to have been quite ignorant of Wyville Thomson's *Cælosphæra*. Without adopting a special group for their reception he associates together and accepts the genera *Histoderma*, *Histodermella*, *Infiatella* and *Cornulum*, placing them all amongst the Myxillæ. He regards *Sideroderma* as a synonym of *Histo-*

\* My information is derived from the 2nd edition, published in 1874.

derma and *Amphiastrella* as a possible synonym of *Iotrochota*. I cannot follow him in all his conclusions, but I consider that he has done good service in pointing out the probable ectyonine origin of the group. He regards the dermal megascleres as being only secondarily "diactinal" and states that they have a monactinal origin, like the dermal spicules in "other Myxillæ." He suggests that *Histoderma* may be derived from some ancestral form such as *Hymedesmia*, by loss of the acanthostyles, &c. The spiny spicules of *Histodermella* and the microrhabds of *Cornulella* probably represent the lost acanthostyles. The most striking evidence in favour of this view is afforded by a species since described by Hentschel [1912] under the name *Cornulum dubium*, which is thinly encrusting, with tubular processes and with fully developed acanthostyles, and thus seems to be strictly intermediate between *Hymedesmia* and *Cælosphæra*.

It should be pointed out, perhaps, that Lundbeck's views as to the monactinal origin of the "diactinal" megascleres in the *Cælosphæreæ* are not supported by the observations of Hallmann [1914] and myself (see under *Siderodermella ramosa*) on the spiculation of the embryos in "*Histoderma*" and *Siderodermella*, but I do not think that these observations are by any means fatal to such conclusions.

In this section of the Ectyoninæ we find considerable diversity in the form of the isochelæ, which may be either palmate, tridentate or birotulate. In this case the very peculiar and characteristic structure of the sponge appears to me to outweigh the form of the chelæ in taxonomic value, but the case of the Phlæodictyinae indicates the possibility that the group may still be polyphyletic.

#### Genus CORNULELLA n. gen.

Sponge encrusting or burrowing, with fistular outgrowths. Megascleres tylota. Microscleres palmate isochelæ and microrhabds, to which others may be added.

I at first assigned the type species of this genus to Lundbeck's genus *Histodermella*, but, apart from its palmate isochelæ, it differs from that genus in the possession of microrhabds. It seems quite possible, however, that these spicules really represent vestiges of the acanthoxea or acanthostrongyla which occur in *Histodermella* and which Lundbeck regards as megascleres. It must be remembered that the distinction between megascleres and microscleres is in many cases purely arbitrary. The presence of the microrhabds, and perhaps also the habit of the sponge, serve to differentiate the genus from *Cornulum*.

#### 88. *Cornulella lundbecki* n. sp.

(Plate 16, fig. 2 a-d.)

The sponge forms a thin crust occupying irregular depressions on the surface of a mass of nullipore and other calcareous debris and growing out here and there into delicate, thin-walled fistulæ. The fistulæ are cylindrical and about 2—3 mm. in diameter. The longest remaining measured about 13 mm. in length. They are much damaged, but it seems probable that some of them normally have wide openings at the extremity while others end blindly. The wall of the fistula spreads out at the base into a thin, bladder-like dermal membrane, which covers the general surface of the sponge where exposed. The body of the sponge appears nowhere to attain any considerable thickness as an independent

growth but it penetrates deeply into the interior of the mass of calcareous debris, through which it can readily be traced by its very characteristic, deep purple colour. This colour is evidently natural to the sponge, for other sponges growing in the same mass are unstained. It seems to be insoluble in alcohol and it occurs chiefly in the deeper parts of the sponge, leaving the dermal membrane itself sometimes almost colourless. The colour is due to deeply pigmented granules, scattered thickly through the choanosome, mostly in small groups. The basal portions of some of the fistulae are ornamented with longitudinal stripes of purple.

The skeleton in the interior of the sponge consists of loosely scattered megascleres. In the walls of the fistulae the megascleres are arranged tangentially and form a rather loose feltwork.

*Megascleres*.—Tylota (Plate 16, fig. 2*a*); slightly curved, with rather feebly developed oval heads which are usually minutely spined, but apparently not always. Size about 0.4 mm. long by 0.006 mm. thick (in the middle of the shaft).

*Microscleres*.—(1) Large palmate isochelae (fig. 2*b*), resembling those of the genus *Esperiopsis*; about 0.05 mm. in length by 0.012 mm. in greatest breadth. Normally the shaft is not very strongly curved but sometimes it is sharply bent in the middle, with the concavity on the palmar side. This condition apparently results from some restraining influence preventing the straightening out of the shaft. It may be a normal developmental stage, as it occurs frequently. This is a singularly beautiful spicule, and it is very abundant throughout the sponge.

(2) Slender, cylindrical or subfusiform microrhabds (fig. 2*c*) with blunt extremities and perhaps very slightly roughened surface; measuring about 0.02 by 0.001 mm. Abundant in the interior of the sponge.

(3) Toxa (fig. 2*d*). Very strongly bent in the middle; arms rather short and strongly recurved, fairly stout and tapering gradually to fine points. Length in a straight line from apex to apex about 0.12 mm., with a thickness in the middle of about 0.0027 mm. I have seen only a very few of these spicules but they have every appearance of being a normal constituent of the spiculation and some of them still retain remains of the enveloping membrane of the silicoblast.

? (4). Sigmata. Some shreds of membrane (in a teased preparation), which may or may not belong to this sponge, contain numerous simple, C-shaped sigmata, fairly stout and about 0.18 mm. long. As they are so very strictly localized I am extremely doubtful whether they form a normal constituent of the spiculation or not.

This is a very distinct species, easily recognizable by its beautiful colour and its remarkable spiculation.

*Register Number, Locality, &c.* CXXVIII. 1 A, Seychelles, 20.10.05, F. 9, 37 fathoms (in association with *Petrosia seychellensis*, a fine specimen of which is attached to the same calcareous mass).

#### Genus CORNULUM Carter [1876].

Sponge with fistular processes (? always); with a thin cortex and pulpy interior. Skeleton chiefly of symmetrically ended megascleres, interwoven tangentially in the cortex and in loose fibres in the interior. Microscleres minute palmate isochelae, to which others may be added. No acanthoxea, acanthostrongyla or microrhabds.

This genus differs from *Caelosphæra* in the palmate character of its isochelae. Carter mentions a very slender style amongst the megascleres of the type species (*C. textile*) but I doubt if these are not really identical with the toxa which he also describes.

#### 89. *Cornulum strepsichela* n. sp.

(Plate 16, fig. 3*a—b*.)

This species is represented by a single very thin-walled, cylindrical tube, widely open at both ends; measuring about 12 mm. in length by 3 mm. in diameter. It has very probably been torn off from a central body. It is quite hollow, very translucent in appearance, and has a faint pinkish tinge (in spirit).

The skeleton is a rather loose feltwork of megascleres, lying tangentially in the wall of the tube and crossing one another in all directions.

*Megascleres*.—Tylota (Plate 16, fig. 3*a*); cylindrical, long but fairly stout; with very feebly developed heads; minutely spined at the extremities; measuring about 0.38 by 0.009 mm.

*Microscleres*.—Small, slender-shafted, palmate isochelae (fig. 3*b*), rather like those of *Clathria*. Frequently contort, so that a front view of one end and a side view of the other appear simultaneously; length about 0.0164 mm., very uniform. These spicules occur in immense numbers in the interstices of the skeleton reticulation in the wall of the tube. They are very similar to those of *Clathria typica* and *Microciona acerato-obtusa* as figured by Hentschel [1911 A], which may also be contort.

Owing to the fragmentary character of the material the reference of this species to the genus *Cornulum* can only be regarded as provisional.

*Register Number, Locality, &c.* xc. 1, Cargados Carajos, 1.9.05, B. 29, 45 fathoms.

#### Genus SIDERODERMELLA n. n.

*Sideroderma* Ridley and Dendy [1886, 1887].

Sponge consisting of tubular processes which may spring from a massive body or form a branching system among themselves. With a dense ectosomal skeleton (spicular cortex) of tangentially placed tylota. Choanosome soft and pulpy, occupying the interior of the sponge but readily contracting away from the wall; with skeleton of scattered spicules. Megascleres tylota only. Microscleres comprising tridentate isochelae (chelae arcuatae) and very minute, navicelliform isochelae, to which sigmata and trichodragmata may be added.

The name *Siderodermella* is here proposed in replacement of *Sideroderma*, R. and D., which was already pre-occupied when the genus was founded.

Lundbeck [1910] accepts the view that *Siderodermella* cannot be separated from "*Histoderma*." Although I myself long ago [1896] suggested this possibility it now appears to me that the presence of the peculiar minute, navicelliform isochelae affords sufficient justification for such separation and this view is strongly supported by the discovery of a second species, with identical spiculation but very different external form, by the "Sealark" Expedition. Hentschel's *Histoderma navicelligerum* var. *aruensis* [1912] probably represents yet a third species, distinguished chiefly by the absence of trichites,

but it is very inadequately described. I agree with Lundbeck that Lendenfeld's *Sideroderma zittelii* [1888 A] does not belong to this genus. Indeed Hallmann [1914] has demonstrated with sufficient clearness that the species in question is really a *Polymastia*! I also agree with Hallmann that Lendenfeld's record of *Siderodermella navicelligera* from Port Jackson is probably erroneous.

90. *Siderodermella ramosa* n. sp.  
(Plate 8, fig. 6; Plate 16, fig. 4 a—e.)

The single specimen consists of an irregularly ramified mass of tubes (Plate 8, fig. 6), varying greatly in diameter and with no central body. The largest tube, which has become detached from the remainder, measures about 63 mm. in length by about 5 mm. in diameter at the proximal end. Towards the distal extremity it tapers away gradually to a diameter of only 2 mm. It gives off a few short, bud-like branches, one of which immediately subdivides into two. All the tubes now end blindly, and I have recognized no natural openings with certainty\*. In the main mass the widest tube is about 8 mm. in diameter and there is a small amount of anastomosis. The wall of the tubes is only about 0.12 mm. thick and very flexible; the interior is partially filled with the soft, pulpy choanosome, more or less contracted away from the wall. The colour in spirit is pale grey and the sponge is much encrusted in places with shell-fragments and other foreign matter.

The principal skeleton is, of course, that of the tube-walls, which consists of a dense feltwork of long tylota crossing one another in various directions, so as to form a spicular cortex about 0.12 mm. thick. In the soft internal choanosome are found very numerous similar spicules, not collected into definite fibres or bundles, though often lying parallel with one another in dense masses.

*Megascleres*.—Tylota (Plate 16, fig. 4 a); usually slightly crooked, with cylindrical shaft slightly thicker in the middle than elsewhere and terminated at each end by a well-developed oval head. Dimensions, especially thickness, very variable; a well-grown specimen measuring, say, about 0.48 mm. in total length by 0.01 mm. in diameter in the middle of the shaft. The heads of these spicules appear to be always perfectly smooth.

*Microscleres*.—(1) Tridentate isochelæ (fig. 4 b), about 0.02 mm. long. These are "chele arcuatae," with shaft not very strongly curved and lateral teeth separated from it for little more than one-third of their length. Rather scarce.

(2) Minute navicelliform isochelæ (fig. 4 c) about 0.009 mm. long. These spicules seem to resemble exactly those described and figured (very badly) in the "Challenger" Report for *Siderodermella navicelligera*. They are extremely abundant.

(3) Fairly large, stout sigmata (fig. 4 d); perhaps always more or less contort, sometimes very markedly so, but sometimes C-shaped; measuring about 0.04 mm. from bend to bend.

(4) Small sigmata (fig. 4 e), of similar form to the above but perhaps relatively more slender; about 0.02 mm. from bend to bend.

Trichites or raphides, of hair-like dimensions, about 0.246 mm. long and usually collected in large, loose bundles (trichodragmata).

\* It is probable, however, that some of them bore terminal vents in life, now closed.

The spiculation of this species appears to be in all essential respects identical with that of *Siderodermella navicelligera*, the type of the genus from New Guinea; such differences as may possibly exist concern merely the dimensions and are quite trifling. The external form of the sponge, however, with its long, branched, tubular processes and the absence of a central body, is so different that I have little hesitation in proposing a new specific name.

The pulpy choanosome of this sponge was found to contain a number of embryos. The largest observed is oval in shape and measures about 0.86 by 0.6 mm. It contains numerous irregularly scattered megascleres. It is interesting to observe that these are all slender, symmetrically ended tylota, measuring about 0.18 by 0.0027 mm. (in the middle of the shaft). Their heads are very well developed, about 0.004 mm. in diameter and nearly spherical, instead of being elongated as in the corresponding spicule of the adult. I have been unable to determine with certainty whether or not microscleres occur in this embryo, those which appear to be associated with it may possibly belong to the surrounding tissues of the adult.

Hallmann [1914] has described similar embryos in the case of his *Histoderma actinioides*.

Register Number, Locality, &c. CXXXIII. 6, Seychelles, F. 9, 37 fathoms.

#### Section CYAMONÆ.

Ectyoninæ in which the echinating acanthostyles are represented by pseudactinal or pseudastrose spicules.

There can be no doubt about the origin of the very curious pseudactinal spicules in the genus Cyamon, for their development clearly shows that they are modified acanthostyles (cf. Plate 16, figs. 5 f—f'''''). The same origin may safely be attributed to the very similar spicules of *Trikentria* (*Plectronella*) and more doubtfully to the curious "desmoid" spicules of *Crambe*. The pseudasters of *Stelligera* Gray [1867 F] and *Sclerochalina* Schmidt [1868] are indistinguishable in appearance from true asters, but in view of the other characters of these genera it seems more reasonable to assume that these spicules also have originated from the heads of echinating acanthostyles than that they have been inherited from astrotetaxonid ancestors.

I therefore propose to include all the above-mentioned genera, provisionally, in the same section, for which the name Cyamonæ seems most appropriate.

It is obvious that this arrangement involves the abandonment of the family "Astraxinellidæ" which I suggested in 1905 [p. 107] and which has since been accepted by Hallmann [1912] and Stephens [1915].

#### Genus CYAMON Gray [1867 F].

The principal megascleres are smooth styli, while the echinating acanthostyles are represented by pseudactinal forms resembling tetracts, triacts, &c. No chele.

This genus was founded by Gray in 1867 upon Bowerbank's figure and description of a single spicule. The type species, *C. vickersii*, was first described by Carter in 1879, but that author did not take any notice of Gray's genus, making use of Bowerbank's original

name (*Dictyocylindrus vickersii*). Ten years later Topsent [1889] referred the species to the genus *Trikenion*, refusing deliberately to recognize *Cyamon*.

In 1905 I revived Gray's genus and referred to it three species, *Dictyocylindrus vickersii* Bowerbank, *Microcionus quadriradiatus* Carter and *Microcionus spinipuerulatus* Carter. The genus has also been adopted by Hentschel [1912] who has described a species which he names *Cyamon aruense*.

The most remarkable feature of the genus is undoubtedly the presence of the curiously modified echinating styli, in which a few of the basal spines have become enormously enlarged to form pseudactines, so that the whole spicule comes to resemble a pentact, tetract, triact or diact as the case may be. This interpretation of the spicule is supported not only by its actual development (cf. Plate 16, figs. 5f—f''''') but also by the remarkable case of Topsent's *Hymenaphia spinispinosa* [1904 A], which may possibly represent another species of *Cyamon*. In this fascinating sponge, a preparation of which I owe to the kindness of Miss June Stephens, the echinating spicules are in a condition intermediate between that of an ordinary acanthostyle, or acanthotylostyle, and that of the *Cyamon* spicule, and, moreover, they are associated with normal acanthostyles. If we may regard the subtylostyles of Topsent's species as representing the curious bulb-bearing styli of *Cyamon* there seems no reason why we should not include the species in this genus.

As I have already pointed out [1905], the genus *Cyamon* seems to be closely related to *Trikenion*, which represents a further stage in the evolution of the pseudotriact, but differs from *Cyamon* in that the principal spicules are oxeote.

X 91. *Cyamon vickersii* (Bowerbank).  
(Plate 4, fig. 4; Plate 16, fig. 5a—f''''')

*Dictyocylindrus vickersii* Bowerbank [1864].  
*Cyamon vickersii* Gray [1867 F].

*Dictyocylindrus vickersii* Carter [1879 B].  
? *Trikenion vickersii* Topsent [1889].

There is a beautiful specimen of this rare and remarkable species in the collection, and as it has hitherto been only imperfectly known I propose to give a full description with the necessary illustrations.

The "Sealark" specimen (Plate 4, fig. 4) has the form of a hemispherical cushion, with a wide and deep cup-shaped cavity excavated slightly excentrically on the convex upper surface. The flattened base is approximately circular in outline and somewhat uneven. It has probably been attached at one or more points. The entire structure of the sponge is strongly columnar and radiate, the stout skeletal columns radiating out from the middle of the base and terminating on the upper surface in prominent, blunt conuli, while the base is radially grooved and ribbed owing to the same cause. The surface conuli are slightly hispid and between them is stretched a smooth, translucent dermal membrane. A similar membrane lines the cup-shaped cavity, the surface of which is devoid of conuli but slightly ribbed radially by the underlying skeleton columns. Neither vents nor pores are recognizable with certainty, but the vents may be represented by a few rather small, scattered apertures in the dermal membrane between the conuli on the outer surface. The diameter of the base of the sponge measures about 28 mm.; the greatest height, to the edge of the cup, is about 19 mm.; the diameter of the opening of the cup is about 17 mm., and the depth of

the cup about 10 mm. The colour in spirit is light brown, shading to dark brown on one side, and is due to the presence of numerous large granular pigment-cells, chiefly in the thin dermal membrane. The texture is firm and stiff, but at the same time compressible and resilient.

The skeleton is composed of stout, plumose columns of spicules, radially arranged and terminating in the surface conuli. Each column is made up chiefly of stout styli and pseudo-tetracts and -triacts. The former in part run longitudinally, in bundles of two or three held together by spongin, but great numbers of them project obliquely from the column, with their apices pointing towards the dermal membrane. The pseudactinal spicules occur in immense numbers between the styli. The columns are separated by intervals about as wide as themselves, containing only a few scattered spicules. There is no special dermal skeleton.

*Spicules*.—(1) Stout, smooth styli or subtylostyli (Plate 16, fig. 5a); more or less curved or bent towards the base, which is considerably narrowed, gradually and finely pointed at the apex; size about 0.74 by 0.029 mm. Occasionally strongly lute (fig. 5b).

(2) Long, slender, smooth styli, occasionally tylote (fig. 5c), almost straight, tapering very gradually to a finely and evenly pointed apex but not diminishing sensibly towards the base; measured up to about 1.7 by 0.014 mm., but usually somewhat smaller and probably sometimes larger. These spicules are not conspicuous in sections but they occur in small numbers in boiled out preparations.

(3) Comparatively short, slender styli of peculiar form (fig. 5d). These spicules are approximately straight except for (usually) a very characteristic bend at about one-third of the distance from base to apex. At or near this bend there is usually a very slight bulbous inflation (x). The spicule is of nearly the same width throughout its length; the base is evenly rounded off and smooth; the apex (fig. 5d') may be simply and abruptly sharp-pointed (hastate), or it may be slightly enlarged and covered with minute spines, or it may be slightly enlarged without being distinctly spined. These spicules are quite common, though not nearly so numerous as the ordinary styli. Some of them occur scattered singly without any sort of orientation in and between the skeleton columns, others occur in dense bundles resembling enormous trichodragmata. Size of individual spicule commonly about 0.33 by 0.005 mm., but rather variable. A variety without the characteristic bend is shown in fig. 5d'.

(4) Pseudo-tetracts, -triacts, -diacts and -pentacts. These spicules usually have four rays (fig. 5e), of which three lie nearly in the same plane, but inclining upwards to meet one another in the centre, while the fourth lies in a plane at right angles to that of the others. The fourth ray, representing the shaft of the ancestral acanthostyle, is commonly a little different in length and a little more sharply pointed as compared with the other three. The angles between the rays are subject to considerable variation. All four rays in the adult spicule are more or less blunted at the apex and their distal portions are thickly covered with small, sharp spines, which tend to disappear more or less completely towards the centre of the spicule; towards the apices of the rays these spines may be slightly recurved. Numerous forms occur with more slender, smooth and sharply pointed rays (fig. 5f'''''); these are evidently young individuals, they are connected by intermediates

with the adult form. Triact forms (fig. 5 e'') seem to be nearly if not quite as common as the tetracts; diacts (fig. 5 e''') are much less frequent and pentacts (fig. 5 e') still less so. Some of the principal developmental stages of this spicule are represented in figs. 5 f—f'''''. It will be noticed that in the earliest stages observed (figs. 5 f, f') the "fourth" ray is very much longer than the other rays, a fact that strongly supports the view that the entire spicule is a modified acanthostyle. In the fully-grown spicules the rays are much stouter and their inequality is less pronounced, the "fourth" ray commonly measuring about 0.07 by 0.012 mm. and the others little less. I am inclined to think that the variability in number concerns only the basal rays, which are evidently enlarged spines, but it would be difficult to establish this point. Very young spicules may show indications of several aborted rays (originally spines) in the form of rounded tubercles between the basal rays and near the proximal end of the fourth ray or shaft (figs. 5 f, f').

The flagellate chambers are about 0.02 mm. in diameter, subspherical and probably eurypylous. They occur scattered in the highly lacunar, gelatinous mesoglaea between the skeletal columns. In the skeletal columns themselves, between the component spicules, masses of darkly staining, granular cells occur.

There can be very little doubt of the specific identity of our specimen with Bowerbank's original type. Concerning the external form of the latter we know very little, but Carter's description opens with the words "Fragment thick, triangular, wedge-shaped, composed of branched columnar structure, radiating from the inner angle, indicative of its having been broken out of a convex radiated mass." Judging from this account the entire specimen may very well have resembled that obtained by the "Sealark." When, however, Mr Carter goes on to say that the columns are "hollow, tubular, smooth within and rough without, wherein the spicules are implanted," I hardly know what he means, but I think he must be describing some post-mortem effect due to desiccation.

There is in Mr Carter's cabinet a slide labelled "Dictyoecylindrus Vickersii—W. Indies" which almost certainly represents the original type. This slide bears, in addition to a number of small fragments, two pieces of skeletal columns, which certainly have the appearance of being tubular, though the appearance is, I believe, deceptive.

The spiculation of our sponge agrees remarkably closely with that of the type, which is not very well represented in Mr Carter's illustrations. Even the curious crookedness, accompanied by a slight bulbous dilatation, of the small styli is faithfully reproduced. The characteristic shape of the apex of this spicule is also the same, but the material at my disposal is not sufficient to enable me to say whether or not the apex is ever spined in the type. It is astonishing to find such minute and apparently meaningless characters reproduced with such fidelity in specimens from such widely different localities.

There can be little doubt that Bowerbank's type came from the West Indies. Bowerbank [1864], it is true, queried the locality ("West Indies?") but Carter and Gray both accepted it without question, and, moreover, Carter mentions another fragment obtained from the West Indies by Mr Higgin\*. I have a preparation of this also in the Carter cabinet and, although it consists of only a few spicules, I am satisfied that it represents a specimen of *Cyamon vickersii*. Carter, however, subsequently [1880 B] identified this

\* Compare Higgin [1877, p. 296, Pl. XIV. fig. 9].

specimen with his *Microciona* (*Cyamon*) *quadriradiata*, from the Gulf of Mauaar, an identification which can, I think, hardly be maintained, unless, indeed, *Cyamon quadriradiatum* should prove to be merely a young, encrusting form of *C. vickersii*.

Topsent [1889] says that the species—which he calls *Trikenitron wickersii*—is common on the Campeachy Bank (Gulf of Mexico) and that it is always more or less encrusting and generally thin. As, however, he does not mention the peculiar bulbous styli it must be considered a little doubtful whether his identification is correct.

*Previously known Distribution.* West Indies (Bowerbank, Carter, Higgin); ? Campeachy Bank, Gulf of Mexico (Topsent).

*Register Number, Locality, &c.* cix., Amiran, 11.10.05, E. 11, 25—30 fathoms.

### Sub-family *Axinellinae*.

Lipochealous Desmacidonidae in which the skeleton is typically arranged in a plumose fashion. The megascleres are usually stylote, sometimes oxote. There are no acanthostyles.

The so-called Axinellid sponges have long been felt to form a very unsatisfactory group. The genus *Raspailia*, formerly included therein, has long since been removed to the Ectyoninae, on account of the occasional acanthostyles which it possesses. The genera *Axinella*, *Phakellia* and *Acanthella*\* may be regarded as the most typical representatives of the group as now generally accepted. These seem to be nearly related, through *Bubaris*, to the genus *Microciona*, and this relationship might appear to justify one in regarding the whole group as an offshoot of the Ectyoninae in which both cheke and acanthostyles have disappeared. I fear that no such simple view as this can be maintained and that the Axinellinae are still of polyphyletic origin. In addition to those of ectyonine origin, some of them may be descended directly from esperelline ancestors, others from Haploscleridae, but it seems impossible, in the present state of our knowledge, to sort them out. That they do not form an important, independent family, of the same rank as the Haploscleridae or Desmacidonidae, seems certain. In my Report on the Okhamandal Sponges [1916 A] I placed all the Axinellinae species amongst the Haploscleridae, but, in accordance with the views expressed in the earlier portions of the present memoir, it seems more probable that most of them, at any rate, are reduced Desmacidonidae, as a sub-family of which I therefore propose to regard them. They may be divided conveniently into two sections—the Axinellinae without acanthoxea and the Heteroxyena with them. Both these sections are well represented in the "Sealark" collection.

Since this Report was first completed I have seen the recent papers of Hallmann [1916, 1917 A, 1917 B] in which the author proposes a number of new genera of Axinellid sponges and a new classification of the group. It is impracticable to discuss these papers in the space and time now at my disposal, but I do not as yet see any reason for altering the views expressed in the present memoir.

### Section AXINELLEAE.

Without acanthoxea.

\* For an interesting discussion of the characters of these genera vide Vosmaer [1912].



## Genus SIGMAXINELLA Dendy [1897].

Axinellæ with microscleres in the form of sigmata or trichodragmata (trichites) or both.

Hallmann [1916, 1917 A], in his recent revision of the genera of Axinellid sponges containing microscleres, has proposed to break up this genus. I am not, at present at any rate, prepared to adopt his views; on the contrary, I propose to enlarge my original conception of the genus Sigmaxinella by including in it species which contain trichodragmata only, without sigmata, as well as species which contain sigmata without trichodragmata.

92. *Sigmaxinella bihamigera* n. sp.

(Plate 16, fig. 6 a—c.)

The single specimen, which is attached to a mass of calcareous debris, is massive, sessile, irregular; roughly in the form of a triangular pyramid, with broad base, and with apex unequally cleft, as if incipiently branching. Surface uneven, rough, and more or less strongly hispid in places, especially towards the apices. Vents rather small and inconspicuous, rather numerous, grouped on the apical portions of the sponge amongst the projecting spicules. Height of specimen 25 mm., breadth at base about the same. Texture rather hard and only slightly compressible, colour in spirit light yellowish brown.

The main skeleton consists of loose, sub-plumose columns of large styli, radiating towards the surface, where the apices of the terminal styli project more or less. The bases of the styli always appear to be directed inwards. There is no special dermal skeleton.

*Megascleres*:—Large, stout styli (Plate 16, fig. 6 a), more or less curved or bent, especially towards the base. The spicule diminishes gradually in diameter towards the base, which is evenly rounded off, and more gradually towards the apex, which is moderately sharply and often more or less abruptly pointed. The full-grown spicule measures about 1.4 by 0.05 mm. A few very slender styli which occur appear to be young forms and are connected by intermediates with the stout ones.

*Microscleres*:—(1) Large sigmata (fig. 6 b), with short, sharply pointed, incurved ends, one of which is twisted out of the principal plane of the spicule, but not sufficiently to give to the spicule an S-shaped form as it lies on the slide. Length from bend to bend about 0.05 mm., thickness in the middle about 0.0027 mm.

(2) Small, slender, very slightly contort, C-shaped sigmata (fig. 6 c), length about 0.0164 mm.

The large sigmata, in particular, are extraordinarily abundant in the mesoglea, which, in fact, is densely charged with them. Only a relatively small number of intermediates between the large and small forms occur.

This species appears to be quite distinct from any previously described. The typical axinellid form and arrangement of the megascleres induces me to place it in Sigmaxinella rather than in Desmacella, but the two genera are possibly nearly related.

*Register Number, Locality, &c.* XXIII., Providence, 4.10.05, D. 8, 125 fathoms.

93. *Sigmaxinella durissima* (Dendy).*Thrinacophora durissima* Dendy [1905].

This species, of which only a single specimen was obtained by Professor Herdman in Ceylon, is represented in the "Sealark" collection by a considerable number of specimens from various localities. The arrangement of the skeleton and the form and size of the spicules are remarkably uniform throughout and agree closely with the corresponding features of the type specimen. As regards external form, however, the specimens may be grouped in three well-marked varieties, all of which differ more or less strikingly from the type, and which seem well worthy of being distinguished by separate varietal names.

The species has hitherto been placed in the genus *Thrinacophora* Ridley. The type of that genus, *R. funiformis* R. and D. [1887], however, is a much more specialized sponge, both as regards the arrangement of the skeleton, with its well-defined central axis, and its peculiar spiculation; and the mere presence of trichodragmata no longer appears to me to constitute sufficient justification for associating with it such species as *Sigmaxinella durissima*.

*Previously known Distribution.* Ceylon Seas (Dendy).

93 a. *Sigmaxinella durissima* (Dendy) var. *massalis* nov.

(Plate 5, fig. 4, Plate 7, fig. 4.)

Sponge (Plate 5, fig. 4, Plate 7, fig. 4) massive, rounded, or at least strongly convex above, irregular; either quite free or with a more or less extensive attachment to the substratum. Vents numerous, scattered, rather large (about 4 mm. in diameter), conspicuous, in some specimens slightly prominent, leading out of deep, wide oscular tubes. The largest specimen (R.N. LXXI. 1) is subglobose, but irregular, and no less than 80 mm. in maximum diameter. It appears to have lain quite freely on the sea-bottom and shows no indication at all of any attachment, while the vents are scattered at irregular intervals pretty well all over the surface, with which their margins are level. Another specimen (R.N. XVIII.) is cushion-shaped, strongly convex above and flattened below, with a large area of attachment. It has numerous large vents on the upper surface, with prominent margins. Another (R.N. XIX. 2) is turbinate, with greatly constricted base of attachment and numerous prominent vents on the upper surface.

This variety perhaps approaches most nearly to the type of the species, from which it differs in the large, conspicuous vents.

*Register Numbers, Localities, &c.* XVIII, XIX. 2, XX. 5, Providence, 4.10.05, 29—78 fathoms; LXXI. 1, Amirante, 17.10.05, E. 21, 30 fathoms.

93 b. *Sigmaxinella durissima* (Dendy) var. *erecta* nov.

(Plate 7, fig. 5 a, b.)

Sponge (Plate 7, fig. 5 a, b) vertically elongated, finger-like, unbranched (? always); attached to the substratum at the lower extremity; cylindrical or somewhat compressed, bluntly rounded at the apex. Vents small (about 2 mm. in diameter), shallow, without prominent margins; scattered all over the surface or with some tendency to form longi-

tudinal rows. The largest specimen (R.N. CXXX. 2 A) measures 120 mm. in height by 31 mm. in diameter, and tapers only slightly towards the apex.

*Register Numbers, Localities, &c.* VIII. 5, Saya de Malha, 6.9.05, C. 15, 55 fathoms; CXXXIII. 2 A, B, Seychelles, F. 9, 37 fathoms; CXXXVII. 1, Seychelles, 20.10.05, F. 4, 39 fathoms.

X 93 c. *Sigmatinella durissimae* (Dendy) var. *tethyoides* nov.

(Plate 7, fig. 6 a, b.)

Sponge (Plate 7, fig. 6 a, b) spherical or nearly so; attached by a more or less restricted area to fragments of nullipore. Surface thickly covered with small, low conuli separated by meandering grooves covered in by the pore-bearing dermal membrane. Vents numerous but rather inconspicuous, small (up to 3 mm. in diameter), shallow, without prominent margins, scattered irregularly all over the surface.

This very pretty and distinct variety bears a remarkable resemblance to a small species of *Tethya*, a resemblance which was probably augmented in life by a deep orange colour, which still remains to a large extent in the preserved specimens. (It is not absolutely certain, however, that this colour is natural.) There are six specimens in the collection, all from the same locality. The largest measures 24 mm. in maximum diameter and the smallest 16 mm.

*Register Number, Locality, &c.* VII. 2, Saya de Malha, 6.9.05, C. 15, 55 fathoms.

#### Genus AXINELLA Schmidt [1862].

Axinellae of varying habit, not flabellate, without microscleres. Skeleton consisting either of a central axis of spiculo-fibre from which brushes of spicules radiate to the surface or of parallel plumose columns of megascleres. Megascleres typically stylote.

It is more than likely that we shall ultimately have to restrict the scope of this genus in the manner indicated by Vosmaer [1912], but at present I make use of it in the wider sense which I have hitherto employed in order that I may be able to include therein certain species which I should otherwise not know where to place pending a much needed revision of the Axinelline genera.

94. *Axinella bubarinoides* n. sp.

(Plate 17, fig. 1 a—b.)

There are half a dozen specimens of this interesting little sponge in the collection, all closely resembling one another in external characters, skeleton arrangement and spiculation. They are all low-growing and cushion-shaped, and several of them are still attached to fragments of nullipore, from which, however, they show a strong tendency to free themselves in the course of their growth. The shape of the specimens is irregular. The upper surface tends to be somewhat flattened and in some specimens is marked by narrow, convergent grooves. It also shows numerous minute round openings, scattered generally and in the grooves, which may represent vents. Otherwise it is even, not conulose. It may be slightly hispid in places. The largest specimen measures about 26 mm. in greatest breadth and 8 mm. in thickness in the middle. The colour in spirit is light brownish yellow. The texture is firm and compact, scarcely compressible, radially columnar.

The skeleton is composed of stout, close-set, plumose columns of bent styli. These columns branch as they approach the surface, but there appear to be no transverse connecting fibres. The component spicules have their bases felted together in the axis of the column and perhaps united by a little spongin, though the latter is not conspicuous. Their apices project obliquely outwards, and, at the ends of the columns, hispidate the surface. Between the columns a few much longer, isolated styli occur, arranged radially with their apices outwards.

*Megascleres*.—(1) Short, stout, smooth styli (Plate 17, fig. 1 a); more or less bent at the base, and sometimes very strongly so, so as to resemble a hockey-stick; thickest towards the middle; base broadly rounded, apex gradually and sharply pointed. Size very variable, commonly about 0.48 by 0.034 mm.

(2) Long, slender, smooth styli (fig. 1 b); almost straight; tapering very gradually to the finely pointed apex, thickest near the base, which is broadly rounded. Size variable; a typical example measured 1.27 by 0.025 mm.; but both longer and shorter forms occur.

I have also seen a very small number of bent oxea. These appear to be merely abnormalities of the stout styli and are too few to be regarded as an essential element of the spiculation.

There are no microscleres.

This species is very interesting on account of its obvious relationship to species of the genus *Bubaris*, from which it differs in the absence of the basal layer of diactinal megascleres.

The form of the stout styli often resembles that of the "rhabdostyle" of *Rhabderemia*.

A very curious phenomenon of resorption is sometimes to be observed in the case of these spicules. In R.N. CXXII. 1 A all degrees of resorption of the silica may be seen, until finally nothing remains but an empty mould formed by the spicule sheath. The solution of the silica appears to take place from the axial canal and the outer surface simultaneously, so that, before finally disappearing, the spicule is reduced to a thin-walled tube.

*Register Numbers, Locality, &c.* R.N. CXXII. 1 A—F, Salomon A, 3.7.05, 75 fathoms

X 95. *Axinella spiculifera* (Lamarck).

(Plate 8, fig. 7.)

*Spongia spiculifera* Lamarck [1813].

*Axinella spiculifera* Ridley [1884 c].

There are two good specimens of this little-known species in the collection. As they agree very closely with Ridley's description and come from the same locality, I do not think there can be any doubt as to their specific identity with his specimen, and as he was able personally to examine a Lamarckian specimen, his identification with the latter is probably also correct.

The larger of the two "Sealark" specimens (Plate 8, fig. 7) consists of three short, thick branches arising from a common base, but two of them are fused together laterally for almost their entire length to form a flattened lobe, bifid at the top. The surface is strongly conulose and honeycombed by round openings between the conuli, exactly as described by Ridley. The total height is about 60 mm. and the individual branches are about 16 mm. thick and broadly rounded at the apex. The colour in spirit is pale brownish yellow,

perhaps slightly stained by other specimens. The second specimen is closely similar but consists of only a single finger-shaped process, arising from a spreading base which encrusts a nullipore. It is rather paler in colour.

The skeleton is a fairly close and not very well defined reticulation of spicular fibre, containing a considerable amount of very inconspicuous spongin. The primary lines are plurispicular and scarcely plumose; they are connected by often unispicular secondaries. The spicules are more or less curved, smooth styli, broadly rounded at the base and gradually sharp-pointed at the apex. They measure, in R.N. xcii. 3, about 0.3 by 0.0123 mm., being decidedly more slender than in Ridley's and Lamarck's specimens. In R.N. cv. 2, however, they may be rather stouter than in R.N. xcii. 3. In both specimens the mesoglea contains an immense number of rounded granular cells, probably pigment cells, about 0.016 mm. in diameter, now of a pale yellowish colour.

*Previously known Distribution.* King Island, Australia (Lamarck); Amirantes (Ridley).

*Register Numbers, Localities, &c.* xcii. 3, cv. 2, Amirante, E. 2 and E. 6, 9.10.05, 28 and 29 fathoms.

#### Genus PHAKELLIA Bowerbank [1864].

Axinellæ of compressed, flabellate (or cup-like) form. Without microscleres.

As in the case of Axinella I retain this genus in the wide sense in which I have hitherto employed it, merely as a provisional measure.

#### 96. *Phakellia donnani* (Bowerbank).

*Isodictya donnani* Bowerbank [1873 n].

*Phakellia donnani* Dendy [1905, 1916 A].

*Axinella donnani* Dendy [1887, 1889].

*Phakellia donnani* Row [1911].

This common Ceylon species is represented in the collection by three cup-shaped specimens with short stalks and more or less folded walls, altogether very typical as regards external form. Two have been dried and one is in spirit and all are rather dark brown in colour. The spiculation is not quite so typical, for the styli are considerably larger than is usual in Ceylon and Indian specimens, commonly measuring about 0.48 by 0.026 mm., though numerous much more slender forms may also occur.

*Previously known Distribution.* Gulf of Manaar, Ceylon Seas (Bowerbank, Dendy); Okhamandal (Dendy); Red Sea (Row).

*Register Numbers, Localities, &c.* xxxii., Cargados Carajos, 30.8.05, B. 17, 30 fathoms; cxlii., cxliii., Cargados Carajos, 30—35 fathoms.

#### 97. *Phakellia conulosa* n. sp.

(Plate 6, fig. 4, Plate 17, fig. 2 a, b.)

The single specimen (Plate 6, fig. 4) is a proliferously lamellar sponge, greatly constricted towards the base of attachment so as to form a very short, thick stalk. The principal lamella gives off secondary lamellæ almost at right angles. The lamellæ are only about 3 mm. thick and have a narrow, slightly sinuous margin. Both surfaces of the lamellæ are thickly beset with small conuli, which often unite in longitudinal ridges running towards the margin. The apices of the conuli are often slightly hispid with projecting spicules.

Between the conuli, where the surface is uninjured, stretches a thin, glabrous dermal membrane. To the naked eye the two surfaces of the lamella appear similar but under a lens the dermal membrane appears, at any rate in places, to be minutely reticulate only or chiefly on the one surface. This is probably the inhalant surface. The other surface bears a few minute, scattered apertures which may represent vents; they are, however, very inconspicuous and seem to be not altogether wanting on the inhalant surface also. Indeed I am not quite sure whether the two surfaces are distinguishable from one another. When the specimen is examined against the light a few small perforations can be seen running at right angles through the thickness of the lamina and blocked at one end (or possibly both) by the dermal membrane. The colour in spirit is light brown, with a pinkish tinge in places\*. The texture is tough, flexible, resilient. The total height of the specimen is 1.15 mm., the greatest breadth 1.19 mm.

The skeleton is very lax and irregular, consisting of loose tracts or bundles of styli held together by a large quantity of very pale-coloured spongin, almost invisible in Canada balsam. There is very little condensation in the middle of the lamella. The spicule-tracts run upwards and outwards into the surface conuli and numerous irregularly scattered spicules lie between them.

*Spicules.*—Smooth styli, of two chief kinds but not by any means sharply distinguished from one another.

(1) Stout and comparatively short (Plate 17, fig. 2 a), often a good deal bent; typical size about 0.69 by 0.03 mm.

(2) Long and comparatively slender (fig. 2 b); typical size about 1.5 by 0.02 mm.; sometimes a good deal more slender. Both kinds are broadly and evenly rounded off at the base and more or less gradually and sharply pointed at the apex. The shorter ones are the more numerous but the others are also plentiful.

This is a very beautiful species, characterized chiefly by its strongly conulose surface, which causes it to resemble somewhat an Acanthella. It has not, however, the characteristic cartilaginous texture of that genus.

*Register Number, Locality, &c.* xlii. 13, Cargados Carajos, 30.8.05, B. 9, 30 fathoms.

#### 97 a. *Phakellia conulosa* var. *mauritiana* nov.

(Plate 6, figs. 5, 5 a.)

The single specimen (Plate 6, figs. 5, 5 a) is stipitate, flabellate, with an irregularly undulating margin and without proliferations. The lamina is supported on four distinct, short stalks, joined together below in the basal attachment plate. The inhalant and exhalant surfaces of the lamina are sharply differentiated from one another. The former is covered with close-set, small conuli, which tend to unite in longitudinal ridges, running towards the margin. The apices of the conuli are often slightly hispid with projecting spicules. Between the conuli is stretched a thin, minutely reticulate, pore-bearing dermal membrane (rubbed off in places). The exhalant surface is more coarsely rugose, with a network of low, rounded ridges. A thin dermal membrane partially covers the depressions between these ridges, but is pierced by numerous circular apertures about 1.5 mm. in

\* Possibly stained by other sponges in the same jar.

diameter, around which the thin edge of the dermal membrane appears like a sphincter. These apertures lead into cylindrical canals which run more or less at right angles through the lamina, being closed at the other end by the pore-bearing dermal membrane. The canals may also be closed on the exhalant surface by an imperforate dermal membrane, so that they may be either closed at both ends or closed at one end and open at the other. Two or more canals often open on the exhalant surface by a common aperture. These features can readily be observed when the specimen is examined against the light by means of a pocket-lens. The raised portions of the exhalant surface are finely granular and minutely and sparsely hispid, and contain a good many imbedded sand-grains.

The maximum height of the specimen is 113 mm., the greatest breadth 132 mm., the thickness of the lamina about 5 mm., the length of the separate stalks about 17 mm. The colour in spirit is dark chocolate brown, but histological examination of thin sections shows that this is almost certainly largely artificial. It is probably chiefly due to staining by a specimen of *Plocamnia massalis* obtained at the same time and perhaps originally in the same jar. Texture rather rigid, but flexible, resilient and fairly tough.

The skeleton is an irregular and lax reticulation of ill-defined spicular fibre and separate spicules, held together by an abundance of spongin. There is a slightly developed condensation in the middle of the lamella, from which primary fibres run outwards into the conuli on both surfaces. These are connected by secondary fibres running more or less at right angles to them, but the whole arrangement is extremely irregular.

*Spicules*.—Smooth styli of two principal kinds but by no means sharply differentiated from one another.

(1) Comparatively short and stout; more or less curved or crooked, broadly rounded at the base, fairly gradually and sharply pointed at the apex; commonly measuring about 0.65 by 0.034 mm.

(2) Long and slender; may be slightly curved; broadly rounded at the base, gradually and finely pointed at the apex; size about 1.4 by 0.017 mm. These are very scarce.

As the specimen is well preserved it seems desirable to add some particulars as to the canal-system and histology, which are of considerable interest. Vosmaer [1885 B], in describing his *Phakellia bowerbanki*, gives a diagram showing the principal canals running right through from surface to surface of the frond. In the Report on the "Challenger" Monaxonida I myself figured the canal-system of *Phakellia ventilabrum* var. *coneziva*. In this case I thought I could distinguish between inhalant and exhalant principal canals, interdigitating with one another and neither running right through the frond. I am convinced now, from re-examination of my original sections and from comparison of *P. conulosa* var. *mauritiana*, that I was wrong, and that the main canals run right through from side to side as Vosmaer described. Vosmaer was unable to find the flagellate chambers in his sponge and suggested that as the water can flow through and through the body the natural movements of the water would probably suffice for the requirements of the sponge. I had, however, no difficulty in finding the flagellate chambers in *P. ventilabrum* var. *coneziva*, and the same is true of *P. conulosa* var. *mauritiana*, in which they are subspherical, about 0.029 mm. in diameter, and almost certainly eurypylous. It seems a very extraordinary thing that the pore-sieves should lead directly into what appear to be the exhalant canals,

so that water can pass right through the sponge without passing through the flagellate chambers, but it is probable that the principal canals should be regarded simply as perforations of the lamella, enclosed in the process of growth, and that the pore-sieves which cover them in at one end are not ordinary inhalant openings. The latter are probably to be found either on the surface of the sponge between the groups of pores which lead into the main canals, or in the walls of these canals themselves. It is easy to see that numerous smaller exhalant canals open into the main canals.

The dermal membrane of the inhalant surface in this variety exhibits a minutely reticulate character quite apart from that caused by the presence of the pores, and on a larger scale. This is due to the presence of a network of fibrillar bands, separating the small, rounded or oval pore-areas from one another.

This variety is no doubt closely related to the typical *Phakellia conulosa*, being distinguished chiefly by the much more obvious differentiation between the two surfaces of the lamella and the much better developed principal canals, with their distinct exhalant openings at one end and pore-sieves at the other.

*Register Number, Locality, &c.* CXXVI. 1, Mauritius, 23.8.05, A. 2, 100 fathoms.

Genus ACANTHELLA Schmidt [1862].

Axinellæ of usually flabellate form and more or less cartilaginous consistence. With more or less strongly aculeate or conulose surface. Without microscleres.

X 98. *Acanthella carteri* Dendy.  
(Plate 5, fig. 5.)

*Acanthella carteri* Dendy [1889, 1905].

*Acanthella aurantiaca* Keller [1889].

*Acanthella aurantiaca* Topsent [1906 g].

*Acanthella aurantiaca* Row [1911].

This common Indian Ocean species is represented in the collection by several specimens, some of which are very fine examples. In my Report on the Ceylon Sponges [1905] I suggested that Keller's *Acanthella aurantiaca* might be identical with *A. carteri*; this view I may now definitely adopt. Keller's description was published in the same year as my own, but some months later.

One of the specimens (LXVI.), when received, still retained its characteristic deep orange colour, and the alcohol in which it was preserved was also coloured orange. Fortunately it was in a jar by itself.

R.N. CXXXIII. 1 (Plate 5, fig. 5) was preserved in formalin and illustrates very well the effect of this preservative, being reduced practically to a mere skeleton. Its appearance has been thereby so altered that I at first quite failed to recognize it as belonging to this species. Keller (1889) has given an excellent coloured figure of the external form of the sponge, apparently taken from life.

*Previously known Distribution.* Gulf of Manaar (Dendy); Red Sea (Keller, Row, Topsent).

*Register Numbers, Localities, &c.* XLII. 9, XLIII. 6, Cargados Carajos, 30.8.05, B. 9 and 13, 30 fathoms; LXVI., LXIX. 1, Diego Garcia, 14 fathoms; XCV., Amirante, 18.10.05, E. 25, 20—44 fathoms; CXX. 1, Salomon, 10—14 fathoms; CXXXIII. 1, Seychelles, F. 9, 37 fathoms.

99. *Acanthella pulcherrima* Ridley and Dendy var. *calyx* nov.

(Plate 5, fig. 6.)

*Acanthella pulcherrima* Ridley and Dendy [1886, 1887].

The typical form of this sponge, from Torres Straits, figured in the Report on the "Challenger" Monaxonida, is remarkable for its beauty, but the variety obtained by the "Sealark" Expedition at Cargados Carajos is still more elegant, having the form of a stalked goblet attached to a piece of dead coral (Plate 5, fig. 6). The total height of the specimen is about 85 mm., and the maximum breadth of the cup about 63 mm. The cup is deep and funnel-shaped and rather thin-walled. The stalk is about 13 mm. in length and 5 mm. in diameter. The inner and outer surfaces of the cup are similar, beset with close-set longitudinal ridges, more or less broken up into small spines or conuli, much as in the type of the species. Neither pores nor vents are recognizable, both being probably covered over by the dermal membrane, which is presumably provided with pore-sieves in life. The colour in spirit is light brown.

The skeleton arrangement and spiculation closely resemble those of the type. The slender strongyla—sinuous in boiled-out preparations—seem to be a good deal longer, sometimes measuring at least 1.3 by 0.0086 mm., but very variable. The styli (sometimes becoming oxeote) are also perhaps a little larger.

*Previously known Distribution of the Species.* Torres Straits (Ridley and Dendy).

*Register Number, Locality, &c.* LXXVIII. 9, Cargados Carajos, 28.3.05, B. 2, 30 fathoms.

X 100. *Acanthella cavernosa* n. sp.  
(Plate 7, fig. 7; Plate 17, fig. 3 a—b.)

The single specimen (Plate 7, fig. 7) is massively lobose, swollen, with a contracted base of attachment, almost forming a short, thick stalk. The surface is covered with coarse aculeations, mostly blunted, between which is stretched the glabrous, parchment-like dermal membrane, interrupted here and there by large pseudoscula, which lead into the very cavernous interior of the sponge. The total height is 65 mm., the maximum diameter 45 mm. Texture compressible, resilient. Colour in spirit, yellowish grey, with a pinkish tinge in places.

The skeleton as a whole is tree-like, with the branches terminating in the surface conuli. Each branch may be regarded as a very stout fibre, about 1.0 mm. in diameter, composed of a very dense feltwork of slender spicules, many of which echinate its surface. If there is any spongin at all in these fibres it is very inconspicuous. The fibres are rather distant from one another and between them the mesoglea is free from spicules. There is of course no dermal skeleton and only on the conuli is there sometimes a slight indication of hispidation.

*Spicules:*—(1) Slender styli (Plate 17, fig. 3 a), nearly straight or more or less crooked; varying greatly in length up to about 0.88 mm. and in diameter up to about 0.011 mm.; base evenly rounded off, apex usually gradually and sharply pointed, often irregular.

(2) Slender strongyla (fig. 3 b), usually longer than the styli and sinuous in boiled out preparations; length up to about 1.3 mm., diameter up to about 0.011 mm.

As regards external form this species seems to come nearest to the type specimen of Carter's *Acanthella stipitata* [1881 c], which seems to be the common species on the South coast of Australia. In that species, however, the strongyla, so abundant in *A. cavernosa*, are either absent or feebly developed. As regards spiculation the "Sealark" sponge makes a newer approach to the Japanese species described [1898] by Thiele (*A. vulgata* and others which are probably identical); but the external form is very different. A supposed variety of *A. stipitata* from Torres Straits, described in the Report on the "Challenger" Monaxonida, may be specifically identical with *A. cavernosa* but has shorter spicules. From the common Indian Ocean species, *A. carteri*, *A. cavernosa* is distinguished both by external form and by the presence of the numerous long, slender strongyla. The species of *Acanthella* are, however, extremely difficult to discriminate, and there is no doubt that far too many have already been proposed, so that it is with considerable reluctance that I suggest a new one.

*Register Number, Locality, &c.* LXXI. 7, Amirante, 17.10.05, E. 21, 30 fathoms.

## Genus AULETTA Schmidt [1870].

Axiellere of tubular form, with vents at the apices of the branches. Skeleton composed of megascleres (stylote, strongylote or oxeote) arranged chiefly in longitudinal bands and radiating towards the surface in tufts. No microscleres.

101. *Auletta elongata* Dendy.*Auletta elongata* Dendy [1905].*Auletta elongata* var. *fruticosa* Dendy [1916 A].

This species is represented in the collection by three specimens, two from Amirante and one from Cargados Carajos. They all differ from the type of the species in their shorter branches (tubes) and more bushy habit; R.N. c., in particular, closely resembling the figure of *Auletta elongata* var. *fruticosa* given in my Okhamandal Report [1916 A]. The average length of the spicules, however, appears to be much greater than in that variety and in R.N. xxix. 1 the strongyla may attain a length of 2.67 mm. These long strongyla, more or less sinuous in boiled out preparations, appear to be very characteristic of the species.

*Previously known Distribution of Species.* Ceylon, Gulf of Manaar, Okhamandal (Dendy).

*Register Numbers, Localities, &c.* xxix. 1, Cargados Carajos, 3.10.05, B. 24, 30 fathoms; c., Amirante, 11.10.05, E. 10. 22—85 fathoms; cil. 1, Amirante, 18.10.05, E. 25, 44—20 fathoms.

102. *Auletta lyrata* (Esper) var. *brevispiculata* Dendy [1905].

A fragment of an *Auletta* from Cargados Carajos is almost certainly referable to this variety. It consists of portions of two very thick-walled tubes fused together laterally for almost their entire length. In one the free end remains perfect and shows a saucer-shaped terminal depression with a sphinctrate vent. The surface is slightly rugose, with a finely reticulate dermal membrane between the rugosities, and very slightly hispid in places.

The skeleton is much more typically "Axinellid" than usual in the genus, consisting chiefly of distinctly plumose columns of short spicules curving outwards to the surface but connected by spicule bundles and single spicules crossing at right angles between adjacent columns. A good deal of very pale-coloured and inconspicuous spongin is present around the spicules, at any rate in places. Many spicules are irregularly scattered between the columns. The spicules are all rather short, usually stout, more or less bent styli and oxea, measuring about 0.34 by 0.017 mm. when fully grown.

It may be necessary, when we know more about the range of variation, to raise this variety to specific rank.

*Previously known Distribution of the Variety.* Gulf of Manaar (Dendy).

*Register Number, Locality, &c.* XXXV., Cargados Carajos, 30.8.05, B. 13, 30 fathoms.

#### Genus HYMENIACIDON Bowerbank [1864].

Axinellere in which the skeleton is a reticulation of spicular fibre or a feltwork of loose spicules, with or without spongin. Without a special dermal crust of tangential spicules. Megascleres stylote to tylostylote (? sometimes oxeote). No microscleres.

This is a very unsatisfactory genus, however it may be diagnosed. It is evidently composed of species with a much reduced spiculation, possibly derived in part from an Ectyonine line of ancestry through some such form as *Hymedesmia lipochela*, in which the spiculation is already reduced to smooth subtylostyli and tylostyli. It is, indeed, very probable that it is not a natural genus at all but a polyphyletic group derived from various sources.

#### 9x 103. *Hymeniacion variospiculata* n. sp. (Plate 17, fig. 4.)

The single specimen appears to be part of an encrusting sponge which has been cut off from its base of attachment. Its present thickness is not more than 3 or 4 mm. except where it rises up in a low projection bearing a single relatively large vent, 3 mm. in diameter, which forms the termination of a deep, cylindrical, oscular tube. The margin of the vent is destitute of any membranous extension. The surface, except immediately around the vent, exhibits a very characteristic meandriniform pattern, due to the presence of a network of strongly developed subdermal cavities, covered over with a very thin, transparent dermal membrane which is reduced to a sieve by the very numerous inhalant pores. The specimen measures about 21 mm. by 13 mm. in length and breadth. The texture is firm but somewhat cavernous internally. The colour in spirit is light brown.

The main skeleton is a dense and thoroughly confused feltwork of single spicules of very various sizes. In the interior of the sponge they appear to be completely without definite orientation, but in the solid trabeculae which separate the subdermal cavities they mostly lie more or less at right angles to the surface and often with their apices projecting slightly beyond it. There also appear to be more of the smallest spicules in those situations than elsewhere, and these may even show a tendency to arrange themselves in very feebly developed dermal brushes. Another noteworthy feature is the presence of a large quantity of sand in the tissues between and immediately beneath the subdermal cavities.

There is no dermal skeleton.

*Spicules* (Plate 17, fig. 4). Smooth styli and subtylostyli (or tylostyli) of various shapes and sizes, connected by intermediates. The following may be taken as typical: (a) Long, stout, more or less bent or crooked; evenly rounded off or slightly enlarged at the base, which is a little narrower than the middle; tapering very gradually to the apex which is usually sharply pointed but may be more or less blunted. Size about 0.9 by 0.039 mm. (b) Similar to the above and of about the same length, but only about 0.017 mm. in diameter, or even less. (c) Short and slender, with well-developed, rounded head and gradually and sharply pointed apex; slightly curved; size about 0.2 by 0.0086 mm. or even less sometimes. Some of the larger spicules, at any rate, instead of being simply tylote, have a slight annular thickening situate at a varying distance from the basal end.

*Register Number, Locality, &c.* CXXII. 7, Salomon A, 3.7.05, 75 fathoms.

#### 104. *Hymeniacion conglomerata* n. sp.

(Plate 8, fig. 8; Plate 17, fig. 5 a—b.)

There are two specimens of this sponge in the collection, which are very likely parts of the same colony. Each consists of an agglomeration of rather slender, frequently anastomosing branches, terminating here and there in short, free apices (Plate 8, fig. 8). The branches are about 3 mm. in diameter and are attached here and there to fragments of calcareous debris. Their surface is marked by a feebly developed reticulation of low ridges and conuli and is slightly hispid. The vents appear to be small and scattered. The colour in spirit is light brown. The texture is compressible and resilient, fairly tough.

The skeleton is a confused reticulation of spicules, some of which are united together in fibres by a large amount of pale-coloured spongin. The principal fibres run lengthwise and the arrangement of the spicules in them is very lax. Individual spicules and loose bundles of spicules radiate obliquely outwards to the surface, especially to the conuli, beyond which their apices frequently project. The radiating bundles may have a slightly plumose character. There is no special dermal skeleton but the thin, transparent dermal membrane is stretched between the conuli.

The spicules are long, smooth styli (Plate 17, fig. 5 a), all rather slender but varying considerably in shape and dimensions. They are more or less curved or crooked, evenly rounded off at the base, usually more or less gradually sharp-pointed but often irregular and sometimes blunted at the apex. They measure up to about 0.9 by 0.022 mm. but are usually more slender; sometimes very slender (perhaps young). A few tylostyli (fig. 5 b), with rounded heads, also occur; these do not appear to attain so great a length as the styli. There are also a few strongyla.

The dermal membrane of this sponge and, to a less extent, the deeper tissues, contain a variable number of curious spherical bodies, commonly about 0.028 mm. in diameter. These have a radially striated structure towards the periphery while the middle is usually occupied by a large number of minute dark granules that look like pigment-granules. I am pretty sure, however, that these bodies are artificial concretions and not pigment cells.

*Register Numbers, Locality, &c.* LXXVIII. 12, 16, Cargados Carajos, 28.3.05, B. 2, 30 fathoms.

Genus *Leucophleus* Carter [1883 F].

Axinellæ of massive habit, often clathrous. Main skeleton a reticulation or feltwork of loose spicules or spicular fibre with little or no spongin. Dermal skeleton well developed, usually as a crust of tangentially placed spicules. Megasccleres typically stylote, sometimes oxeote. No microsccleres.

105. *Leucophleus fenestratus* Ridley.

*Leucophleus fenestratus* Ridley [1884 c].

*Hymeniacion fenestratus* Lindgren [1898].

The specimen is a good deal damaged, but in its highly cavernous character, with numerous wide cavities separated by thin partitions, it evidently agrees closely with the type, as described by Ridley. The general form is massive, with very uneven, much folded, but almost glabrous surface. It measures about 83 mm. in length, with an average breadth of about 35 mm. The texture is rather friable, the colour in spirit pale yellowish grey.

The main skeleton is a dense, confused feltwork of fairly large and stout styli, with a tendency to arrange themselves in ill-defined bundles. The dermal skeleton consists, in places at any rate, of a dense feltwork of smaller styli, or subtylostyli, arranged tangentially.

The larger styli are usually more or less crooked and are characterized by the often very conspicuous narrowing of the base; they measure up to 0.8 by 0.026 mm. The smaller subtylostyli vary greatly in size, say about 0.25 by 0.007 mm., but they are connected with the larger forms by innumerable gradations. These smaller forms are not mentioned by Ridley in his original description but we pointed out in the Report on the "Challenger" Monaxonida (p. 169) that small surface spicules do occur in this species.

In *L. subacervatus* Ridley and Dendy [1887], which is evidently very closely related to *L. fenestratus*, there appears to be a much sharper distinction between the larger styli of the main skeleton and the small surface spicules, and the latter are characteristically arranged at right angles to the surface, but very sparsely. I suspect that there is much variation in this respect, however.

*Previously known Distribution.* Port Darwin (Australia), Arafura Sea, Providence (Mascarenes) (Ridley); Coast of Cochin China (Lindgren).

*Register Number, Locality, &c.* VIII. 4, Saya de Malha, 6.9.05, c. 15, 55 fathoms.

Genus *Spongisorites* Topsent [1896 A].

Axinellæ in which the main skeleton is a dense, confused feltwork of oxea of very various sizes; some of the smaller oxea, arranged tangentially, usually form a dermal skeleton. No microsccleres.

This genus was originally proposed by Topsent in 1896 for his *Spongisorites placenta* and placed in the family "Coppatiidæ." Two years later [1898 c] the same author proposed the genus *Anisoxya*, also characterized by the absence of microsccleres and the presence of oxea of very various sizes, but supposed to differ from *Spongisorites* in the nature of the ectosome, the structure of the choanosome, &c. This genus has also been placed by its author [1904 A] in the "Coppatiidæ" but the name *Anisoxya*, being pre-occupied, has been replaced by *Topsentia* [Berg 1899].

As there does not seem, in the present state of our knowledge, to be any really tangible distinction between *Spongisorites* and *Topsentia* I propose to make use of the former name, as I did in my report on the Ceylon Sponges, although the latter has been adopted by Hentschel [1912] for a species closely related to that about to be described. Hentschel, indeed, adopts both genera, placing *Spongisorites* in the Axinellidæ and *Topsentia* in the Coppatiidæ. It is quite possible that there may really be two phylogenetically distinct generic types, represented by such forms as *Spongisorites placenta* and *Topsentia glabra* respectively, which have come to resemble one another by convergence, but this point can only be decided by minute anatomical investigations such as have not yet been carried out.

In the meantime the resemblance which these sponges bear to species of *Hymeniacion* and *Leucophleus* makes it advisable to keep them all close together as reduced Sigmato-tetraonida. It is true that in *Hymeniacion* and *Leucophleus* the typical megasccleres are stylote, while in *Spongisorites* they are oxeote, but these two types of spicule appear to merge into one another in many so-called Axinellidæ.

On the other hand it must be borne in mind that *Spongisorites* may have affinities with the genus *Petrosia*, with which it would seem to be connected by such species as *P. seychellensis* (q.v.).

106. *Spongisorites salomonensis* n. sp.

(Plate 17, figs. 6 a—c.)

This species is represented by two or three irregular, massive, almost tuberos pieces, all in the same jar and very possibly parts of the same colony. The largest piece measures about 58 mm. in maximum diameter. The surface, which is fairly smooth but very uneven, has been a good deal worn, but in some places, at any rate, where it remains uninjured, there is a thick dermal membrane firmly adherent to the underlying tissues. The vents appear to be rather small round openings in the dermal membrane, varying in size, without prominent margins. Rather narrow cylindrical canals penetrate the interior of the sponge; otherwise it is solid and compact. Texture rigid and incompressible. The colour in spirit is dark brown, and, as there were no other specimens in the jar, this may be regarded as proper to the sponge.

The main skeleton is a very dense and entirely confused feltwork of megasccleres of various sizes, large and small mixed together without any sort of order. For some distance beneath the (uninjured) surface, however, the smaller ones predominate, while in the dermal membrane itself the skeleton is composed almost exclusively of the smaller forms, interwoven to form a very compact feltwork in which most of the spicules lie tangentially.

*Spicules*.—(1) Large, stout megasccleres (Plate 17, fig. 6 a); slightly curved, fusiform; ends very variable, sharp or blunt, so that the spicule may be oxeote, strongylote or stylote. Size about 1.2 by 0.043 mm.

(2) Small oxea (fig. 6 c); slightly curved, fusiform, gradually and sharply pointed at each end. Size very variable, commonly about 0.37 by 0.012 mm., but ranging down to 0.065 by 0.0034 mm. on the one hand, and, on the other, connected by intermediates (fig. 6 b) with the large, stout oxea.



This species is evidently nearly related to my *Spongosorites* (?) *lapidiformis* from Ceylon [1905] and Hentschel's *Topsentia indica* from the Arafura Sea [1912]. It appears to differ from both in its dark colour, in the presence of a well-developed dermal membrane with special skeleton, and in the greater length attained by the large oxea.

Register Number, Locality, &c. cxvi., Salomon B. 60—120 fathoms, 3.7.05.

#### Section HETEROXYEAE.

Axinellinae with symmetrical acanthoxea which do not appear to be derived from echinating acanthostyles. Other spicules various.

#### Genus HIGGINSLIA Higgin [1877].

Heteroxyeae of various habit. Megascleres smooth oxea (sometimes styli) and acanthoxea. No microscleres (unless the acanthoxea can be regarded as such).

#### 107. *Higginsia petrosioides* n. sp.

(Plate 7, fig. 9; Plate 17, fig. 7 a—e.)

The single specimen (Plate 7, fig. 9) is cushion-shaped, with a constricted base of attachment and broadly rounded margins. The upper surface is strongly convex, rising gradually to a blunt apex in the centre, occupied by two or three rather small, inconspicuous vents. The upper surface is also thickly and uniformly beset with small conuli, caused by the slightly projecting ends of the stout radially arranged skeleton-columns. The specimen measures 38 mm. in greatest diameter and 25 mm. in maximum thickness, in the centre. The texture is very hard and compact; the colour, in spirit, light, dull yellow.

The main skeleton is very dense and consists principally of stout, radially arranged columns of stout megascleres (chiefly oxeote). In the columns the spicules are not very regularly arranged but for the most part run lengthwise. The narrow intervals between the columns are bridged by similar spicules which often run more or less at right angles to them, either singly or grouped; but the whole arrangement of the skeleton tends to become confused and irregular. Small spined oxea are abundantly scattered everywhere between the other spicules and in the thin dermal membrane which is stretched between the slightly projecting ends of the skeletal columns.

*Spicules*.—(1) Stout, smooth, fusiform oxea (Plate 17, fig. 7 a); fairly strongly curved; usually gradually and sharply pointed at each end, only very occasionally passing into stylote or strongylote forms (figs. 7 b, c); size about 0.74 by 0.043 mm.

(2) Smooth, slender megascleres (fig. 7 d—d''); usually more or less crooked; sometimes gradually and simply sharp-pointed at each end, sometimes hastate, and sometimes having each end divided into two sharp teeth, with a slight enlargement of the shaft and a distinct enlargement of the axial canal at the point of bifurcation; size about 0.55 by 0.0086 mm. These spicules occur in comparatively small numbers, quite irregularly scattered through the sponge.

(3) Small spined oxea (acanthoxea) (fig. 7 e); sharply pointed at each end; fairly stout;

usually curved or even angulated in the middle; uniformly and fairly closely beset with small sharp spines; size about 0.16 by 0.008 mm. (excluding spines). In a boiled-out preparation I have seen a very few smooth oxea of about the same size and shape, and there are a number of smaller spined forms which may be young.

This species appears to be quite distinct from any previously described. Its most interesting feature is the possession of slender megascleres whose ends are frequently bidentate. It will be remembered that this character occurs at one end only of a similar spicule (described as a stylus) in *Dendropsis bilentifera* Ridley and Dendy [1887], and its occurrence in *Higginsia petrosioides* certainly seems to afford support to the views of those authors who regard *Dendropsis* as a synonym of *Higginsia*.

Register Number, Locality, &c. cxxxii. 2, Seychelles, 20.10.05, F. 6, 44 fathoms.

#### X 108. *Higginsia higgini* n. sp. (Plate 7, fig. 8; Plate 17, fig. 8 a—f.)

*Higginsia* sp. Dendy [1915].

Sponge (Plate 7, fig. 8), massive, irregular, or encrusting; with a more or less strongly pronounced tendency to grow out into ascending digitiform processes, which are usually compressed laterally. Surface uneven, slightly conulose, in places hispid (especially on the conuli). Texture fairly compact but compressible and resilient; slightly fibrous; rather friable. Vents not seen. The largest specimen (R.N. LXV.), which is broken in half and otherwise a good deal damaged, measures about 98 mm. in height, 60 mm. in breadth, and 70 mm. in thickness at the base. It is somewhat wedge-shaped, narrowing off to a ridge at the top, from which the feebly developed digitiform processes arise. Another, much smaller, specimen (R.N. LXIX. 2) is very irregular in shape but has the digitiform processes much better developed. The colour, in spirit, ranges from brown to light yellowish grey.

The main skeleton is very lax and irregular, composed chiefly of very loose, ill-defined wisps of long, stout oxea, which run towards the surface, from which they may project in loose radiate tufts of usually more slender spicules. The oxea are accompanied by very long, slender styli, which seem to have no definite arrangement. Numerous spined microxea are scattered in the thin dermal membrane and in the choanosome.

*Spicules*.—(1) Fairly stout, smooth oxea (Plate 17, fig. 8 a); gently curved or slightly angulate in the middle; gradually and sharply pointed at each end; occasionally becoming stylote; size about 1.3 by 0.026 mm. Numerous more slender forms of about the same length also occur.

(2) Very long, slender, smooth styli (fig. 8 b); usually slightly curved; evenly rounded off at the base, which is the thickest part of the spicule; gradually sharp-pointed at the apex; size about 2.76 by 0.017 mm. Occasionally a short slender style is also seen (fig. 8 c).

(3) Spined oxea (acanthoxea) (fig. 8 d); rather slender; slightly angulate in the middle; covered pretty uniformly with small, sharp spines, but often with a specially strongly developed whorl of spines at or near the middle; gradually and sharply pointed at each end; very occasionally smooth and sub-centrotylote (fig. 8 f); sometimes intermediate (fig. 8 e); size about 0.164 by 0.004 mm. (exclusive of spines).

This species is chiefly distinguished by its long, fairly stout, smooth oxea and very long, slender styli; also, perhaps, by the frequently sub-centrotylote character of the acanthoxea, indicated usually by specially strong spination near the centre, but most distinctly in the rare cases where the spicule is smooth.

The imperfect specimen which I recently recorded from Okhamandal is evidently a slight variety of this species, in which the acanthoxea are usually more strongly angulate, and the smooth sub-centrotylote form is much more abundant.

*Previously known Distribution.* Okhamandal (Dendy).

*Register Numbers, Localities, &c.* XXI. 6, 7, 10, Providence, 3.10.05, D. 1, 39 fathoms; LXV., Lagoon, Diego, 12.7.05, 10 fathoms; LXIX. 2, Diego Garcia, 14 fathoms; CXIII. 7, Egmont Reef.

#### Genus HALICNEMIA Bowerbank [1864].

Heteroxyene in which the sponge typically forms a thin crust. The principal megascleres are long, stout tylostyli or styli arranged at right angles to the base of support. Microscleres are present in the form of spined microxea (which may be replaced by pseudasters?). There may also be long, slender, centrotylote oxea.

Topsent has published a very useful and interesting paper [1897 B] on this rare and little known genus, in which he points out its close relationship to Higginsia. He includes in the genus one species, *H. constellata*, in which the spined microxea are replaced by "oxyasters", from which he draws the conclusion that the microxea are aster-derivatives. More probably the "oxyasters" are merely pseudasters derived from the spined microxea.

The "Sealark" collection contains a single specimen, evidently referable to an undescribed species, distinguished chiefly by the absence of the long, slender, centrotylote oxea (tornota of Topsent). I am inclined to think that these spicules, so conspicuous in the few other species of *Halicnemis*, may be regarded as elongated microxea, and that their presence or absence is not of generic importance. Nor do I imagine that *H. constellata*, on account of its pseudasters, need be considered as the type of a distinct genus.

#### 109. *Halicnemis salomonensis* n. sp.

(Plate 17, fig. 9 a—c.)

The sponge forms a rather thin, irregular crust, of a pale greyish yellow colour, spreading over a very irregular calcareous pebble (nullipore?). The surface is coarsely hispid owing to the projection of the long tylostyles. No vents were seen.

The skeleton consists of long, smooth, stout tylostyles, subtylostyles and styles, arranged, for the most part, more or less at right angles to the base of attachment. The soft tissues between these spicules are densely charged with spined microxea.

*Spicules:*—(1) Tylostyli (Plate 17, fig. 9 a); long, smooth, usually irregularly curved; usually thickest about the middle and tapering gradually to both extremities; with a fairly well-developed head, usually of "enormispinulate" type, and usually a finely pointed apex. Size up to about 2.2 by 0.069 mm. These more typical megascleres pass into much more slender, simple styli of about the same length (fig. 9 b).

(2) Spined microxea (acanthoxea) (fig. 9 c); fusiform, gradually sharp-pointed at each end; gently curved or slightly angulated in the middle; uniformly beset with feebly developed spines, sometimes nearly smooth; size very variable, up to about 0.14 mm. by 0.005 mm., but usually smaller.

This species differs from others of the same genus in the absence of the long, centrotylote oxea (tornota of Topsent).

*Register Number, Locality, &c.* CXXIV. 4, Salomon, 3.7.05, 75 fathoms.

#### Genus ACANTHOXIFER Dendy [1905].

Heteroxyene with a dense spicular cortex broken up into polygonal plates by pore-bearing grooves. Main skeleton a confused reticulation of oxea. Cortical skeleton composed chiefly of dense brushes of oxea arranged at right angles to the surface. Megascleres smooth and spined oxea. Microscleres trichodragmata.

When I first proposed this genus I overlooked the already existing genus *Myrmekioderma*, founded by Ehlers [1870] for the reception of Esper's *Acyonium granulatum*, from the East Indies. Judging from Ehlers' detailed description of this species it seems quite possible that *Acanthoxifer* may be a synonym of *Myrmekioderma*, but Ehlers says nothing about the existence of trichodragmata and, for the present at any rate, the two may conveniently be kept distinct.

#### X 110. *Acanthoxifer ceylonensis* Dendy [1905].

= *Myr. granulata*

There are several specimens of this remarkable sponge in the collection but they agree so closely in all respects with the Ceylon types that it is unnecessary to give any further description.

*Previously known Distribution.* Gulf of Manaar (Dendy).

*Register Numbers, Localities, &c.* LII. 5, LIII. 9, 10, 11, 13, Coetivy; cx. 5, Egmont Reef.

#### Family Clavulidæ.

Monaxonellid Sigmatotetraxonida in which the typical microscle is a pseudaster with an elongated axis. Very occasionally chelæ are present; more frequently all microscleres are suppressed. The megascleres are typically tylostylote and frequently radially arranged, especially towards the surface. The sponge is frequently corticate, with a special cortical skeleton.

The scope of this family is almost identical with that of Vosmaer's sub-order Clavulina as employed in Bronn's *Klassen und Ordnungen des Thierreichs* (Porifera, p. 328), and adopted in the Report on the "Challenger" Monaxonida, the principal difference being the exclusion of the genus *Stylocordyla*, which I now regard as having in all probability originated independently from a Tetillid ancestor.

In recent years the various sub-families comprising the Clavulidæ have, with very general consent, been regarded as belonging to the astrotetraxonid line of evolution. So long ago as 1902, however, in his paper "On the shape of some siliceous spicules of sponges," Vosmaer showed that the "spiraster" is not a true aster at all, but a modified monaxon. This fact alone would hardly have sufficed to justify the transference of the

family to the Sigmatotetragonida, for spiny microrhabds are by no means uncommon in the Astrotetragonida, and it might be supposed that they had simply supplanted true asters.

On the other hand the alleged occurrence of chelæ in association with so-called discasters (discorhabds) in Schmidt's *Sceptrella regulis* [1870] has long been felt as an anomaly that required explanation if these sponges were really Astrotetragonida. The explanation which I myself formerly adopted was that the association was accidental, but in view of the remarkable discoveries of the "Sealark" expedition this explanation must now be abandoned.

As will be seen presently, the new genera Barbozia, Didiscus and Sigmosceptrella demonstrate in a very conclusive manner the desmacidonid origin of, at any rate, the Spirastrellinæ, for, in addition to a primitive type of discorhabd, the first possesses abundant chelæ which are unquestionably proper to the sponge, while the second, although it no longer contains chelæ, still possesses echinating tylostyles associated with its peculiar oxydiscorhabds.

I have also been able to show, quite recently, that the discorhabd in the new genus Sigmosceptrella arises from a sigmoid protorhabd and must therefore be regarded as belonging to the sigmatose series of microscleres. We may therefore conclude, with some degree of confidence, not only that the Clavulidæ are modified Desmacidonids, but also that they have sprung from the ectyonine division of that group.

The three sub-families into which the Clavulidæ are here divided, viz. Spirastrellinæ, Cloninæ and Suberitinæ, are by no means sharply marked off from one another. The Spirastrellinæ are undoubtedly the most primitive of the three and the Suberitinæ seem to have originated from them simply by loss of microscleres. Indeed one cannot draw a hard and fast line even between the genera Spirastrella and Suberites as at present understood. It is amongst the Spirastrellinæ, then, that the origin of the pseudasters must be sought and we shall return to this question after giving a diagnosis of the sub-family.

#### Sub-family Spirastrellinæ.

Non-boring Clavulidæ with pseudastrose microscleres of various forms, chelæ rarely present.

If we may judge from the form and from what is known of the development of the pseudaster (discorhabd) in Barbozia, Didiscus, Sceptrella, Sigmosceptrella and Latrunculia, which, for various reasons, are probably to be regarded as more primitive genera than Spirastrella, it would seem that this spicule arose by the appearance of discs, or whorls of outgrowths, on an elongated axis.

I have recently [1917] given an account of the development of the discorhabd in two species of the genus Latrunculia, while early stages of the corresponding spicule in Didiscus and Sigmosceptrella are shown in Plate 18, figs. 3 c'—c''' and 4 c. It is obvious in these cases that the whorls of outgrowths are secondary features and have nothing to do with the rays of true asters\*. The transition from Latrunculia through Sigmosceptrella to Spirastrella is so gradual that we can hardly avoid extending the same conclusion to the pseudasters (spinispiræ) of that genus also.

\* Cf. also Dendy and Nicholson [1917].

In the genera Barbozia and Didiscus the axis of the pseudaster (discorhabd) is either straight or but slightly curved. In Latrunculia it also remains straight but the whorls of outgrowths may show indications of torsion. In Sigmosceptrella the young discorhabd is actually sigmoid and frequently shows torsion. In Spirastrella, on the other hand, the axis has become bent in a spiral, zig-zag fashion, and the spines are distributed along its length instead of being collected in whorls. The axis of this spinispira may also become greatly abbreviated and the spines crowded together, and this leads, in the genus Timea (and in Hemiasterella?), to the formation of a spicule which is indistinguishable, at any rate in the adult condition, from a euaster. Finally, in the genus Placospongia, the original spinispira develops into a spicule which is almost indistinguishable from the sterraster of Geodia, with which, indeed, it was for a long time confounded.

It is evident that, in considering the relationships of the genera in this sub-family, it is necessary to make very full allowance for the phenomenon of convergence so frequently met with amongst sponges. The pseudasters here appear to be of quite different origin from the pseudasters of such genera as Cyamon and Trikentron. The latter are undoubtedly also modified Ectyonines, but their pseudasters—at any rate in the case of Cyamon and probably, by analogy, in that of Trikentron also—are derived from the spiny bases of the echinating acanthostyles, as I have already pointed out in dealing with the Cyamonæ (p. 107). The development of pseudasters from spined isochelæ in *Hymedesmia crux* and *H. anigma* [cf. Lundbeck 1910] appears as another case of convergence, but the sigmatose origin of the pseudasters in Sigmosceptrella suggests a closer relationship between the forms in question than might at first sight be suspected\*.

The "Sealark" collection is very rich in generic representatives of the Spirastrellinæ. In addition to the new genera Barbozia, Didiscus and Sigmosceptrella, it contains species of Spirastrella, Timea, Placospongia and Hemiasterella. Other very interesting genera which are not represented in the collection, but which I think must also be assigned to the sub-family, are Sceptrella, Podospongia, Negombo, Trachyladus and Axos.

#### Genus BARBOZIA n. gen.

Spirastrellinæ with pore-areas on the summits of papillæ. Skeleton reticulate. Megasccleres diactinal, oxeote or strongylote. Microscleres palmate anisochelæ and discorhabds, the latter not radially arranged in a special surface layer.

This remarkable new genus is named in honour of the well-known zoologist J. V. Barboza du Bocage, the founder of the genus Latrunculia. The character of the canal system, with its raised pore-areas, and the occurrence of the discorhabds are sufficient to establish a close relationship between Latrunculia and Barbozia. The association of chelæ and discorhabds has, as stated above, already been described in Schmidt's genus Sceptrella [1870] and Schmidt himself suggested that the loss of chelæ in a Sceptrelline ancestor may have given rise to the genus Latrunculia. Subsequently, also, he described [1875] a species without chelæ under the name *Sceptrella triloba*, which is probably a Sigmosceptrella.

Hitherto I have refused to accept the genus Sceptrella, which was very imperfectly described, and regarded the association of the discorhabds with chelæ as probably accidental.

\* For further discussion of the origin of pseudasters *vide* Dendy [1921].

The discovery of Barbozia, however, indicates that Schmidt's description was probably correct so far as it goes. Unfortunately he says nothing of the megascleres, so that we cannot be certain what the characters of the genus *Sceptrella* really are, but the form of the cheke and of the discorhabds, and the arrangement of the latter in a well-defined dermal layer, indicate that it is probably quite distinct from Barbozia.

The retention of the cheke seems to indicate very clearly that Barbozia is a more primitive genus than *Latrunculia*, and the discorhabds of this genus are therefore perhaps the most primitive form of the spicule known. The strongly marked differentiation of the two ends of the discorhabd in some species of *Latrunculia* (e.g. *L. apicalis*) may perhaps be regarded by some as a result of their radial arrangement in a surface layer, but the fact that the spicule develops in the interior of the sponge constitutes a difficulty in the way of attributing this differentiation directly to mechanical causes [cf. Dendy 1917, 1921].

111. *Barbozia primitiva* n. sp.

(Plate 8, fig. 9; Plate 18, fig. 1*a*—*e*.)

The single specimen (Plate 8, fig. 9) is massive, hemispherical, flat below, where it has evidently been cut off from the substratum. The upper surface bears three groups of prominent vents, two or three in each group and each vent occupying the summit of a short, thin-walled, conical projection. It also carries numerous hollow, thin-walled, pore-bearing papillae in various stages of development. When fully grown these papillae appear to be more or less compressed laterally and may measure as much as 4 mm. in height by 4 mm. in maximum diameter. They are truncated at the top, where the pore-bearing area is situated. Between these papillae the surface is much encrusted with a thin coating of foreign organisms (*Reniera* &c.). The oscular projections and pore-bearing papillae are fragile and easily broken, but the texture of the sponge as a whole is compact, solid and incompressible. The colour in spirit is very pale yellow. The maximum diameter of the almost circular base is 75 mm.; the maximum height of the sponge about 45 mm.

The main skeleton is a dense and extremely confused reticulation of oxea and strongyla, with no distinct fibre and no spongin, but with a more or less pronounced tendency for the megascleres to arrange themselves in very dense tracts, with more or less vacant intervals (free from megascleres) between. There is an especially dense dermal or cortical layer of megascleres, varying up to about 0.34 mm. in thickness, supported on short, thick pillars of spicules springing from the main skeleton and with more or less extensive subdermal cavities between them. The megascleres of the cortex lie in various directions, but for the most part tangentially. Immediately around the vents they arrange themselves side by side at right angles to the vent margin, and in the pore-areas at the ends of the pore-bearing papillae they form dense brushes at right angles to the surface. There appears to be no difference between the cortical (dermal) megascleres and those in the interior of the sponge, and there is no dermal layer of discorhabds.

*Megascleres*.—(1) Strongylote (Plate 18, fig. 1*a*); usually slightly curved or bent, equal-ended, narrowing somewhat at the two ends, which are broadly rounded off; size commonly about 0.35 by 0.013 mm.

(2) Oxea (fig. 1*b*); slightly curved, often distinctly biangulate; gradually and finely pointed at each end; size commonly about 0.266 by 0.01 mm. Intermediate forms are rarely met with.

*Microscleres*.—(1) Palmate anisochelae (fig. 1*c*, *c'*), of the form shown in the figure, about 0.02 mm. long; very numerous. The small end is often minutely apiculate.

(2) Oxydiscorhabds (fig. 1*d*), consisting of a slender shaft, sharply pointed at each end and bearing two whorls of sharp spines, each whorl placed at about one quarter of the total length of the shaft from one end. The typical number of spines in each whorl appears to be six. Length of shaft usually about 0.036 mm., with spines 0.007 mm. long. A few larger individuals, up to 0.057 mm. in length, are to be found. These spicules, though very numerous, are not so abundant as the cheke. Neither form of microsclere shows any special arrangement.

A remarkable abnormal spicule (fig. 1*e*), observed only once, intermediate in size and form between the ordinary oxea and the oxydiscorhabds, suggests very strongly the presence of two rings of formative cells responsible for the whorls of spines in the latter, as in the case of the *Latrunculia* discorhabd [Dendy 1917].

In external characters, including the arrangement of the pores and vents, this species agrees closely with typical species of *Latrunculia*, such as *L. bocagei* and *L. apicalis*, figured in the Report on the "Challenger" Monaxonida (Plate XLIV). The encrustation of the surface by foreign organisms suggests a reason for the development of the raised pore-areas, although that reason may no longer exist in many species exhibiting this character.

The condition of the material does not allow one to say very much as to the minute anatomy and histology, but the following observations made upon sections stained with borax carmine may be of interest. There is a thick, gelatinous ectosome, composed almost entirely of collenchymatous tissue, but there is a thin layer of fibrous tissue developed in the deeper part of the wall of the hollow pore-bearing papillae.

The outer part of the ectosome contains the dense cortical skeleton. The inner part is highly lacunar, containing the larger and smaller subdermal (or subcortical) cavities, which are continuous with the cavities of the pore-bearing papillae. The choanosome is broken up into irregular inhalant and exhalant regions, interlocking with one another in a very complex manner. The former are really continuations of the lacunar, gelatinous ectosome and contain the branches of the inhalant canal-system. They correspond roughly with the spicule-bearing tracts referred to in the description of the skeleton. The latter, which surround branches of the exhalant canal-system, are at once distinguished by their more compact and granular appearance. They are crowded with flagellate chambers, which are spherical in shape and about 0.02 mm. in diameter, with very finely granular mesogloea between. I am unable to say anything definite as to the mode of opening of the chambers, but the character of the mesogloea and a radial arrangement of very narrow exhalant canals around much wider ones, which is sometimes recognizable, suggests that they are possibly aphodal or dipodal. I am inclined to think, however, that they are really eurypylous.

Register Number, Locality, &c. LXXII. 1, Amirante, 11.10.05, E. 10, 22—85 fathoms.

111a. *Barbozia primitiva* var. *digitata* nov.

(Plate 8, fig. 10; Plate 18, fig. 2.)

This variety differs from the type of the species chiefly in external form, the sponge consisting of irregular, digitiform processes springing from an encrusting base and each terminating in a prominent vent (Plate 8, fig. 10). The pore-bearing papillae are abundantly scattered over these processes as well as on the encrusting base, which is much mixed up with calcareous debris, foraminifera, &c. (especially *Gypsina plana*). The largest process is about 55 mm. long and 12 mm. in diameter in the middle; it is sharply bent like a crooked finger and has evidently had a branch, which is now broken off. There is another fragment (R.N. cxxv. 8) from the same jar, growing on a similar mass of calcareous debris (in association with *Hymedesmia laevissima*), which does not (in its present damaged condition) show any finger-shaped processes. Both specimens are now of a deep chocolate brown colour but this is almost certainly due to staining by another sponge in the same jar (probably *Plocamia massalis*).

This variety also differs from the type of the species in the somewhat more slender character of the megascleres.

Register Numbers, Locality, &c. cxxv. 5, 8, Mauritius, 23.8.05, A. 2, > 100 fathoms.

## Genus DIDISCUS n. gen.

Spirastrellinae with spicular cortex divided into polygonal areas by contractile pore-grooves. Main skeleton reticulate, with a good deal of spongin. Principal megascleres diactinal, typically oxeote. Echinating tylostyles may be present. Cortical skeleton consisting of a feltwork of diactinal megascleres and a dermal layer of discorhabds.

This genus is proposed for one of the most interesting novelties in the collection. The presence of the discorhabds and their arrangement in the type species indicate a close relationship to *Latrunculia*, while their form is intermediate between those of a typical *Latrunculia* and those of *Barbozia*. Whereas, however, *Barbozia primitiva* shows its close relationship to the Desmacidonidae by the possession of abundant chelae, *Didiscus placospongioides* shows a similar relationship by its echinating tylostyles, which, as already pointed out, seem to indicate an ectyonine origin for the Spirastrellinae.

As a second species of the genus we may provisionally regard Ridley and Dendy's *Latrunculia* (?) *acerata* [1887]. *Didiscus aceratus* is, however, very imperfectly known, owing to the very bad condition of the only specimen, and may prove to belong to a distinct, though closely related genus. It is extremely unfortunate that the locality from which *Didiscus aceratus* was obtained by the "Challenger" expedition is uncertain, but probably it came from the South Atlantic.

A third species may possibly be represented by a "sceptrella" spicule figured by Mr Carter as coming from the root-tufts of a *Euplectella* from the Seychelles [1879 B, Plate XXIX, fig. 20], and a fourth by the fossil spicule described and figured by Hinde and Holmes [1892] under the name *Latrunculia obtusa*, from the tertiary deposits of Oamaru, New Zealand.

112. *Didiscus placospongioides* n. sp.

(Plate 7, fig. 10; Plate 18, fig. 3 a—c'''.)

Sponge (Plate 7, fig. 10) repent (?), irregularly cylindrical, slightly branched. Surface smooth, but with a curiously crumpled appearance and marked out into large, irregular, polygonal areas by low, narrow, angular ridges which are not very conspicuous.

These ridges are seen in section to represent closed grooves, which contain the inhalant pores and probably also the vents. In some parts of the surface deep furrows with prominent margins probably represent the grooves in an open condition. The single specimen measures about 65 mm. in length by 8 mm. in average diameter. Colour in spirit very light yellowish grey (with a pinkish tinge which is probably accidental, as there were many other sponges in the same jar). Texture fairly firm but compressible and resilient. The whole external appearance of the sponge curiously resembles that of species of *Placospongia*, for which it might easily be mistaken at first sight.

The main skeleton, in the interior of the sponge, consists, in the first place, of very loose longitudinal bands of long, slender oxea, crossed here and there by spicules and spicule-bundles at various angles. From the more superficial parts of this main skeleton dense brushes of spicules arise which run, more or less at right angles, to the surface, where they spread out in a radiate fashion to form a close cortical feltwork of tangentially disposed oxea several spicules deep. In the neighbourhood of the pore-grooves the cortical oxea tend to run at right angles to the margins of the latter, which are thus protected by their apices. The main skeleton, in the interior of the sponge, is strengthened by spongin cement, which unites the megascleres with one another in a very irregular fashion. It is also sparsely echinated by tylostyles.

Between the spicule-bundles and separate megascleres of the main skeleton, and extending outwards to the cortex, is a rather loose network of slender fibres ranging from about 0.004 to about 0.02 mm. in diameter, or even more at the nodes. This network is difficult to detect except in stained preparations. It is continuous with the spongin cement which binds the megascleres together but is itself quite free from spicules. The substance of which it is composed, like the spongin cement, stains deeply with borax carmine, but the fibres exhibit a fibrillated appearance hardly like that of ordinary spongin fibres. They are, however, much more resistant than the soft tissues of the sponge, which, unfortunately, have almost completely disappeared owing to imperfect preservation.

On the surface of the sponge, immediately outside the layer of cortical oxea, is a single layer of closely packed oxydiscorhabds, arranged radially, usually with their smaller discs and shorter apices outwards. Similar spicules also occur abundantly scattered in the interior of the sponge and there is a dense layer of them in or beneath the floor of the pore-grooves, overarched, when the groove is closed, by the dermal cortex.

*Megascleres* :—(1) Oxea (Plate 18, fig. 3a); rather slender, smooth, slightly curved, gradually and sharply pointed at each end; very variable in size, ranging from about 0.04 by 0.0014 mm. to 1.4 by 0.02 mm.; the largest in the interior of the sponge, where they are for the most part arranged lengthwise.

(2) Tylostyli (fig. 3b); smooth, straight, gradually sharp-pointed at the apex and with

irregularly polytylote base; size very variable, say about 0.16 by 0.008 mm.; sparsely echinating the spicular fibre in the interior.

*Microscleres*.—Oxydiscorhabds (fig. 3c); shaft slender, oxeote, fusiform, slightly bent or curved, gradually and finely pointed at each end, minutely roughened, especially towards the apices, when fully grown. With two discs, larger and smaller; the larger one in the middle of the shaft and the smaller one at about one-third of the distance from the middle to the corresponding end of the shaft. The larger disc is distinctly concave towards the smaller and the smaller more nearly flat. Both discs have an irregularly crenate margin. Length of shaft about 0.09 mm., with maximum diameter of 0.005 mm.; diameter of larger disc 0.018 mm., of smaller disc 0.012 mm.

The development of the oxydiscorhabds (figs. c'—c'') shows clearly that they are derived from smooth microxea by the addition of two annular discs, which are at first extremely thin and narrow and indeed hardly visible, accompanied by thickening and roughening of the shaft. The youngest stages are, so far as I can see, indistinguishable from the youngest stages of the oxeote megascleres. The position of the discs appears to be determined by the fact that the developing spicule at the critical stage is thrown into vibration by the water-currents passing through the sponge, the initial cells, responsible for the formation of the discs, settling down at or near the nodes, or points of least vibration [Dendy and Nicholson 1917].

It is unfortunate that the state of preservation of this very remarkable sponge does not admit of any observations on the flagellate chambers. The extensive maceration of the interior of the specimen is indeed very remarkable and seems to imply a very delicate, gelatinous mesogloea, with presumably eurypylous chambers. The cortex, which is only about 0.13 mm. thick, including the layer of discorhabds, consists almost entirely of spicules, with a gelatinous mesogloea. The floor of the pore-grooves, however, contains an abundance of fibrous (fibrillar) tissue.

This species, as already indicated, is evidently closely related to Ridley and Dendy's *Latrunculia* (?) *acerata*, of which a single very badly preserved specimen was brought home by the "Challenger" expedition from a doubtful locality, possibly Tristan da Cunha, and nothing at all resembling which has, I believe, since been recorded. There are so many differences in details of spiculation, however, that there can be no question of specific identity. The curious discorhabds are essentially the same, but in *Didiscus aceratus* they are much smaller and with the shaft blunted at both ends, while they do not appear to be radially arranged at the surface. Perhaps, however, the most important distinction lies in the absence of the echinating spicules from the "Challenger" species. The "Challenger" material was so badly preserved that practically nothing can be said of the external form and we do not even know whether or not pore-grooves occur in that species.

*Register Number, Locality, &c.* LXXVIII. 13, Cargados Carajós, 28.3.05, B. 2, 30 fathoms.

#### Genus SIGMOSCEPTRELLA n. gen.

Spirastrellinæ with microscleres in the form of discorhabds, which typically form a surface crust. The discorhabd develops from a sigmoid form, but acquires secondarily a straight axis; in other words, it is a sigmodiscorhabd.

I have been able to show [1917] that in typical species of *Latrunculia* (*L. bocager* and *L. apicalis*) the protorhabd which forms the foundation of the discorhabd is a straight rod. Quite recently I have found that in my *Spirastrella fibrosa*, referred by Vosmaer to the genus *Latrunculia*, the protorhabd is strongly sigmoid, with the two ends bent back parallel to the shaft. This is also undoubtedly the case with the species about to be described under the name *quadrilobata*, for the young discorhabd, even after the deposition of a considerable amount of silica and the commencement of the formation of the spiny whorls (Plate 18, fig. 4c), is still sigmoid in form. I hope to give a detailed account of the development of these remarkable spicules at an early date [Dendy 1921] and in the meantime will content myself with saying that in the adult form the space between the recurved portions and the shaft becomes filled up with silica and all trace of the sigmatose origin is normally lost (Plate 18, fig. 4b).

This curious developmental history of the discorhabd seems alone sufficient to justify the generic separation of the species in which it occurs. So far as we yet know positively these species are only two in number—*Sigmosceptrella fibrosa* and *S. quadrilobata*—but it seems almost certain that several other described species will have to come in with them.

The new genus differs from *Sceptrella*, of course, in the absence of typical chelæ and from *Spirastrella* in the presence of the discorhabd instead of the spinispira. The discorhabd of *Sigmosceptrella* may, however, approach very closely to the spinispira of *Spirastrella* and the two genera appear to be very nearly related. The transition between the two forms of spicule is very well shown in Carter's figures of "*Latrunculia*" *corticata* (1879 B, Plate XXVII, fig. 1), which I have little hesitation in referring to the genus *Sigmosceptrella*, more especially as I find that the supposed "acerate" spicules described by Carter may with equal justice be regarded as reduced styli.

#### 113. *Sigmosceptrella quadrilobata* n. sp.

(Plate 18, fig. 4 a—c.)

There are several specimens of this species in the collection, encrusting, in association with *Timea unistellata* and other things, a horny sponge. The general appearance of the specimens reminds one closely of *Chondrilla*. They form irregular, spreading crusts, about 2 mm. in thickness. The upper surface appears smooth to the naked eye, but minutely and evenly punctate under a lens. A very few small, widely scattered papillæ bear each a minute vent, now closed. The inhalant pores seem to be collected in small groups at frequent and fairly regular intervals, each group protected by a tent-like arrangement of the projecting ends of megascleres. It is apparently these small tent-like groups of spicule-points that give the minutely punctate appearance to the surface. The colour in spirit is now dark chocolate brown, but this may be due to accidental staining, as everything in the same jar was stained the same colour.

There is a very sharply defined, strongly fibrous cortex, about 0.2 mm. thick, the outer two-thirds, or thereabouts, of which is densely charged with discorhabds. The cortex is interrupted at intervals by cylindrical plugs of tissue which project into it from the

underlying choanosome. These extend for about half or two-thirds of the way through the cortex. They contain inhalant canals, which probably communicate with the overlying dermal pores by narrower canals piercing the outer part of the cortex. Owing to the strong contraction that the sponge has undergone the actual pores are not visible and, moreover, the plug of choanosomal tissue often seems to have shrunk away from the cortical tissue, leaving a wide, chone-like space, which seems to be an artefact. The whole arrangement suggests comparison with that described by Ridley and Dendy for *Latrunculia apicalis* [1887], but in that species the pore-areas are elevated above the surrounding surface as cylindrical projections.

The main skeleton is composed of dense and well-defined spicular fibres which spring from the basal lamina and run towards the surface almost parallel with one another, branching as they go but not anastomosing. All the fibres and their branches seem to extend as far as the cortex but only a few spicules penetrate the latter. These fibres are composed of the characteristic styli of the species, which also occur sparsely and irregularly scattered in the soft tissues between them. I have not been able to satisfy myself of the presence of spongin in the fibres but the spicules seem to be held together by something, which may be only fibrous tissue.

*Spicules*.—(1) Styli (Plate 18, fig. 4 a); smooth, straight, usually sharp-pointed; usually distinctly though not very strongly polytylote; size about 0.3 by 0.008 mm.

(2) Sigmodiscorhabds (fig. 4 b—c); with two principal whorls of spines, each typically divided into four branched lobes, and in addition a tuft of from one to about five spines at each end of the shaft. The shaft may be slightly twisted, so that the lobes of the two whorls do not come quite opposite to one another. The number of spines at the two ends of the spicule may be the same or different. These spicules occur in several layers in the outer part of the cortex, with their long axes at right angles to the surface. They are also thickly scattered at the base of the sponge, and less abundantly in the intervening choanosome. Slender juvenile forms are occasionally met with and the youngest (fig. 4 c) show very clearly the origin of this discorhabd from a sigmoid form.

This species is evidently nearly related to Schmidt's "*Sceptrella*" *triloba* [1875] from the North Sea, but differs in the four-lobed instead of three-lobed character of the whorls of the discorhabd and probably also in the arrangement of the inhalant pores. It also seems to be very closely related to "*Latrunculia*" *biannulata* Topsent [1892 c], from the North Atlantic, but that species is so inadequately described that I do not venture upon an identification. The most interesting relationship, however, is with my "*Spirastrella*" *fibrosa* from the neighbourhood of Port Phillip Heads [1897], which I regard as the type species of the genus *Sigmosceptrella*. The discorhabds of this species come very near to those of *Sigmosceptrella quadrilobata* but the whorls appear to be usually three-lobed instead of four-lobed; moreover, the inhalant pores are scattered and not collected in pore-sieves and the habit is lobose and branching instead of thinly encrusting.

*Register Number, Locality, &c.* CXXVI. 4 A, C, D, Mauritius, 23.8.05.

# Genus SPIRASTRELLA Schmidt [1868].

*Spirastrellinae* of usually massive form. Skeleton reticulate. Megascleres styli or tylostyli, scattered or in ill-defined fibres. Microscleres spinispirae.

In the absence of detailed information as to the early development of the characteristic spinispirae it would be unsafe to say much as to the actual derivation of this cosmopolitan genus. Its close relationship to *Sigmosceptrella* is obvious and the transitional forms of microsclere observed in the latter indicate very clearly that the spinispirae is a modified discorhabd.

In another direction *Spirastrella* merges quite gradually into *Timea* and in yet another into *Suberites*.

It appears to me very difficult to accept Vosmaer's view that all the described species of *Spirastrella*, some forty in number, should be included under the same specific name (*Spirastrella purpurea*). Even if that distinguished spongologist is correct as to the existence of a more or less complete series of intermediate forms this would hardly justify such a drastic procedure in the present state of our knowledge, and a logical extension of the same principle would probably sooner or later oblige us to widen still further the limits of the single "species" so as to include perhaps all the known species of *Sigmosceptrella*, *Timea* and *Suberites*. The existence of an extraordinary number of connecting links in sponges cannot, of course, be denied, and it is to this fact that the group largely owes its surpassing interest from the evolutionary point of view, but there is still a great deal of hard work to be done in the way of building up the phylogenetic tree before we can hope to cut it up into "tropes" or any other philosophically-conceived units in a satisfactory manner. In the meantime it seems desirable that as many fixed points as possible should be accurately determined taxonomically and that these points should be represented by "species" named in accordance with the established rules of priority. A philosophical rearrangement of all the described species can only be the ultimate task of the systematist.

## X 114. *Spirastrella vagabunda* Ridley [1884 c].

(For Literature and possible Synonymy *vide* Dendy [1905] and Vosmaer [1911].)

Although there are a considerable number of specimens in the collection the "Sealark" material does not add greatly to our knowledge of this common and widely distributed Indian Ocean species. Several more or less distinct varieties are represented.

The finest specimen is R.N. CXXXIX., from Cargados Carajos (dry). It consists of a massive base which first enlarges and then contracts upwards to a broad apex, subdivided into three lobes, on which are situated numerous vents, now partially obliterated by contraction. The surface of the sponge is more or less rugose longitudinally, the ridges frequently developing into irregular proliferations which do not bear vents. Numerous wide longitudinal canals run vertically upwards and terminate in the vents. The specimen measures about 260 mm. in height by about 250 mm. in greatest breadth and is perhaps the largest sponge in the whole collection. R.N. XL. and LXXVII. 3, also from Cargados Carajos, agree closely with this specimen but are much smaller, and R.N. LVII. 9, from



Coin Peros, does not differ greatly. These specimens seem to approach most nearly to the type of the species as described by Ridley.

R.N. LVII. 2 (Coin Peros), LXVIII. 1 (Diego Garcia), XCII. 1 (Amirante) and CXIX. 7 (Salomon), consisting each of a solitary, tubular, digitiform process terminating in a single vent; rather flabby and thin-walled, and sometimes giving off accessory processes, are clearly referable to my variety *tubulodigitata*, from Ceylon Seas and Okhamandal, figured in my Report on the Okhamandal Sponges [1916 A].

R.N. CXXIX. 2 (Seychelles) is rather peculiar. The usual encrusting sandy base rises up into a very thick, digitiform process terminating in a broad rounded extremity. A single much smaller process is given off obliquely from near the bottom of the large one. In the middle of the broad extremity of each process there appears to be a single very minute vent, now closed. The surface of the sponge, except towards the apices, is longitudinally corrugated. When cut open the sponge shows a thick wall of very compact, firm tissue surrounding a thick core of gelatinous tissue, and there are no wide canals. The specimen measures about 85 mm. in height and the greatest breadth of the base is 73 mm. This variety seems to agree very closely with the specimen from the Gulf of Manaar which I identified [1905] with Ridley's *Spirastrella vagabunda* var. *trincomaliensis*. I am afraid that that identification was hardly justifiable. If a varietal name is needed it might be called var. *gelatinosa*.

R.N. CX. 3 (Egmont) and CXIX. 8, 15 (Salomon) are single digitiform processes which appear to end blindly; they may be imperfect or immature.

R.N. LX. (Diego Garcia) is a compressed, lobose specimen, with a single good-sized vent at the summit, forming the termination of a wide oscular tube lined by an easily separable membrane in which numerous tylostyles are arranged in a somewhat plumose fashion. Spinispiræ appear to be almost entirely absent; I have only seen two—rather large and robust. This specimen seems to approach my *Spirastrella* (*Suberites*) *inconstans* [1887].

All the above specimens are evidently closely related to one another and fall within the limits which, in the present state of our knowledge, may reasonably be assigned to Ridley's species *Spirastrella vagabunda*.

For further particulars as to the distribution of that species I may refer to my memoirs on the Ceylon and Okhamandal Sponges [1905, 1916 A].

# 115. *Spirastrella decumbens* Ridley [1884 c].

(For possible synonymy vide Vosmaer [1911].)

There are two thinly encrusting specimens in the collection which agree very closely with Ridley's original description of the type from Torres Straits. The larger (R.N. LIII. 4) measures about 47 by 22 mm., with a thickness of only about 2 mm. The other is closely similar. The colour of the larger one is light chocolate brown, but the contents of the jar containing it appear to have been accidentally stained. The smaller one (in spirit) is dull greenish grey. The tylostyles are straight, with well-developed oval heads, and measure about 0.4 by 0.0085 mm. They occur scattered in the interior and in bundles running towards the surface. The spinispiræ are very numerous; for the most part short and

robust, but with small ones intermingled. They are thickly scattered in the interior and also form a dense dermal crust.

This is a well-marked and widely distributed form, included by Vosmaer in his "tropus" *tegens* of *Spirastrella purpurea*, but I do not think that much is gained by departing from Ridley's original name. Whether or not the species, if we may still so call it, is identical with Schmidt's *Tethya* (*Suberites*) *bistellata* I do not profess to decide. I find it hard to believe that it can be specifically identical with *Spirastrella purpurea*, as Vosmaer maintains, and I even doubt now whether the supposed variety from the Philippines, collected by the "Challenger," should be included in the same species as Ridley's type.

*Previously known Distribution* (of the typical form). Torres Straits (Ridley); Red Sea (Keller); ? Adriatic (Lendenfeld); Amboina (Topsent).

*Register Numbers, Localities, &c.* LIII. 4, Coetivy; CXX. 14, Salomon, 10—14 fathoms.

# 116. *Spirastrella globularis* n. sp.

(Plate 4, fig. 5 a, b; Plate 18, fig. 5 a, b.)

The specimen (Plate 4, fig. 5 a) which I regard as the type of this species consists of an almost globular head attached to the end of a short (?) and slender stalk, which has been broken off below so that its full length cannot be ascertained. The head measures 20 mm. in maximum diameter, while the stalk is only about 6 mm. in diameter where it joins the head and is now only 6 mm. in length, tapering away below. The surface is minutely granular but only slightly uneven. There is a single very minute vent, visible only with a lens, situate on a small papilla in the middle of the upper surface. The texture is firm and compact and the colour in spirit light yellowish brown.

The main skeleton is a very irregular reticulation of stout, loose spicular fibres, apparently with no spongin and with many spicules irregularly scattered between them. There is a cortical skeleton about 0.5 mm. thick, formed of a dense feltwork of spicules, many, but by no means all of which lie at right angles or nearly at right angles to the surface, with their apices projecting outwards. In the stalk the skeleton is composed almost entirely of longitudinal spicule-bundles closely packed together.

*Megascleres*.—Stylote to tylostylote (Plate 18, fig. 5 a); very variable in size and irregular in shape. The larger ones, especially characteristic of the interior of the sponge, are often very crooked, often with "enormispinulate" heads and often with irregular apices; size commonly about 0.53 by 0.016 mm. The smaller ones, especially characteristic of the cortex, seem to be less irregular and may measure about 0.25 by 0.0082 mm.

*Microscleres*.—Slender spinispiræ (fig. 5 b), commonly angulated some three or four times; about 0.02 mm. long. Not very abundant and not forming a dermal crust.

A second specimen (R.N. CXX. 14), from Salomon, is also quite distinctly stipitate and closely resembles the type in external appearance, though the surface is rather more uneven and partially covered with low conuli. The diameter of the globular body is about 15 mm. and the length of the stalk 10 mm., with a thickness of about 5 mm. The skeleton arrangement and spiculation agree closely with those of the type but I have been able to find only one or two spinispiræ, so that at first I placed the specimen in the genus *Suberites*.

R.N. LVI. 2 and LVII. 5, both from Coin Peros, may also possibly belong to this species. They agree fairly closely with the type in skeletal characters but they are sessile rather than stipitate (R.N. LVI. 2 seems to have been attached by a very broad base) and of much darker colour, so that it is very doubtful.

So far as I know, nothing has hitherto been described in the genus *Spirastrella* which at all closely resembles the characteristic stipitate form of the two typical specimens of this sponge, and the fact that these two specimens came from two slightly different localities seems to support the view that they represent a distinct species.

*Register Numbers, Localities.* LVII. 6, Coin Peros; CXIX. 14, Salomon.

#### *Spirastrella* spp.

There are a number of other small specimens of *Spirastrella*, to which, in view of the great taxonomic difficulties presented by this genus and the insufficiency of the material at my disposal, I refrain from attaching specific names, but those who accept Vosmaer's views can, of course, call them all *Spirastrella purpurea*.

*Register Numbers, Localities, &c.* VII. 4, Saya de Malha, 6.9.05, C. 15, 55 fathoms; LVI. 2, LVII. 5, Coin Peros; LXVIII. 2—4, Lagoon, Diego, 12.7.05, 10 fathoms; CXI. 3, Egmont Reef.

#### Genus TIMEA Gray [1867 F].

Spirastrellinæ of thinly encrusting habit. Megascleres smooth tylostyli. Microscleres pseudoeuasters of various forms, occasionally passing into spinispiræ.

In my Report on the Ceylon Sponges [1905] I followed Carter and Topsent in the use of the name *Hymedesmia* for this genus, although Thiele [1903 B] had already adopted that name for a different genus and stated (in a footnote) that Gray's genus *Timea* should be employed for species congeneric with Bowerbank's *Hymedesmia stellata* [1866, 1874].

More recently Lundbeck [1910] has accepted Thiele's views and described a very large number of species of *Hymedesmia*, some of which are of extraordinary interest.

Bowerbank's type of his genus *Hymedesmia* was *H. zelandica* [1866, 1874], an Ectyonine sponge with acanthostylote and diactinal megascleres, and isochelæ and sigmata for microscleres, and thus very different from *H. stellata* with its tylostyles and asters.

There seems to be no justification for Topsent's having [1892 D] placed *H. zelandica* in his own genus *Leptosia* while retaining Bowerbank's name *Hymedesmia* for *H. stellata* and other species congeneric therewith.

I must therefore agree with Thiele and Lundbeck that Topsent's *Leptosia* must be abandoned in favour of *Hymedesmia* and that Gray's genus *Timea* must be revived for *H. stellata* and its allies.

The derivation of this curious genus from a *Spirastrella* ancestor is very clearly indicated by the existence of such intermediate forms as *Spirastrella (Tethya) bistellata* Schmidt [1862], *Timea (Hymedesmia) tristellata* Topsent [1900] and *Timea (Hymedesmia) curvistellifera* Dendy [1905], in which occur pseudasters which are strictly intermediate

between those of *Spirastrella* and those of a typical *Timea*, such as *T. stellivarians* Carter; while, on the other hand, such thinly encrusting *Spirastrellas* as *S. bistellata* and *S. decumbens* Ridley, form perfect transitions as regards external form. In view of the several ways in which it is possible for a pseudaster to be developed, however, we must not lose sight of the possibility that the genus may be of polyphyletic origin.

#### X 117. *Timea stellivarians* (Carter).

*Hymedesmia stellivarians* Carter [1880 B].

*Hymedesmia stellivarians* Dendy [1905].

The single specimen of this species agrees very closely with the specimen recorded by me from Ceylon. The characteristic feature of the species appears really to be the differentiation of the fully developed pseudaster into two very distinct categories, the one with conical, smooth rays and the other with cylindrical, capitate rays, the heads being often roughened or minutely spined.

*Previously known Distribution.* Gulf of Manaar (Carter); Ceylon (Dendy).

*Register Number, Locality, &c.* LXXIII. 1 A, Amirante, 11.10.05, E. 14, 36 fathoms.

#### 118. *Timea unistellata* (Topsent).

*Hymedesmia unistellata* Topsent [1892 D, 1900].

I identify with this species a thinly encrusting specimen of considerable extent, attached to the surface of a horny sponge. The tylostyles have well-developed oval heads and usually measure about 0.225 by 0.004 mm., and are thus somewhat shorter than those of the type (0.37—0.4 by 0.003—0.004 mm.). The spherical pseudasters are not sharply differentiated into two kinds and have about thirteen simple, smooth, conical rays about as long as the diameter of the centrum. The total diameter of the fully grown spicule may reach 0.029 mm., but most of them are a good deal smaller. Occasionally, especially in the larger ones, the rays of the pseudaster, instead of being perfectly smooth, are roughened or even slightly thickened at the apices, exactly as described and figured by Topsent for one of his specimens.

Topsent states that the colour in life of the type is salmon or brick red. The "Sealark" specimen was in a jar in which everything had been stained brown, presumably by pigment dissolved out from some of the specimens.

*Previously known Distribution.* Mediterranean (Topsent).

*Register Number, Locality, &c.* CXXVI. 4 B, Mauritius, 23.8.05.

#### Genus PLACOSPONGIA Gray [1867 E].

Spirastrellinæ with a strong spicular axis and a similar cortex, both composed of closely packed sterospiræ; with bundles of tylostyles radiating from the axis towards the periphery. Cortex divided into polygonal areas by grooves containing the inhalant and exhalant apertures.

✕ 119. *Placospongia carinata* (Bowerbank).

(For Literature and Synonymy *vide* Vosmaer and Vernhout [1902] and Dendy [1905].)

This well-known and highly characteristic Indian Ocean species is represented in the collection by some very good specimens. It was also present in Professor Herdman's Ceylon collection and in Mr Hornell's collection from Okhamandal.

*Previously known Distribution.* Tropical seas between 30° N. and 20° S. of the equator (Vosmaer and Vernhout, &c.).

*Register Numbers, Localities, &c.* XLII. 5, Cargados Carajos, 30.8.05, B. 9, 30 fathoms; LIII. 7, Coetivy; LXXXV. 2, Egmont Lagoon Shoal.

Genus *HEMIASTERELLA* Carter [1879 A].

Spirastrellinae of cup-like or plate-like external form. The main skeleton consisting of loose columnus of megascleres which may be partially cemented together by spongin. Megascleres ranging from tylostylote to oxeote. Microscleres pseudoeuasters. Canal system eurypylous.

This genus was proposed by Carter in 1879 for the two species *Hemiassterella typus* and *H. affinis*, both, unfortunately, according to Carter's description, of unknown locality\*.

In 1888, in his Report on the "Challenger" Tetractinellida, Sollas proposed the new genus *Epallax* for a cup-shaped, "aster"-bearing sponge from the south-west of New Guinea. He placed this genus in the Axinellidae and, in referring to Carter's *Hemiassterella typus*, remarked (p. 434) "This appears to closely resemble *Epallax callocyathus* (see p. 423), should subsequent examination prove the two sponges to be congeneric, my name must be suppressed in favour of Carter's." There can, I think, be no doubt of the generic identity of the two.

*Hemiassterella affinis* was removed by Sollas to his genus *Dorypleres*, but I have no doubt, after examination of the types, that Carter was right in assigning the species to *Hemiassterella*.

In 1903 Kirkpatrick proposed yet another genus, *Kalastrella*, for a cup-shaped, "aster"-bearing sponge from South Africa, which he assigned to the Spirastrellidae under the name *Kalastrella vasiformis* [1903]. As regards the systematic position of this genus I agree with Kirkpatrick, but as to the genus itself I have no doubt that it also must be regarded as a synonym of *Hemiassterella*.

The characters of the pseudaster indicate the genus *Timea* as perhaps the nearest in relationship to *Hemiassterella*. The derivation of the pseudaster in the former genus has been discussed already, but I may point out especially in the case of *Hemiassterella* that the general arrangement of the skeleton and the development of spongin seem clearly to indicate a sigmatotetraxonid rather than an astrotetraxonid origin. I may also point out that the larger pseudasters in *Hemiassterella* (*Epallax*) *callocyathus* somewhat resemble those of *Cyamon*, and suggest a possible derivation from that genus, the origin of the pseudasters of which has already been discussed in this Report (see under *Cyamoness*).

\* The type-slide of *H. typus* in Mr Carter's cabinet is, however, labelled "Australia."

120. *Hemiassterella intermedia* n. sp.

(Plate 7, fig. 11; Plate 18, fig. 6 a—h.)

The single specimen (Plate 7, fig. 11) has the form of a very thick-walled, funnel-shaped cup, tapering away below to form a short stalk. The cavity of the cup is rather shallow, the margin rounded and uneven. The total height of the specimen is about 18 mm., the diameter of the mouth of the cup about 15 mm., the average thickness of the wall of the cup about 5 mm. The outer surface is rather uneven and sparsely hispid, and shows numerous small, ill-defined pore-areas. The inner surface is also uneven and hispid and shows indications of minute scattered vents under a pocket lens. The colour in spirit is white, the texture fairly firm and compact.

Stained sections show that the principal inhalant and exhalant canals run at right angles to the outer and inner surfaces of the wall of the cup. The outer ends of the large inhalant canals merge into an extensive system of shallow subdermal cavities, covered over by the pore-bearing dermal membrane. The appearance of small pore-areas on the outer surface thus seems to be deceptive, these areas probably indicating merely the positions of the deep inhalant canals.

Beneath the inner surface of the cup there is also an extensive series of subdermal cavities, which open to the exterior by small scattered vents. From these subdermal cavities the wide exhalant canals are separated by thin, pore-bearing membranes.

There is no true cortex and the boundary between ectosome and choanosome cannot be made out, but the pseudasters, everywhere enormously abundant, increase in numbers towards the surface until they form an almost solid layer.

The flagellate chambers are scattered in the abundant mesogloea between the large inhalant and exhalant canals, which give off numerous branches very much smaller than themselves. The chambers are approximately spherical and only about 0.02 mm. in diameter; they appear to be eurypylous. The ground-substance between them is rather coarsely granular, the granules being mostly small nuclei (?).

The skeleton consists chiefly of the extraordinarily abundant pseudasters, but there are also sparse, plumose columns of megascleres, mostly long styli, radiating upwards through the wall of the cup, and the projecting ends of some of these megascleres give rise to the hispidation of the surface. It is important to notice that these very loose skeleton columns are strengthened by a considerable amount of spongin cementing the spicules together where their bases approach one another.

*Spicules*.—(1) Smooth styli (Plate 18, fig. 6 a, b); of two principal types but not sharply distinguishable from one another, (a) slender, slightly curved, evenly rounded off at the base, very gradually sharp-pointed at the apex; measuring about 1.9 by 0.022 mm.; sometimes rather longer and stouter, occasionally strongly lute (fig. 6 c); (b) much stouter and somewhat shorter, measuring about 1.5 by 0.05 mm.

(2) Oxea (figs. 6 d, e); slightly curved, fusiform, of about the same size as the stout styli, with which they are connected by intermediate forms; sometimes more slender.

(3) Pseudasters of two principal varieties, but not sharply distinguishable from one another, (a) with small centrum and about 10 bluntly pointed, distinctly roughened rays

(fig. 6 *f*); total diameter about 0.029 mm.; (b) similar and of about the same size, or smaller in varying degrees, but with smooth, conical, sharp-pointed rays (fig. 6 *h*); these pass into (a) by intermediate stages (fig. 6 *g*) and may be merely young forms, but they are very numerous.

This species is evidently closely related to the four species of *Hemiasterella* already known, all of which are cup-shaped sponges. From *Hemiasterella typus* Carter [1879 A] it differs in the possession of oxeote as well as stylote megascleres and in the much more pronounced roughening of the rays of the fully developed pseudaster. Carter describes the rays of the pseudaster in *H. typus* as being smooth, but I find from examination of a slide in his cabinet that they are sometimes slightly roughened towards the tip and by no means always sharply pointed. Perhaps a more important difference lies in the fact that *H. typus* contains numerous very small pseudasters with slightly tylote rays, which are absent from *H. intermedia*.

From *Hemiasterella affinis* Carter [1879 A] our species would seem to differ in the presence of stylote as well as oxeote megascleres, but I am afraid, after examination of one of Mr Carter's slides, that he has overlooked the occurrence of styli in *H. affinis*, as he may also have overlooked the occurrence of oxea in *H. typus*. *H. affinis* also has the minute pseudasters with faintly tylote rays and the rays of the large pseudasters seem to be either quite smooth or very nearly so.

In the character of its pseudasters our species approaches more nearly Kirkpatrick's *Hemiasterella* (*Kalustrella*) *vasiformis* [1903], but it differs from that species in the absence of the tylostyles, and possibly in other respects also.

Lastly, *Hemiasterella intermedia* differs widely from Sollas's *H. (Epallax) callocyathus* [1888] in the form both of the pseudasters and of the principal megascleres.

[Since this Report was written an account has been published by Topsent [1919] of a new species of *Hemiasterella* from the East coast of Madagascar, to which he has given the name *Hemiasterella complicata*. This species is evidently very closely related to ours, but since there seems to be considerable difference in the dimensions both of the megascleres and microscleres I have decided not to make an identification for the present.]

Register Number, Locality, &c. XIX. 3, Providence, 4.10.05, D. 4, 50—78 fathoms.

#### Sub-family Clioninæ.

Clavulidæ which have the habit of perforating a calcareous substratum. The typical megascleres are tylostyli and the typical microscleres pseudasters.

There appears to be little doubt that these sponges are directly descended from Spirastrelline ancestors and indeed it is open to question whether the boring habit is sufficient to justify the maintenance of a separate sub-family for their reception.

#### Genus CLIONA Grant [1826].

Clioninæ in which the typical spiculation consists of tylostyles only, to which, however, spinispiræ and raphides are sometimes added.

#### 121. *Cliona celuta* Grant [1826].

(For Literature and Synonymy *vide* Topsent [1900].)

There is in the collection a large, empty gasteropod shell (belonging to *Vasum* sp.) beautifully perforated with this ubiquitous boring sponge. The growth appears to be perfectly normal, the sponge coming to the surface at frequent intervals in the form of small round plugs filling the circular apertures in the shell. The specimen agrees very closely with the admirable description given by Topsent of the European form. With the exception of two spinispiræ in a boiled out preparation I have seen only tylostylote spicules, which appear to be perfectly typical, measuring about 0.32 by 0.008 mm. According to Topsent spinispiræ are produced only in youth and the typical spiculation consists of tylostyles only, though some specimens develop oxea in addition. These so-called oxea appear really to be raphides and are commonly arranged in bundles (trichodragmata), and it seems quite possible that Sollas was right in considering the specimens which possess them as belonging to a distinct species (*Cliona linearis*).

Previously known Distribution. Cosmopolitan (for details *vide* Topsent [1900]).

Register Number, Locality, &c. XXXI. Cargados Carajos, 30.8.05, B. 17, 20—25 fathoms.

#### Sub-family Suberitinæ.

Clavulidæ of free-living habit and without either chelæ or pseudasters. Usually the only spicules are tylostyli, sometimes passing into styli.

#### Genus SUBERITES Nardo [1833].

Suberitinæ of varying form, usually massive, but without well-defined mammiform projections on the surface. Megascleres nearly always tylostylote, usually arranged radially, with surface brushes of spicules smaller than those of the main skeleton. No microscleres of any kind.

#### 122. *Suberites cruciatus* Dendy var. *depressa* nov.

*Suberites cruciatus* Dendy [1905, 1916 A].

This variety differs from the type of the species in its rather thinly encrusting habit. The specimen on which it is based covers somewhat extensively an irregular mass of calcareous débris which it partially incorporates in its own substance. The surface shows the same small, translucent areas as in the type and the colour in spirit is pale greyish yellow. It agrees closely with the type in skeleton arrangement and spiculation. The main skeleton consists of loose wisps of tylostyles branching out into loose surface brushes composed of smaller spicules of the same kind. The largest spicules seem to be just a little larger than in the type, but the difference is very slight. The head of the tylostyle is formed by two or three rounded knobs exactly as in the type, but these always seem to be terminal, while in the type they are commonly, but not always, subterminal, with the base of the shaft projecting for a short distance beyond them.

This variety evidently comes very near to Schmidt's *Suberites lobiceps* from Florida

[1870], but the description of that species, consisting of a line and a half, although accompanied by two figures of the spicule, is hardly sufficient to justify an identification, especially as no spicular dimensions are given.

It also suggests that both *S. lobiceps* and *S. cruciatus* may prove to be identical with Lamarck's *Alegonium epiphytum*, redescribed by Ridley [1884 c] under the name *Suberites epiphytum*; Ridley figures the spicules but unfortunately omits to refer to the figures in his text.

*Previously known Distribution of the Species.* Ceylon, Okhamandal (Dendy).

*Register Number, Locality, &c.* xcviii. 3, Amirante, 9.10.05, E. 3, 25 fathoms.

Genus TERPIOS Duchassaing and Michelotti [1864] *emend.*

Thinly encrusting Suberitinae of gelatinous consistence, with skeleton composed of slender tylostyles arranged without order or in loose wisps and brushes.

X 123. *Terpios fugax* Duchassaing and Michelotti. = *granulosus*  
(For Literature and Synonymy *vide* Topsent [1902].)

A single small specimen thinly encrusting a branch of an arborescent Polyzoon is evidently referable to this species as defined by Topsent. Even in alcohol and when mounted in Canada balsam it is of a deep metallic green colour. The slender tylostyles are arranged chiefly in loose radiating brushes; they measure about 0.2 mm. in length and their heads are broader than they are long.

*Previously known Distribution.* Almost cosmopolitan (for details *vide* Topsent, *loc. cit.*).

*Register Number, Locality, &c.* cxxviii. 8 A, Seychelles, 20.10.05, F. 9, 37 fathoms.

Genus POLYMASTIA Bowerbank [1864].

Massive Suberitinae with hollow, mammiform or cylindrical processes projecting from the surface, with strongly differentiated cortex enclosing a choanosome which may be more or less pulpy. The cortical skeleton consists typically of a deeper layer of large, tangentially placed spicules, often arranged in bundles or fibres, and a superficial layer of small, radially arranged spicules. Spicules tylostylote to stylote.

124. *Polymastia tubulifera* n. sp.

(Plate 4, fig. 6; Plate 18, fig. 7 a—b'.)

The single specimen (Plate 4, fig. 6) consists of a subglobular, saccular body about 13 mm. in diameter, with a single, large, conical projection on one side (probably the upper), apparently terminating in a vent, now completely closed. This projection is about 7 mm. long and 6 mm. broad at the base.

From other parts of the body radiate three long, slender, but stiff, cylindrical processes, about 20 mm. in length and only about 1 mm. in diameter. No point of attachment is recognizable and the sponge appears to have lain freely on the substratum. The body is enclosed in a thin cortex, only about half a millimetre thick, and the interior is filled with

the somewhat pulpy choanosomal tissue, which also partially fills the large conical process. The three slender filiform projections appear to be hollow tubes, at any rate in their present condition, and the only one which was examined microscopically appears to be closed at the extremity. The surface of the sponge to the naked eye appears smooth and clean and the colour in spirit is very pale yellow.

The skeleton of the interior of the sponge is very lax; a number of fairly stout and well-defined spicular fibres can, however, be easily seen with a pocket lens, running vertically (i.e. parallel to the long axis of the conical process) through the soft choanosome. These fibres are about 0.2 mm. thick. Otherwise the choanosomal skeleton consists of spicules of all sizes either scattered quite irregularly or aggregated in more or less well-defined bundles.

The general cortical skeleton consists of two well-defined layers. In the first place there is an irregular felt-work of large styli arranged tangentially, and outside this is a thin fur of very small, slender tylostyles arranged radially with their apices directed outwards. The structure of the cortex is continued in the walls of the slender fistular processes, with the addition of about half a dozen stout spicular fibres running longitudinally beneath the inner layer and arranged in a single circle. In the wall of the large conical process the longitudinal spicular fibres are more numerous and very stout, and the tangential spicules which lie between them and the surface fur are closely packed together and run transversely to the long axis of the process.

*Spicules.* (1) Long, straight styli or subtylostyli (Plate 18, fig. 7 a—a''); fusiform and tapering gradually to each end, so as to resemble oxea when viewed under a low magnification; the apex gradually and more or less finely pointed; the base suddenly narrowing towards the simply rounded or very slightly enlarged extremity. The diameter in the middle of the spicule is about seven times that of the base. These spicules measure up to about 2.25 by 0.033 mm.; though they are often much smaller. They occur in the soft choanosome, in the spicular fibres and in the tangential layer of the cortex.

(2) Small, slender tylostyli (fig. 7 b); with well-developed oval beads and long, fine points: the apical third of the spicule, or thereabouts, usually curved to one side. These spicules commonly measure about 0.12 by 0.002 mm. They are chiefly found in the surface fur but also occur abundantly in the choanosome. Similar forms of larger size (fig. 7 b'), sometimes about twice the length and three times the thickness, are not uncommon in boiled out preparations, though nothing like so abundant as the smaller ones.

This pretty little sponge is evidently nearly related to my *Polymastia gemmipara* from Okhamandal [1916 A]. It is probable that the slender tubular processes are homologous with the budding fistulae of that species and that buds are formed on them at the proper time, though there is no trace of any in the specimen. The most noteworthy difference lies in the sizes of the spicules, for while the large styli are more than twice as long the small tylostyli of the surface fur are considerably smaller—and especially more slender—than the corresponding spicules in *Polymastia gemmipara*.

*Register Number, Locality, &c.* xiv., S. de Malha, 6.9.05, C. 12, 47 fathoms.

125. *Polymastia conigera* Bowerbank [1874].

There are in the collection two specimens from Saya de Malha which seem to me to be referable to this species, one of them (R.N. LXXX. B) in company with a specimen of *Trichostemma sarsii* on the same fragment. Each is cushion-shaped, approximately circular in outline, attached by a flat lower surface and with convex upper surface bearing a single very small mammiiform projection near the middle, probably with an apical vent. The diameter of each is about 12 mm. and the colour in spirit white or nearly so. In R.N. LXXX. B the surface appears smooth under a pocket lens, while in R.N. XIII. 1 it is rather strongly hispid, but sections show that this is only a question of the degree to which the apices of the larger spicules project.

The skeleton arrangement is that of a typical *Polymastia*, at least so far as the body of the sponge is concerned; I have not attempted to examine it in the very small mammiiform projection. The surface fur of small tylostyles rests upon a thicker cortical layer of irregularly felted tylostyles of intermediate size. This is not mentioned by Bowerbank in his description but seems to be a characteristic feature of both *Polymastia* and *Trichostemma* [cf. Vosmaer 1885]. The choanosome contains numerous stout spicular fibres composed of long subtylostyles or tylostyles which run to the surface and terminate in brushes either in the cortex or projecting beyond it. Between these fibres are scattered numerous examples of the small tylostyles, mostly arranged in bundles or "dragmata," each containing about half a dozen, or sometimes more. These bundles are not mentioned by Bowerbank but they evidently correspond to the "stellate groups" of tylostyles described by Kirkpatrick in his *Polymastia invaginata* [1908 c].

The spicules agree very closely indeed with the descriptions and figures given by Bowerbank, both as to form and dimensions, and it is this agreement, rather than the external form, which has caused me to make the identification. The large tylostyles measure up to about 1.9 mm. in length, though usually a good deal shorter; they have quite well-developed, oval or subconical heads at the narrowed base and are characteristically polytylote, with a variable number of slight annular swellings in addition to the head—as described by Bowerbank (*loc. cit.* p. 194), though not shown in his figures. The small tylostyles are rather slender, measuring about 0.13 by 0.0041 mm., and have relatively large heads of spherico-conical form. Numerous intermediates occur between the two extremes. This description of the spiculation is taken from R.N. XIII. 1. R.N. LXXX. B agrees closely enough, but the large spicules do not seem to attain so large a size and their heads are less well developed, though the polytylote character is commonly quite distinct. The small tylostyles are a good deal more slender so that the head appears even larger in comparison with the diameter of the shaft.

This species is evidently very nearly related to *Trichostemma sarsii* and to Kirkpatrick's *Polymastia invaginata* and Thiele's *Polymastia insidis* [1905]. Indeed it is doubtful whether any of these species ought really to be regarded as distinct from *P. conigera*, and perhaps even whether that species itself ought ever to have been separated from *Polymastia mammillaris*, the type of the genus.

It may also be pointed out that the "Sealark" specimens approach very closely in external

form to *Suberites caminatus* Ridley and Dendy [1887] and indicate the impossibility of distinguishing sharply between the genera *Suberites* and *Polymastia* as at present understood.

*Previously known Distribution.* British Seas (Bowerbank).

*Register Numbers, Locality, &c.* XIII. 1, LXXX. B, Saya de Malha, 4.9.05, C. 2 and 125 and 123 fathoms.

Genus *TRICHOSTEMMA* Sars [1869, 1872].

Suberitinae of discoid or hemispherical form, with a marginal fringe of long spicules free-living or attached; with one or more vents at the ends of short oscular tubes on the upper surface. Megascleres typically tylostylote.

I have nothing to add to the observations on the relationships of this genus in the Report on the "Challenger" Monaxonida. It is very doubtful if it is really distinct from *Polymastia*, with which it seems to be connected by intermediate forms.

126. *Trichostemma sarsii* Ridley and Dendy.

*Trichostemma sarsii* Ridley and Dendy [1886, 1887]. *Trichostemma Sarsi* Topsent [1892 c, 1904 A].

The "Sealark" expedition obtained three small specimens of this species. Two of them (R.N. v. 5 A and B) have the form of thin, flattened disks with a very well-developed spicular fringe. The total diameter, including the fringe, is about 15 mm. These two specimens closely resemble those described and figured in the "Challenger" Report. They appear to have lain quite freely on a sandy bottom and the lower surface exhibits a very beautiful, radially arranged spicular thatch, while the upper surface is covered with an incrustation of fine sand which conceals any vents that may have been present. In one the lower surface is flat and the upper one convex, while in the other these conditions are exactly reversed. The skeleton arrangement and spiculation agree very closely indeed with those of the types.

The third specimen, a little smaller in size, is attached by the lower surface to a fragment of shell and is less typical in form. The fringe is less well developed and less well defined and the spicular thatch on the lower surface is not recognizable, while the cortical skeleton of the upper surface is more confused.

Topsent [1913] has recently figured and described a number of specimens of *Trichostemma hemisphaericum* Sars from the North Atlantic, some of which very closely resemble *Trichostemma sarsii*, and it now seems to me quite possible that the latter species may be a mere synonym of the former. I await further evidence, however, before definitely committing myself to this view. (See also under *Polymastia conigera*, p. 150.)

*Previously known Distribution.* Off the Azores and near Torres Straits (Ridley and Dendy); North Atlantic, Azores (Topsent).

*Register Numbers, Localities, &c.* v. 5 A, B, S. de Malha, 7.9.05, C. 20, 3—500 fathoms LXXX. A, Saya de Malha, 4.9.05, C. 2, 125 fathoms.

## LIST OF LITERATURE REFERRED TO.

(This list includes the memoirs referred to in the Report on the Homosclerophora and Astrotetrazonida as well as those referred to in the present contribution.)

1905. BAER, L. "Silicispongien von Sansibar, Kapstadt und Puget" (Arch. Naturg. Jahrg. 72, Bd. 1, pp. 1—32).
1860. BARBOZA DU BOCAGE, J. V. "Éponges silicieuses nouvelles de Portugal et de l'île St Iago" (Jour. Sci. Math. Lisbon, Vol. II, 1870, pp. 159—162).
1890. BERG, C. "Substitucion de nombres genericos; III" (Comm. Mus. Nac. Buenos Aires, I, pp. 77—80).
- 1862 c. BOWERBANK, J. S. "On the Anatomy and Physiology of the Spongiadae. Part III" (Phil. Trans. Roy. Soc. London, Vol. CLII, pp. 1087—1135).
1864. Id. "A Monograph of the British Spongiadae. Vol. I" (London).
1866. Id. "A Monograph of the British Spongiadae. Vol. II" (London).
- 1872 a. Id. "Contributions to a General History of the Spongiadae. Part I" (Proc. Zool. Soc. London, 1872, pp. 115—129).
- 1873 a. Id. "Contributions to a General History of the Spongiadae. Part IV" (Proc. Zool. Soc. London, 1873, pp. 3—25).
- 1873 b. Id. "Report on a Collection of Sponges found at Ceylon by E. W. H. Holdsworth, Esq." (Proc. Zool. Soc. London, 1873, pp. 25—32).
1874. Id. "A Monograph of the British Spongiadae. Vol. III" (London).
1875. Id. "Contributions to a General History of the Spongiadae. Part VII" (Proc. Zool. Soc. London, 1875, pp. 281—296).
1882. Id. "A Monograph of the British Spongiadae. Vol. IV" (edited, with additions, by the Rev. A. M. NORMAN. London).
1860. CARTER, H. J. "On Grayella cyathophora, a new genus and species of Sponges" (Ann. and Mag. Nat. Hist. Vol. IV, pp. 189—197).
1870. Id. "Notes on the sponges Grayella, Osculina, and Cliona" (Ann. and Mag. Nat. Hist. Vol. V, pp. 73—83).
- 1871 a. Id. "A descriptive account of three pachytragus sponges growing on the rocks of the South coast of Devon" (Ann. and Mag. Nat. Hist. Vol. VII, pp. 1—15).
- 1871 f. Id. "Description and Illustrations of a new species of Tethya, with observations on the Nomenclature of the Tethyidae" (Ann. and Mag. Nat. Hist. Vol. VIII, pp. 99—105).
- 1873 c. Id. "On two new species of Gumminae (Corticium abyssii, Chondrilla australiensis) with special and general observations" (Ann. and Mag. Nat. Hist. Vol. XII, pp. 17—30).
1874. Id. "Descriptions and figures of deep-sea sponges and their spicules from the Atlantic Ocean, &c." (Ann. and Mag. Nat. Hist. Vol. XIV, pp. 207—221, 245—257).
1875. Id. "Notes introductory to the Study and Classification of the Spongiadae, II" (Ann. and Mag. Nat. Hist. Vol. XVI, pp. 126—145, 177—200).
1876. Id. "Descriptions and figures of deep-sea sponges and their spicules from the Atlantic Ocean, &c." (Ann. and Mag. Nat. Hist. Vol. XVII, pp. 226—240, 307—324, 388—410, 458—479).
- 1879 a. Id. "On Holasterella, a fossil sponge of the Carboniferous era, and on Hemiansterella, a new Genus of recent Sponges" (Ann. and Mag. Nat. Hist. Vol. III, pp. 141—150).
- 1879 b. Id. "Contributions to our knowledge of the Spongiadae" (Ann. and Mag. Nat. Hist. Vol. III, pp. 284—304, 343—360).

- 1879 g. CARTER, H. J. "Spongiidae from Kerguelen's Island" (Phil. Trans. Roy. Soc. London, Vol. CLXVIII, pp. 286—288).
- 1880 b. Id. "Report on specimens dredged up from the Gulf of Manaar, and presented to the Liverpool Free Museum by Capt. W. H. Cawne Warren" (Ann. and Mag. Nat. Hist. Vol. VI, pp. 35—61, 129—156).
- 1881 c. Id. "Supplementary Report on specimens dredged up from the Gulf of Manaar, &c." (Ann. and Mag. Nat. Hist. Vol. VII, pp. 361—385).
- 1881 c. Id. "Contributions to our knowledge of the Spongiadae. Order I. Carnosa" (Ann. and Mag. Nat. Hist. Vol. VIII, pp. 241—259).
- 1882 a. Id. "Some sponges from the West Indies and Acapulco, in the Liverpool Free Museum, &c." (Ann. and Mag. Nat. Hist. Vol. IX, pp. 266—301, 346—368).
- 1882 c. Id. "New Sponges, observations on old ones, and a proposed new group (Phloeodictyina)" (Ann. and Mag. Nat. Hist. Vol. X, pp. 106—125).
- 1883 b. Id. "Contributions to our knowledge of the Spongiadae. Pachytragida" (Ann. and Mag. Nat. Hist. Vol. XI, pp. 344—369).
- 1883 f. Id. "Contributions to our knowledge of the Spongiadae" (Ann. and Mag. Nat. Hist. Vol. XII, pp. 308—329).
1884. Id. "Catalogue of the Marine Sponges collected by Mr Jos. Willcox on the West Coast of Florida" (Proc. Acad. Nat. Sci. Philadelphia, 1884, pp. 202—209).
- 1885—6. Id. "Descriptions of Sponges from the neighbourhood of Port Phillip Heads, &c." (Ann. and Mag. Nat. Hist. Vols. XV, XVI).
1887. Id. "Report on the Marine sponges, chiefly from King Island, in the Mergui Archipelago, &c." (Journ. Linn. Soc. Zool. Vol. XXI, pp. 61—84).
1879. CZERNIAVSKY, V. "Spongie littorales Pontis Euxini et Maris Caspii" (Bull. Moscow Soc. Nat. Vol. LIV, Pt. 2, pp. 88—128, 228—320).
1887. DENDY, A. "The Sponge Fauna of Madras, &c." (Ann. and Mag. Nat. Hist. Vol. XX, pp. 153—165).
1889. Id. "Report on a Second Collection of Sponges from the Gulf of Manaar" (Ann. and Mag. Nat. Hist. Vol. III, pp. 73—99).
1895. Id. "Catalogue of Non-Calcareous Sponges collected by J. Brucebridge Wilson, &c., Part 1" (Proc. Roy. Soc. Victoria, Vol. VII, pp. 232—260).
1896. Id. "Catalogue of Non-Calcareous Sponges collected by J. Brucebridge Wilson, &c., Part 2" (Proc. Roy. Soc. Victoria, Vol. VIII, pp. 14—51).
1897. Id. "Catalogue of Non-Calcareous Sponges collected by J. Brucebridge Wilson, &c., Part 3" (Proc. Roy. Soc. Victoria, Vol. IX, pp. 230—259).
1905. Id. "Report on the Sponges collected by Professor Herdman at Ceylon in 1902" (Report Pearl Oyster Fisheries, Roy. Soc. London, Part 3, pp. 57—246).
- 1916 a. Id. "Report on the Non-Calcareous Sponges collected by Mr James Hornell at Okhamandal, &c." (Report to the Government of Baroda on the Marine Zoology of Okhamandal in Kattiawar. Part 2, pp. 93—146, London, Williams and Norgate).
- 1916 c. Id. "Report on the Homosclerophora and Astrotetrazonida collected by H.M.S. 'Sealark' in the Indian Ocean" (Trans. Linn. Soc. Zool. Vol. XVII, pp. 225—271).
- 1916 d. Id. "Some Factors of Evolution in Sponges" (Presidential address, Quekett Microscopical Club, Journ. Quek. M.C. Vol. XIII, pp. 27—46).
- 1916 e. Id. "On the occurrence of Gelatinous Spicules, and their Mode of Origin, in a New Genus of Siliceous Sponges" (Proc. Roy. Soc. B, Vol. LXXXIX, pp. 315—322).



1917. DENDY, A. "The Chessman Spicule of the Genus *Latrunculia*; a Study in the Origin of Specific Characters" (Presidential Address, Quekett Microscopical Club. Jour. Quek. M.C. Vol. XIII, pp. 231—246).
1921. Id. "The Tetraxonid Sponge-Spicule:—A Study in Evolution (Acta Zoologica, Vol. II, pp. 95—152).
1917. DENDY, A. and NICHOLSON, J. W. "On the Influence of Vibrations upon the Form of Certain Sponge-Spicules" (Proc. Roy. Soc. B, Vol. LXXXIX, pp. 573—587).
1878. DESZÖ, B. "Die Histologie und Sprossenentwicklung der Tethyen, besonders der *Tethya lyncurium* Lbk." (Arch. Mikr. Anat. Vol. XVI, pp. 626—651).
1864. DUCHASSAING, P. et MICHELOTTI, G. "Spongiaires de la Mer Caraïbe" (Mat. Nat. Verh. Haarlem, Vol. XXI).
1870. EHRLERS, E. "Die Esper'schen Spongien in der Zoologischen Sammlung der K. Universität, Erlangen" (Universitäts-Programm, Erlangen).
1912. FERRER HERNANDEZ, F. "Notas sobre algunas esponjas de Santander" (Bol. Soc. españ. Hist. Nat. Vol. XII, pp. 573—589).
1828. FLEMING, J. "A History of British Animals" (Edinburgh).
1887. FRISTEDT, K. "Sponges from the Atlantic and Arctic Oceans and the Behring Sea" ("Vega" Exped. Vetensk. Sakttag, Vol. IV, pp. 401—471).
1826. GRANT, R. E. "Notice of a New Zoophyte (*Cliona celata* Gr.) from the Firth of Forth" (Edinburgh New Philosophical Journal, Vol. I, pp. 78—81).
1858. GRAY, J. E. "Description of a new genus of Sponge (*Xenospongia*) from Torres Strait" (Proc. Zool. Soc. London, 1858, pp. 229—230).
- 1867 E. Id. "On Placospongia, a new generic form of Spongiadae in the British Museum" (Proc. Zool. Soc. London, 1867, pp. 127—129).
- 1867 F. Id. "Notes on the Arrangement of Sponges, with the descriptions of some new Genera" (Proc. Zool. Soc. London, 1867, pp. 492—553).
1868. Id. "Note on Theconella, a new genus of Coralloid Sponges from Formosa" (Proc. Zool. Soc. London, 1868, pp. 565—566).
1912. HALLMANN, E. F. "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" (Commonwealth of Australia Fisheries. Zool. Results of the Fishing Experiments carried out by the F.I.S. "Endeavour," 1909—10. Part II, pp. 115—300).
1914. Id. "A Revision of the Monaxonid Species described as now in Lendenfeld's Catalogue of the Sponges in the Australian Museum. Part 3" (Proc. Linn. Soc. N.S.W. Vol. XXXIX, pp. 398—446).
1916. Id. "A Revision of the Genera with Microscleres included, or provisionally included, in the family *Acinellidae*; with Descriptions of some Australian species. Parts 1 and 2" (Proc. Linn. Soc. N.S.W. Vol. XLII, pp. 453—491 and 495—552).
- 1917 A. Id. Op. cit. Part 3 (Proc. Linn. Soc. N.S.W. Vol. XLII, pp. 634—675).
- 1917 B. Id. "On the genera *Echinaxia* and *Rhabdosigma*" (Proc. Linn. Soc. N.S.W. Vol. XLII, pp. 391—404).
1894. HANITSCH, R. "Revision of the generic nomenclature and classification in Bowerbank's 'British Spongiadae'" (Proc. Liverpool Biol. Soc. Vol. VIII, pp. 173—206).
1909. HENTSCHEL, E. "Tetraxonida. Th. 1" (Die Fauna Südwest-Australiens, Bd. II, pp. 347—402. Jena, G. Fischer).
- 1911 A. Id. "Tetraxonida. Th. 2" (Die Fauna Südwest-Australiens, Bd. III, pp. 279—393. Jena, G. Fischer).
1912. Id. "Kiesel- und Hornschwämme der Aru- und Kei-Inseln" (Abh. Senckenberg nat. Ges. Bd. XXXIV, pp. 291—448).

1914. HENTSCHEL, E. "Monaxone Kieselchwämme und Hornschwämme der deutschen Südpolar-Expedition 1901—1903" (Deutsch. Südpol.-Exped. Bd. XV, Zool. Bd. VII, pp. 35—141).
1877. HIGGIN, T. "Description of some sponges obtained during a cruise of the steam yacht 'Argo' in the Caribbean and neighbouring seas" (Ann. and Mag. Nat. Hist. Vol. XIX, pp. 291—299).
1892. HINDE, G. J. and HOLMES, W. M. "On the Sponge-Remains in the Lower Tertiary Strata near Oamaru, Otago, New Zealand" (Linn. Soc. Journal Zool. Vol. XXIV, p. 177).
1889. HOPE, R. "On two new British species of sponges, &c." (Ann. and Mag. Nat. Hist. Vol. IV, pp. 333—342).
1892. JOHNSTON, G. "History of British Sponges and Lithophytes" (Edinburgh).
1878. KELLER, C. "Ueber den Bau von *Reniera semitubulosa*, O.S.: ein Beitrag zur Anatomie der Kieselchwämme" (Zeit. wiss. Zool. Vol. XXX, pp. 563—586).
1889. Id. "Die Spongien-fauna des rothen Meeres. I. Hälfte" (Zeit. wiss. Zool. Vol. XLVIII, pp. 311—405).
1891. Id. "Die Spongien-fauna des rothen Meeres. II. Hälfte" (Zeit. wiss. Zool. Vol. LII, pp. 294—368).
1896. KIESCHNICK, O. "Silicispongien von Ternate nach den Sammlungen von Herrn Prof. Dr. W. Kükenthal" (Zool. Anzeiger, Bd. XIX, pp. 526—534).
1900. Id. "Kieselchwämme von Amboina" (Semon, Zool. Forschungsreisen Australien Malay Archipel, Bd. V, Lief. 5, pp. 545—582. Denkschr. med.-nat. Ges. Jena, Bd. VIII).
- 1900 A. KIRKPATRICK, R. "On the Sponges of Christmas Island" (Proc. Zool. Soc. London, 1900, pp. 127—141).
- 1900 B. Id. "Description of Sponges from Funafuti" (Ann. and Mag. Nat. Hist. Vol. VI, pp. 345—362).
1902. Id. "Descriptions of South African Sponges" (Marine Investigations South Africa Dept. Agric. Vol. I, pp. 219—232).
1903. Id. "Descriptions of South African Sponges, Part 3" (Marine Investigations South Africa Dept. Agric. Vol. II, pp. 233—264).
1905. Id. "On the Oscules of *Cinachyra*" (Ann. and Mag. Nat. Hist. Vol. XVI, pp. 662—667).
- 1908 C. Id. "Tetraxonida" (National Antarctic Expedition, Natural History, Vol. IV, pp. 1—56).
- 1908 D. Id. "On two new Genera of Recent Pharetronid Sponges" (Ann. and Mag. Nat. Hist. Vol. II, pp. 503—514).
1911. Id. "On *Merlia normani*, a Sponge with a Siliceous and Calcareous Skeleton" (Quart. Journ. Microsc. Science, Vol. LVI, pp. 657—702).
1813. LAMARCK, J. B. P. A. de M. de. "Sur les Polypiers empâtés: Éponges" (Ann. Mus. Hist. Nat. Paris, Vol. XX, pp. 294—312, 370—386, 432—458).
- 1815 (1815 A). Id. "Suite des Polypiers empâtés" (Mém. Mus. Hist. Nat. Paris, Vol. I, pp. 69—80, 162—168, 331—340).
1896. LAMBE, L. M. "Sponges from the Atlantic Coast of Canada" (Trans. R. Soc. Canada (2), Vol. II, Sec. 4, pp. 181—211).
1914. LEBWOHL, F. "Japanische Tetraxonida" (Journal of the College of Science, Imperial University of Tokyo, Vol. XXXV, Arts. 2 and 5).
- 1886 A. LENDENFELD, R. von. "A Monograph of the Australian Sponges. Part 4. The Myxospongiae" (Proc. Linn. Soc. New South Wales, Vol. X, pp. 3—22).
1887. Id. "Die Chalineen des australischen Gebietes" (Zool. Jahrb. Vol. II, pp. 723—828).
1888. Id. "Catalogue of Sponges in the Australian Museum" (Sydney, N.S.W.).
1896. Id. "Die Clavulina der Adria" (Nova Acta Acad. Leopoldino-carolinæ, T. LXIX, pp. 1—251).
1897. Id. "Spongien von Sansibar" (Abh. Senckenberg nat. Ges. Bd. XXI, pp. 93—133).
1903. Id. "Tetraxonida" (Das Tierreich, Lief. XIX).
1906. Id. "Die Tetraxonida" (Wiss. Ergebn. deutsch. Tiefsee-exp. Bd. XI, Lief. 2).

1907. LENDENFELD, R. von. "Tetraxonida der deutschen Südpolar-Expedition, 1901—1903" (Deutsch. Südpol.-Exped. Bd. ix, Zool. Bd. i, pp. 303—342).
- 1910 A. Id. "The Geodiidae" (Reports on the Scientific Results of the "Albatross" Expedition, XXI. The Sponges, pp. 1—260).
- 1910 B. Id. "The Erylidae" (Reports on the Scientific Results of the "Albatross" Expedition, XXI. The Sponges, pp. 261—321).
1893. LEVINSEN, G. M. R. "Studier over Svaampe-Spicula: Cheler og Ankere" (Vidensk. Medd. naturh. Foren. i Kjobenhavn, pp. 1—21).
1859. LIEBERKÜHN, N. "Neue Beiträge zur Anatomie der Spongien" (Müller's Archiv, 1859, pp. 353—382, 515—529).
1897. LINDGREN, N. G. "Beitrag zur Kenntnis der Spongienfauna des malayischen Archipels und der chinesischen Meere" (Zool. Anzeiger, Bd. xx, pp. 480—487).
1898. Id. "Beitrag zur Kenntniss der Spongienfauna des malayischen Archipels und der chinesischen Meere" (Zool. Jahrbuch, Abth. Syst. Bd. xi, pp. 283—378).
1902. LUNDBECK, W. "Homorhaphidae and Heterorhaphidae" (Porifera, Pt. I, Danish Ingolf-Expedition, Vol. vi, No. 1).
1905. Id. "Desmacidonidae (Pars)" (Porifera, Pt. II, Danish Ingolf-Expedition, Vol. vi, No. 2).
1910. Id. "Desmacidonidae (Pars)" (Porifera, Pt. III, Danish Ingolf-Expedition, Vol. vi, No. 3).
1833. NARDO, G. D. "Untersuchungen über die Spongien und nächst verwandten Thier-Gattungen" (Lis. 1833, Coll. 519—524).
1868. NORMAN, A. M. "Shetland Final Dredging Report, Part 2" (Rep. Brit. Ass. 1868, p. 327).
1878. Id. "On the Genus Haliphysema, with Description of several Forms apparently allied to it" (Ann. and Mag. Nat. Hist. Vol. i, pp. 265—284).
1882. Id. (See 1882 Bowerbank.)
1881. RIDLEY, S. O. "On the genus Plocamia, Schmidt, (Dirrhopalum), and on some other Sponges of the order Echinonemata" (Journ. Linn. Soc. Zool. Vol. xv, pp. 476—487, 493—497).
- 1884 C. Id. "Spongiida" (Report on the Zoological Collections made in the Indo-Pacific Ocean during the voyage of H.M.S. "Alert," 1881—2, pp. 366—482, 582—630).
1886. RIDLEY, S. O. and DENDY, A. "Preliminary Report on the Monaxonida collected by H.M.S. 'Challenger'" (Ann. and Mag. Nat. Hist. Vol. xviii, pp. 325—351, 470—493).
1887. Id. "Report on the Monaxonida" ("Challenger" Reports, Zoology, Vol. xx, Pt. 59).
1911. ROW, R. W. H. "Report on the Sponges collected by Mr Cyril Crossland in 1904—5" (Reports on the Marine Biology of the Sudanese Red Sea, Journ. Linn. Soc. Zool. Vol. xxxi, pp. 287—400).
1869. SARS, G. O. "On the Deep Sea Fauna of the Norwegian Coast" (Vidensk. Selsk. Forhandl. 1868, p. 250).
1872. Id. "On some Remarkable Forms of Animal Life from the Great Depths of the Norwegian Coast, I" (University Program. Christiania, 1872).
1862. SCHMIDT, O. "Die Spongien des adriatischen Meeres" (Leipzig).
1864. Id. "Supplement der Spongien des adriatischen Meeres" (Leipzig).
1866. Id. "Zweites Supplement der Spongien des adriatischen Meeres" (Leipzig).
1868. Id. "Die Spongien der Küste von Algier, &c." (Leipzig).
1870. Id. "Grundzüge einer Spongien-Fauna des atlantischen Gebietes" (Leipzig).
1875. Id. "Spongien" (Zool. Ergebn. der Nordseefahrt 1872. Kiel, Deutsch. Meer. Ber. Vol. 2 and 3, pp. 115—120).
- 1877 C. SCHULZE, F. E. "Untersuchungen über den Bau und die Entwicklung der Spongien. III. Die Familie der Chondrosida" (Zeit. wiss. Zool. Vol. xxix, pp. 87—122).

1880. SCHULZE, F. E. "Untersuchungen über den Bau und die Entwicklung der Spongien. IX. Die Plakiniden" (Zeit. wiss. Zool. Vol. xxxiv, pp. 407—451).
1867. SELENKA, E. "Ueber einige neue Schwämme aus der Südsee" (Zeit. wiss. Zool. Vol. xvii, pp. 565—571).
1902. SOLLAS, I. B. J. "On the Sponges collected during the 'Skeat Expedition' to the Malay Peninsula, 1899—1900" (Proc. Zool. Soc. London, 1902, Vol. II, pp. 210—221).
1886. SOLLAS, W. J. "Preliminary Account of the Tetractinellid Sponges dredged by H.M.S. 'Challenger,' 1872—1876. Part I, The Choristida" (Proc. Dublin Soc. Vol. v, pp. 177—199).
1888. Id. "Report on the Tetractinellida" ("Challenger" Reports, Zoology, Vol. xxv).
1915. STEPHENS, J. "Sponges of the Coasts of Ireland. I. The Triaxonida and part of the Tetraxonida" (Fisheries, Ireland, Scientific Investigations, 1914, IV, pp. 1—43).
1898. THIELE, J. "Studien über pazifische Spongien, I" (Zoologica, Heft 24).
1899. Id. "Studien über pazifische Spongien, II" (Zoologica, Heft 24).
1900. Id. "Kieselschwämme von Ternate, I" (Abh. Senckenb. Nat. Ges. Bd. xxv, pp. 17—80).
- 1903 A. Id. "Beschreibung einiger unzureichend bekannten monaxonen Spongien" (Arch. Naturg. Jahrg. 69, Bd. I, pp. 375—398).
- 1903 B. Id. "Kieselschwämme von Ternate, II" (Abh. Senckenb. Nat. Ges. Bd. xxv, pp. 933—968).
1905. Id. "Die Kiesel- und Hornschwämme der Sammlung Plate" (Zool. Jahrb. Suppl. vi, pp. 407—496).
1873. THOMSON, C. WYVILLE. "The Depths of the Sea" (London).
- 1888 B. TORSENT, E. "Notes Spongologiques" (Arch. Zool. Exp. et Gén. (2) vi, 3, pp. xxxiii—xlvi).
- 1888 E. Id. "Contribution à l'Étude des Clonides" (Arch. Zool. Exp. et Gén. v bis. Suppl. Mém. iv, pp. 1—165).
1889. Id. "Quelques Spongiaires du Banc de Campêche et de la Pointe-à-Pître" (Mém. Soc. Zool. France, II, I, pp. 30—52).
1890. Id. "Notice préliminaire sur les Spongiaires recueillis durant les Campagnes de l'Hirondelle" (Bull. Soc. Zool. France, xv, No. 2, pp. 26—32, 65—71).
- 1892 C. Id. "Contributions à l'Étude des Spongiaires de l'Atlantique Nord" (Camp. Scient. du Prince de Monaco, Fasc. II).
- 1892 D. Id. "Diagnoses d'Éponges nouvelles de la Méditerranée et plus particulièrement de Banyuls" (Arch. Zool. Exp. et Gén. (2) x, pp. xvii—xxviii).
1893. Id. "Mission Scientifique de M. Ch. Alluaud aux Îles Séchelles (Mars-Mai 1892). Spongiaires" (Bull. Soc. Zool. France, xviii, pp. 172—175).
- 1893 E. Id. "Note sur quelques Éponges du Golfe de Tadjoura recueillies par M. le Dr L. Faurot" (Bull. Soc. Zool. France, xviii, pp. 177—182).
- 1894 G. Id. "Étude monographique des Spongiaires de France. I. Tetractinellida" (Arch. Zool. Exp. et Gén. (3) II, No. 3, pp. 259—400).
- 1896 A. Id. "Matériaux pour servir à l'Étude de la Faune des Spongiaires de France" (Mém. Soc. Zool. France, ix, I, pp. 113—133).
- 1896 B. "Éponges" (Résult. Scient. Camp. Caudan, pp. 273—297. Annales de l'Université de Lyon).
- 1897 A. Id. "Spongiaires de la Baie d'Amboine" (Rev. Suisse Zool. Vol. iv, pp. 421—487).
- 1897 B. Id. "Sur le Genre *Halicnemis* Bowerbank" (Mém. Soc. Zool. France, x, pp. 235—251).
- 1898 B. Id. "Sur les Hadromerina de l'Adriatique" (Bull. Soc. Scient. Méd. Ouest, T. 7, pp. 117—130).
- 1898 C. Id. "Éponges nouvelles des Açores" (Mém. Soc. Zool. France, T. xi, pp. 225—255).
1900. Id. "Étude monographique des Spongiaires de France. III. Monaxonida (Hadromerina)" (Arch. Zool. Exp. et Gén. (3) viii, pp. 1—331).

1901. TOPSENT, E. "Spongiaires" (Résult. Voyage Belge, Zool.).
- 1904 A. Id. "Spongiaires des Açores" (Camp. Scient. du Prince de Monaco, Fasc. xxv).
- 1906 B. Id. "Éponges recueillies par M. Ch. Gravier dans la Mer Rouge" (Bull. Mus. Hist. Nat. Paris, 1906, pp. 557—570).
1912. Id. "Sur une grande *Tedania* abyssale des Açores (*Tedania phacellina*, n. sp.)" (Bull. Inst. Océanogr. Monaco, No. 252).
1913. Id. "Spongiaires provenant des Campagnes Scientifiques de la Princesse-Alice dans les Mers du Nord" (Camp. Scient. du Prince de Monaco, Fasc. XLV).
1919. Id. "Notes sur les Genres *Semisuberites* et *Hemiassterella*" (Bull. Inst. Océanographique, Monaco, No. 359).
1880. VOSMAER, G. C. J. "The Sponges of the Leyden Museum. I. The Family of the Desmacidinae" (Notes from the Leyden Museum, Vol. II, pp. 157—164).
1885. Id. "The Sponges of the 'Willem Barents' Expedition" (Bijdr. Dierk. Aftev. 12).
1887. Id. "Porifera" (Bronn's Klassen und Ordnungen des Thierreichs, Vol. II).
1902. Id. "On the Shape of some Siliceous Spicules of Sponges" (Proc. Sect. Sc. Akad. Wet. Amsterdam, Vol. 5, pp. 104—114).
1911. Id. "The Porifera of the Siboga-Expedition. II. The Genus *Spirastrella*" (Siboga Expedition Monographs).
1912. Id. "On the Distinction between the Genera *Axinella*, *Phacellia*, *Acanthella* a.o." (Zool. Jahrb. Suppl. 15, Bd. 1, pp. 307—322).
1902. VOSMAER, G. C. J. and VERNHOUT, J. H. "The Porifera of the Siboga-Expedition. I. The Genus *Placospongia*" (Siboga Expedition Monographs).
1905. WATSON, A. T. "Note on *Polydora armata* Lngbs." (Report Pearl Oyster Fisheries, Roy. Soc. Lond. Part 4, pp. 325—6).
- 1901 A. WHITELEGGE, T. "Report on Sponges from the Coastal Beaches of New South Wales" (Records of the Australian Museum, Vol. IV, pp. 55—118).
- 1901 B. Id. "Supplementary Note to the Report on Sponges from the Coastal Beaches of New South Wales" (Records of the Australian Museum, Vol. IV, pp. 211—216).
1907. Id. "Scientific Results of the Trawling Expedition of H.M.C.S. 'Thetis' off the Coast of New South Wales. Sponges (continued)" (Australian Museum, Mem. IV, pp. 487—515).
1894. WILSON, H. V. "Observations on the Gemmule and Egg Development of Marine Sponges" (Journal of Morphology, Vol. IX, No. 3, pp. 277—406).
1904. Id. "The Sponges" (Reports on the "Albatross" Expedition off the West Coasts of Mexico, &c. xxx. Mem. Mus. Comp. Zool. Harvard Coll. Vol. xxx, No. 1, pp. 1—164).
1881. WRIGHT, E. P. "On a new Genus and Species of Sponge (*Alema seychellensis*) with supposed heteromorphic zooids" (Trans. Irish Acad. Vol. XXVIII, pp. 13—20).
- 1878 A. ZITTEL, K. A. "Zur Stammesgeschichte der Spongien" (Festschrift für Prof. von Siebold. München).

## DESCRIPTION OF PLATES.

## PLATE 1.

- Fig. 1. *Taprobane herdmanni* Dendy. Exhalant surface of dry specimen. R.N. CXLVII.  $\times \frac{1}{2}$ .
- Fig. 1 a. *Taprobane herdmanni* Dendy. Part of exhalant surface of same specimen as shown in Fig. 1.  $\times 1\frac{1}{4}$ .
- Fig. 2. *Petromicu massalis* Dendy. R.N. xcvi. 1. Nat. size.
- Fig. 3. *Cinachyra unonata* (Dendy). R.N. XXXIII. 4.  $\times 1\frac{1}{2}$ .
- Fig. 4. *Cinachyra vaccinata* n. sp. R.N. LXVII. 2.  $\times \frac{1}{10}$ .
- Fig. 5. *Cinachyra providentia* n. sp. R.N. XXI. 1.  $\times \frac{1}{10}$ .
- Fig. 5 a. *Cinachyra providentia* n. sp. Cut surface of same specimen as Fig. 5, shewing (above) porocalices laid open.  $\times \frac{1}{10}$ .
- Fig. 6. *Paratettilla bacca* (Selenka) var. *violacea* (Kieschnick). R.N. CXIX. 3. Nat. size.
- Fig. 7. *Paratettilla bacca* (Selenka) var. *corrugata* nov. R.N. LIX. Nat. size.

## PLATE 2.

(All figures about natural size.)

- Fig. 1. *Gelliodes carnosus* Dendy var. *laxus* nov. R.N. XLIV. 2.
- Fig. 2. *Reniera tufoidea* n. sp. Largest specimen. R.N. XCIII. Upper surface.
- Fig. 2 a. *Reniera tufoidea* n. sp. Edge of same specimen as represented in Fig. 2.
- Fig. 3. *Petrosia seychellensis* n. sp. R.N. CXXVIII. 1.
- Fig. 4. *Petrosia seychellensis* n. sp. R.N. LXXII. 3.
- Fig. 5. *Halichondria retiderma* n. sp. R.N. XCVII. 1.
- Fig. 6. *Clathria procera* (Ridley) R.N. LI. 1.
- Fig. 7. *Clathria procera* (Ridley) R.N. LXXXIV.
- Fig. 8. *Echinoclathria intermedia* Whitelegge. R.N. XXVII.
- Fig. 9. *Plumohalichondria gardineri* n. sp. R.N. CIII. 1.

## PLATE 3.

(All figures about natural size.)

- Fig. 1 a. *Reniera cribriculis* n. sp. R.N. LXXI. 10 A.
- Fig. 1 b. *Reniera cribriculis* n. sp. R.N. LXXI. 10 B.
- Fig. 2. *Reniera tuberosa* n. sp. R.N. VII. 3 A.
- Fig. 3. *Halichondria aplysinioides* n. sp. R.N. LXXVII. 2.
- Fig. 4. *Halichondria aplysinioides* n. sp. R.N. LXXVIII. 7.
- Fig. 5. *Halichondria aplysinioides* n. sp. R.N. XLII. 3.
- Fig. 6. *Chalina confusa* n. sp. R.N. LXXV. 3.
- Fig. 7. *Ceraochalina differentiata* n. sp. R.N. CVII. 1.
- Fig. 8. *Yvesia spinulata* Hentschel. R.N. XLIII. 1 A.

## PLATE 4.

- Fig. 1. *Reniera ligniformis* n. sp. R.N. LXI. (restored). About natural size.
- Fig. 2. *Plumohalichondria clathroides* n. sp. R.N. CLI. (dry).  $\times$  about  $\frac{1}{2}$ .
- Fig. 3 a. *Acarnus topsenti* n. sp. R.N. XXX. 2. About natural size.
- Fig. 3 b. *Acarnus topsenti* n. sp. R.N. XLII. 7. About natural size.

- Fig. 4. *Cymon vickersii* (Bowerbank). R.N. CIX.  $\times 2$ .  
 Fig. 5 a. *Spirastrella globularis* n. sp. R.N. LVII. 6. About natural size.  
 Fig. 5 b. *Spirastrella globularis* n. sp. R.N. CXIX. 14. About natural size.  
 Fig. 6. *Polymastia tubulifera* n. sp. R.N. XIV.  $\times 1\frac{1}{2}$ .

## PLATE 5.

- Fig. 1. *Mycale crassissima* (Dendy). R.N. LXXVII. 5. About natural size.  
 Fig. 2. *Clathria spicata* Hallmann. R.N. CXLIV. (dry).  $\times$  about  $\frac{1}{2}$ .  
 Fig. 3. *Clathria madrepora* n. sp. R.N. CXXX. About natural size.  
 Fig. 4. *Sigmazinnella durissima* (Dendy) var. *massalis* nov. R.N. LXXI. 1. About natural size.  
 Fig. 5. *Acanthella carteri* Dendy. Macerated skeleton. R.N. CXXXIII. 1. About natural size.  
 Fig. 6. *Acanthella pulcherrima* Ridley and Dendy var. *calyx* nov. R.N. LXXVIII. 9. About natural size.

## PLATE 6.

(All figures about natural size.)

- Fig. 1. *Clathria spongodes* n. sp. R.N. LXXIX. 2.  
 Fig. 2. *Ectyon ceylonica* (Dendy). R.N. LXXVIII. 15.  
 Fig. 3. *Hymedesmia lipochela* n. sp. R.N. XLIV. 3.  
 Fig. 4. *Phakellia conulosa* n. sp. R.N. XLII. 13.  
 Fig. 5. *Phakellia conulosa* var. *mauritanica* nov. Exhalant surface. R.N. CXXXVI. 1.  
 Fig. 5 a. *Phakellia conulosa* var. *mauritanica* nov. Inhalant surface. R.N. CXXXVI. 1.

## PLATE 7.

- Fig. 1. *Clathria whiteleggii* n. sp. R.N. VIII. 1. About natural size.  
 Fig. 2. *Collocathria ramosa* n. sp. R.N. CXXXVIII. 1. About natural size.  
 Fig. 3. *Bubaris conulifera* n. sp. R.N. XXI. 11. About natural size.  
 Fig. 4. *Sigmazinnella durissima* (Dendy) var. *massalis* nov. R.N. XVIII. About natural size.  
 Figs. 5 a, 5 b. *Sigmazinnella durissima* (Dendy) var. *erecta* nov. R.N. CXXXIII. 2 and CXXXIII. 2 bis. About natural size.  
 Figs. 6 a, 6 b. *Sigmazinnella durissima* (Dendy) var. *tethyoides* nov. R.N. VII. 2 and VII. 2 bis. About natural size.  
 Fig. 7. *Acanthella cavernosa* n. sp. R.N. LXXI. 7. About natural size.  
 Fig. 8. *Higginsia higgini* n. sp. R.N. LXIX. 2. About natural size.  
 Fig. 9. *Higginsia petrosioides* n. sp. R.N. CXXXII. 2. About natural size.  
 Fig. 10. *Didiscus placospongioides* n. sp. R.N. LXXVIII. 13.  $\times 2$ .  
 Fig. 11. *Hemiaspella intermedia* n. sp. R.N. XIX. 3.  $\times 3$ .

## PLATE 8.

(All figures about natural size.)

- Fig. 1. *Pachychalina subcylindrica* Dendy. R.N. XX. 1.  
 Fig. 2. *Oceanapia toxophila* n. sp. Body and detached fistula. R.N. XX. 2.  
 Fig. 3. *Phlaeodictyon seychellense* n. sp. R.N. CXXIX. 1.  
 Fig. 4. *Phlaeodictyon porosum* n. sp. R.N. LXXVII. 4.  
 Fig. 5. *Phlaeodictyon polysiphonia* n. sp. Fragments. R.N. LXXXIII. 1.  
 Fig. 6. *Siderodermella ramosa* n. sp. R.N. CXXXIII. 6.  
 Fig. 7. *Azinella spiculifera* (Lamarck). R.N. XCII. 3.  
 Fig. 8. *Hymeniadon conglomerata* n. sp. R.N. LXXVIII. 12.  
 Fig. 9. *Barbozia primitiva* n. sp. R.N. LXXII. 1.  
 Fig. 10. *Barbozia primitiva* var. *digitata* nov. R.N. CXXV. 5.

## PLATE 9.

- Fig. 1 a—p. *Theonella pulchrifolia* n. sp. R.N. CXXXIII. 1.  
 1 a. Typical tetracrepid desma,  $\times 117$ ; 1 b. Tuberculate surface desma, showing (at *xx*) mode of interlocking,  $\times 117$ ; 1 c—e. Variations of the desma,  $\times 110$ ; 1 f—h. Phyllotrienes, views of cladome,  $\times 305$ ; 1 i. Less branched form of phyllotriane,  $\times 335$ ; 1 m. Side view of phyllotriane (optical section), showing greatly enlarged axial canal in shaft and in bases of cladi,  $\times 305$ ; 1 n. Dichotriane,  $\times 305$ ; 1 o. Long, smooth microxea,  $\times 565$ ; 1 p. Short, roughened microxea,  $\times 565$ .  
 Fig. 2 a—g. *Discodermia tuberosa* n. sp.  
 2 a. R.N. X. 5. Tetracrepid desma,  $\times 120$ ; 2 b—d. R.N. IX. 2 a. Discotrienes,  $\times 110$ ; 2 c. R.N. IX. 2 c. Young discotriene, from just below the surface layer, before fusion of the cladi to form the disc,  $\times 180$ ; 2 f. R.N. IX. 2 a. Microxea,  $\times 770$ ; 2 g. R.N. IX. 2 a. Microstrongyla,  $\times 770$ .

## PLATE 10.

- Fig. 1 a—k. *Tetilla furcifer* n. sp. R.N. CXIX. 13.  
 1 a. Vertical section through vent, showing arrangement of prodianes,  $\times 60$ ; 1 b. Vertical section through outer part of cortex and bud,  $\times 60$ ; 1 c. Oxeon,  $\times 60$ ; 1 d. Style,  $\times 60$ ; 1 e. Large prodiane,  $\times 60$ ; 1 f. Cladomes of large prodianes,  $\times 310$ ; 1 g. Large protriane,  $\times 60$ ; 1 h. Cladomes of large protriane,  $\times 310$ ; 1 i. Cladome of large protriane,  $\times 310$ ; 1 j. Small prodiane,  $\times 60$ ; 1 k. Small protriane,  $\times 60$ ; 1 l. Cladome of small protriane,  $\times 310$ ; 1 m. Sigmata,  $\times 550$ .  
 Fig. 2 a—f. *Cinachyra providentia* n. sp. R.N. XXI. 1.  
 2 a. Large oxea,  $\times 34$ ; 2 b. Style,  $\times 34$ ; 2 c. Prottriene,  $\times 60$ ; 2 d. Cladome of prottriene,  $\times 310$ ; 2 e. Anatriene,  $\times 60$ ; 2 f. Cladome of anatriene,  $\times 310$ ; 2 g. Short, slender oxea,  $\times 315$ ; 2 h. Sigmata,  $\times 550$ .  
 Fig. 3 a—b. *Cinachyra isis* Lendenfeld. R.N. CXXXIII. 4.  
 3 a—a'. Cladomes of protrianes,  $\times 310$ ; 3 b. Cladome of anatriene,  $\times 310$ .

## PLATE 11.

- Fig. 1 a—l. *Cinachyra vaccinata* n. sp. (1 a—b from R.N. LVIII, the remainder from R.N. LXXVII. 2).  
 1 a. Bundles of hair-like protrianes and prodianes, breaking up beneath porocalyx,  $\times 60$ ; 1 a'. Ends of shafts of small prodianes and protrianes, frayed out from bundle, to show terminal enlargements,  $\times 550$ ; 1 b. Part of pore-membrane from porocalyx, showing pores and hispidating prodianes,  $\times 180$ ; 1 c. Large oxeon,  $\times 35$ ; 1 d. Style,  $\times 35$ ; 1 e. Large prodiane,  $\times 130$ ; 1 f. Cladome of large prodiane,  $\times 330$ ; 1 g. Prottriene of intermediate size,  $\times 130$ ; 1 h. Cladomes of large protrianes,  $\times 330$ ; 1 i. Small prodiane,  $\times 130$ ; 1 j. Cladome of small prodiane,  $\times 330$ ; 1 k. Small prottriene,  $\times 130$ ; 1 l'. Cladome of small prottriene,  $\times 330$ ; 1 j. Anatriene,  $\times 130$ ; 1 j'. Cladome of anatriene,  $\times 330$ ; 1 k. Short, slender oxea,  $\times 315$ ; 1 l. Sigmata,  $\times 550$ .

## PLATE 12.

- Fig. 1. *Reniera cribriculis* n. sp. R.N. LXXI. 10 a. Oxea,  $\times 380$ .  
 Fig. 2. *Reniera tuberosa* n. sp. R.N. VII. 3 a. Oxea,  $\times 380$ .  
 Fig. 3. *Reniera tufoides* n. sp. R.N. XCIII. Oxeon,  $\times 380$ .  
 Fig. 4. *Reniera ligniformis* n. sp. R.N. LXI. Oxea,  $\times 380$ .  
 Fig. 5 a—b. *Petrosia seychellensis* n. sp. R.N. CXXVIII. 1.  
 5 a. Stout oxea and strongyla,  $\times 165$ ; 5 b. Slender oxeon,  $\times 165$ .  
 Fig. 6. *Petrosia mammiformis* n. sp. R.N. CXXII. 2. Oxea,  $\times 165$ .  
 Fig. 7 a—b. *Halichondria retiderma* n. sp. R.N. XCVII. 1.  
 7 a. Oxeon,  $\times 165$ ; 7 b. Style,  $\times 165$ .  
 Fig. 8. *Halichondria nigra* n. sp. R.N. LIII. 5. Oxea,  $\times 165$ .  
 Fig. 9. *Halichondria aptysinoides* n. sp. R.N. LXXVII. 2. Oxea,  $\times 165$ .  
 Fig. 10. *Chalina confusa* n. sp. R.N. LXXV. 3. Oxea,  $\times 380$ .  
 Fig. 11. *Ceraochalina differentia* n. sp. R.N. CVII. 1. Oxea,  $\times 380$ .  
 Fig. 12 a—c. *Oceanapia toxophila* n. sp. R.N. XX. 2.  
 12 a. Oxea,  $\times 290$ ; 12 b. Sigma,  $\times 660$ ; 12 c. Toxon,  $\times 660$ .

- Fig. 13 a—b. *Phlaeodictyon seychellense* n. sp.  
13 a. R.N. CXXIX. 1, oxea,  $\times 450$ ; 13 b. R.N. LI. 2, oxea,  $\times 450$ .  
Fig. 14. *Phlaeodictyon porosum* n. sp. R.N. LXXVII. 4. Oxea,  $\times 450$ .  
Fig. 15. *Phlaeodictyon incrustatum* n. sp. R.N. CX. 2. Oxea,  $\times 450$ .  
Fig. 16. *Phlaeodictyon polysiphoniu* n. sp. R.N. LXXXIII. 1. Oxea,  $\times 450$ .  
Fig. 17 a—b. *Amphilectus* (?) *unguiculatus* n. sp. R.N. CXIII. 10.  
17 a. Tylostylii,  $\times 325$ ; 17 b. Isochela,  $\times 770$ .  
Fig. 18. *Mertiu* sp. Clavidi,  $\times 650$ .

## PLATE 13.

- Fig. 1 a—e. *Microciona atrorubra* Bowerbank. R.N. CX. 8.  
1 a. Large styli,  $\times 330$ ; 1 b. Slender tylostyle,  $\times 330$ ; 1 c. Echinating acanthostyle,  $\times 550$ ;  
1 d. Palmate isochela,  $\times 1100$ ; 1 e. Toxa,  $\times 550$ .  
Fig. 2 a—f. *Bubaris conulifera* n. sp. R.N. XXI. 11.  
2 a. Strongyla,  $\times 110$ ; 2 b, b', c. Oxea,  $\times 110$ ; 2 d. Short styli,  $\times 110$ ; 2 e. Long style,  $\times 110$ ;  
2 f. Trichodragmata,  $\times 460$ .  
Fig. 3 a—b. *Bubaris salomonensis* n. sp. R.N. CXXII. 5.  
3 a. Strongyla,  $\times 110$ ; 3 b. Styli,  $\times 110$ .  
Fig. 4 a—f. *Clathria spicata* Hallmann. R.N. XLII. 4.  
4 a. Large tylostyles,  $\times 330$ ; 4 b. Acanthosubtylostyles,  $\times 550$ ; 4 c. Forms intermediate be-  
tween 4 a and 4 b,  $\times 330$ ; 4 d. Long, slender tylostyles,  $\times 330$ ; 4 e. Palmate isochela,  $\times 1100$ ; 4 f.  
Toxon,  $\times 550$ .  
Fig. 5 a—f. *Clathria whiteleggii* n. sp. R.N. VIII. 1.  
5 a. Large subtylostyles,  $\times 330$ ; 5 b. Acanthosubtylostyles,  $\times 550$ ; 5 c. Form intermediate  
between 5 a and 5 b,  $\times 330$ ; 5 d. Long, slender tylostyle,  $\times 330$ ; 5 e. Palmate isochela,  $\times 1100$ ;  
5 f. Toxon,  $\times 550$ .

## PLATE 14.

- Fig. 1 a—d. *Clathria madrepore* n. sp. R.N. CXXX.  
1 a. Large tylostyles,  $\times 330$ ; 1 a'. Possibly young forms of 1 a,  $\times 330$ ; 1 b. Acanthosubtylo-  
style,  $\times 550$ ; 1 c. Slender tylostyle,  $\times 330$ ; 1 d. Isochela,  $\times 1100$ .  
Fig. 2 a—d. *Clathria spongodes* n. sp. R.N. LXXIX. 2.  
2 a. Large tylostyles,  $\times 330$ ; 2 b. Acanthosubtylostyle,  $\times 550$ ; 2 c. Slender tylostyle,  $\times 330$ ;  
2 d. Sigma,  $\times 1100$ .  
Fig. 3 a—e. *Clathria cheliferu* (Hentschel). R.N. CVIII. 3.  
3 a. Styli,  $\times 330$ ; 3 b. Acanthostyles,  $\times 550$ ; 3 c. Strongylon,  $\times 330$ ; 3 d. Larger palmate  
isochela,  $\times 1100$ ; 3 e. Smaller palmate isochela,  $\times 1100$ .  
Fig. 4 a—h. *Collociathria ramosa* n. sp. R.N. CXXXVIII. 1.  
4 a. Stout style,  $\times 330$ ; 4 b. Acanthosubtylostylii,  $\times 550$ ; 4 c. Slender styli,  $\times 330$ ; 4 d.  
Palmate isochela,  $\times 1115$ ; 4 e. Forms intermediate in appearance between 4 d and 4 f,  $\times 1115$ ; 4 f.  
Colloscleres,  $\times 1115$ ; 4 g. Very minute isochela,  $\times 1115$ ; 4 h. Toxa,  $\times 550$ .  
Fig. 5 a—c. *Plocamia massalis* n. sp. R.N. CXXV. 2.  
5 a. Acanthostongyla,  $\times 330$ ; 5 b. Tylote,  $\times 330$ ; 5 c. Palmate isochela,  $\times 1100$ .  
Fig. 6. *Lithoplocamius lithistoides* n. sp. R.N. CXXXVII. 2. Acanthostongyla.

## PLATE 15.

- Fig. 1 a—c. *Hymedesmia lavissima* n. sp. R.N. CXXV. 6.  
1 a. Stout subtylostyles,  $\times 290$ ; 1 b. Slender tylostyle,  $\times 290$ ; 1 b'. Apex of slender tylostyle,  
 $\times 1075$ ; 1 c. Tridentate isochela,  $\times 1075$ .  
Fig. 2 a, b. *Hymedesmia lipochela* n. sp. R.N. XLIV. 3.  
2 a. Stout subtylostyles,  $\times 290$ ; 2 b. Slender tylostyle,  $\times 290$ .  
Fig. 3 a—d. *Plumohalichondria clathroides* n. sp. R.N. CLI.  
3 a. Tornota,  $\times 460$ ; 3 b. Acanthostyles,  $\times 460$ ; 3 c. Larger tridentate isochela,  $\times 1075$ ; 3 d.  
Smaller tridentate isochela,  $\times 1075$ .

- Fig. 4 a—d. *Plumohalichondria gardineri* n. sp. R.N. CIII. 1.  
4 a. Large acanthostyles,  $\times 290$ ; 4 b. Small acanthostyles,  $\times 290$ ; 4 c. Long, slender styli,  
 $\times 170$ ; 4 d. Long, slender oxea,  $\times 290$ .  
Fig. 5 a—c. *Hamigera papillata* n. sp. R.N. XIX. 1.  
5 a. Subtylostylii,  $\times 290$ ; 5 b. Tylote,  $\times 290$ ; 5 c. Tridentate isochela,  $\times 1075$ .  
Fig. 6 a—e. *Forcepia stephensi* n. sp. R.N. LXXXII. A.  
6 a. Tylostyle,  $\times 460$ ; 6 b. Tylote,  $\times 460$ ; 6 c. Tridentate isochela,  $\times 1080$ ; 6 d. Signata,  
 $\times 1080$ ; 6 e. Forceps,  $\times 1080$ .  
Fig. 7 a, b. *Orella cyathophora* (Carter) var. *acuta* nov. R.N. CXIII. 11.  
7 a. Subtylostylii,  $\times 550$ ; 7 b. Acanthoxea,  $\times 550$ .  
Fig. 8 a—e. *Acarnus topsenti* n. sp. R.N. XXX. 2.  
8 a. Styli and subtylostyle,  $\times 550$ ; 8 b. Clado-acanthostylii,  $\times 550$ ; 8 c. Tylota,  $\times 550$ ;  
8 d. Palmate isochela,  $\times 1090$ ; 8 e. Toxa,  $\times 550$ .

## PLATE 16.

- Fig. 1 a—b. *Tedanione wilsoni* n. sp. R.N. XX. 6.  
1 a. Strongylotylota,  $\times 440$ ; 1 b. Larger raphides,  $\times 670$ ; 1 b'. Smaller raphis,  $\times 670$ .  
Fig. 2 a—d. *Cornulella lundbecki* n. sp. R.N. CXXXVIII. 1 A.  
2 a. Tylote,  $\times 280$ ; 2 b. Palmate isochela,  $\times 860$ ; 2 c. Microrhabd,  $\times 860$ ; 2 d. Toxon,  $\times 860$ .  
Fig. 3 a, b. *Cornulum strepsichela* n. sp. R.N. XC. 1.  
3 a. Tylota,  $\times 330$ ; 3 b. Palmate isochela,  $\times 770$ .  
Fig. 4 a—e. *Siderodermella ramosa* n. sp. R.N. CXXXIII. 6.  
4 a. Tylote,  $\times 170$ ; 4 b. Tridentate isochela,  $\times 1080$ ; 4 c. Navicelliform isochela,  $\times 1080$ ;  
4 d. Larger sigma,  $\times 1080$ ; 4 e. Smaller sigma,  $\times 1080$ .  
Fig. 5 a—f. *Cyamon vickersii* (Bowerbank). R.N. CIX.  
5 a. Short, smooth styli or subtylostylii,  $\times 108$ ; 5 b. Strongylote,  $\times 108$ ; 5 c. Long, slender,  
smooth style (subtylostyle),  $\times 108$ ; 5 d. Slender styli of peculiar form, two with bulbous inflation (x),  
 $\times 330$ ; 5 d'. Variety of same without the characteristic bend,  $\times 330$ ; 5 e. Pseudotetract,  $\times 550$ ;  
5 e'. Pseudopentact,  $\times 550$ ; 5 e''. Pseudotriact,  $\times 550$ ; 5 e'''. Pseudodiact,  $\times 550$ ; 5 f—f'''.  
Developmental stages pseudotetracts, &c.,  $\times 550$ .  
Fig. 6 a—c. *Sigmatonella bihamigera* n. sp. R.N. XXXII.  
6 a. Styli,  $\times 70$ ; 6 b. Large sigma,  $\times 670$ ; 6 c. Small sigmata,  $\times 570$ .

## PLATE 17.

- Fig. 1 a, b. *Azinella bubarinoides* n. sp. R.N. CXXII. 1 A.  
1 a. Short styli,  $\times 165$ ; 1 b. Long style,  $\times 165$ .  
Fig. 2 a, b. *Phakellia conulosa* n. sp. R.N. XLII. 13.  
2 a. Short styli,  $\times 110$ ; 2 b. Long styli,  $\times 110$ .  
Fig. 3 a, b. *Acanthella cavernosa* n. sp. R.N. LXXI. 7.  
3 a. Style,  $\times 165$ ; 3 b. Strongylote,  $\times 165$ .  
Fig. 4. *Hymeniacidon varioplicata* n. sp. R.N. CXXII. 7. Styli and tylostyli,  $\times 110$ .  
Fig. 5 a, b. *Hymeniacidon conglomerata* n. sp. R.N. LXXVIII. 12.  
5 a. Styli,  $\times 110$ ; 5 b. Tylostyle,  $\times 110$ .  
Fig. 6 a—c. *Spongosorites salomonensis* n. sp. R.N. CXVI.  
6 a. Large oxea (one strongylote),  $\times 165$ ; 6 b. Intermediate forms,  $\times 165$ ; 6 c. Small oxea,  $\times 165$ .  
Fig. 7 a—e. *Higginsia petrosioides* n. sp. R.N. CXXXII. 2.  
7 a. Stout oxea,  $\times 60$ ; 7 b. Stout styli,  $\times 60$ ; 7 c. Stout strongyla,  $\times 60$ ; 7 d. Slender oxeon  
with bifid ends,  $\times 325$ ; 7 d', 7 d''. Variations in ends of slender oxea,  $\times 800$ ; 7 e. Acanthoxeote,  
 $\times 550$ .  
Fig. 8 a—f. *Higginsia higgini* n. sp. R.N. LXV.  
8 a. Long, slender oxea,  $\times 60$ ; 8 b. Long, slender style,  $\times 60$ ; 8 c. Short style,  $\times 60$ ; 8 d.  
Acanthoxea,  $\times 550$ ; 8 e. Subcentrotylote acanthoxeon,  $\times 550$ ; 8 f. Smooth, subcentrotylote oxea,  
 $\times 550$ .  
Fig. 9 a—c. *Halienemia salomonensis* n. sp. R.N. CXXXIV. 4.  
9 a. Tylostylii,  $\times 60$ ; 9 b. Style,  $\times 60$ ; 9 c. Acanthoxea,  $\times 550$ .

## PLATE 18.

Fig. 1 *a—e*. *Barbozia primitiva* n. sp. R.N. LXXII. 1.

1 *a*. Strongylia,  $\times 335$ ; 1 *b*. Oxea,  $\times 335$ ; 1 *c*. Palmate anisochela,  $\times 1095$ ; 1 *c'*. Young anisochela,  $\times 1095$ ; 1 *d*. Oxydiscorhabd,  $\times 1095$ ; 1 *e*. Abnormal oxeote, approaching oxydiscorhabd in size and form,  $\times 1095$ .

Fig. 2. *Barbozia primitiva* var. *digitata* nov. R.N. CXXV. 5. Palmate anisochela,  $\times 1095$ .

Fig. 3 *a—c''*. *Didiscus plucospongioides* n. sp. R.N. LXXVIII. 13.

3 *a*. Oxea,  $\times 103$ ; 3 *b*. Tylostyli,  $\times 266$ ; 3 *c*. Oxydiscorhabds,  $\times 1065$ ; 3 *c'—c''*. Developmental stages of oxydiscorhabd,  $\times 1065$ .

Fig. 4 *a—c*. *Sigmosceptrella quadrilobata* n. sp. R.N. CXXVI. 4 *a*.

4 *a*. Styli,  $\times 310$ ; 4 *b*. Discorhabds, side views,  $\times 770$ ; 4 *b'*. Discorhabd, three quarters end view,  $\times 770$ ; 4 *b''*. Discorhabd, full end view,  $\times 770$ ; 4 *c*. Young discorhabd, showing sigmoid form,  $\times 1750$ .

Fig. 5 *a, b*. *Spirastrella globularis* n. sp. R.N. LVII. 6.

5 *a*. Megascleres (stylote to tylostylote),  $\times 230$ ; 5 *b*. Spinispirae,  $\times 820$ .

Fig. 6 *a—h*. *Hemiassterella intermedia* n. sp. R.N. XIX. 3.

Fig. 6 *a, b*. Styli,  $\times 60$ ; 6 *c*. Strongylote,  $\times 60$ ; 6 *d, e*. Oxea,  $\times 60$ ; 6 *f*. Pseudasters with rough, blunt rays,  $\times 770$ ; 6 *g*. Intermediate forms of pseudaster,  $\times 770$ ; 6 *h*. Pseudasters with smooth, sharp rays,  $\times 770$ .

Fig. 7 *a—b'*. *Polymastia tubulifera* n. sp. R.N. XIV.

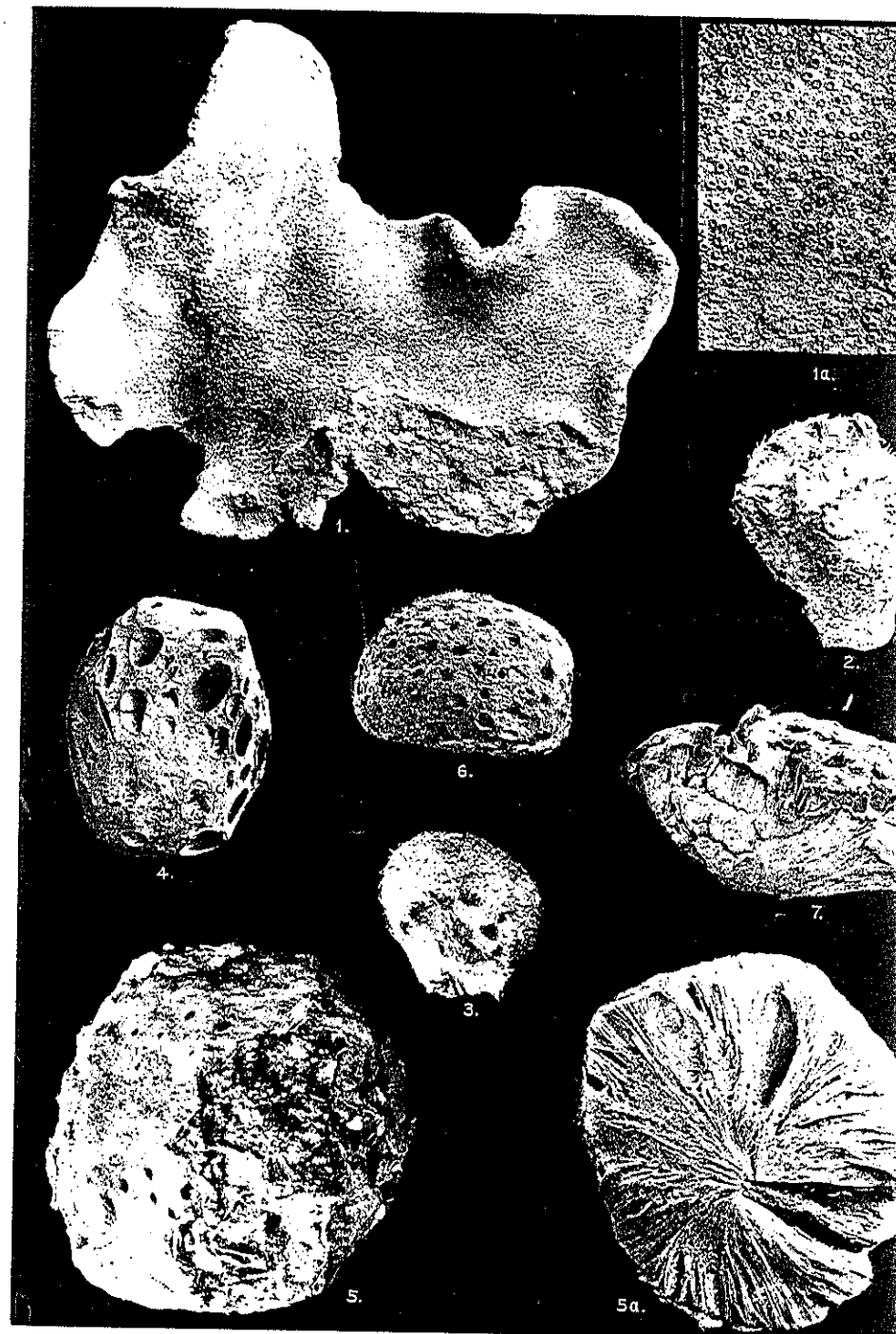
7 *a*. Large subtylostyle,  $\times 90$ ; 7 *a', a''*. Base and apex of same,  $\times 380$ ; 7 *b, b'*. Small tylostyles,  $\times 380$ .

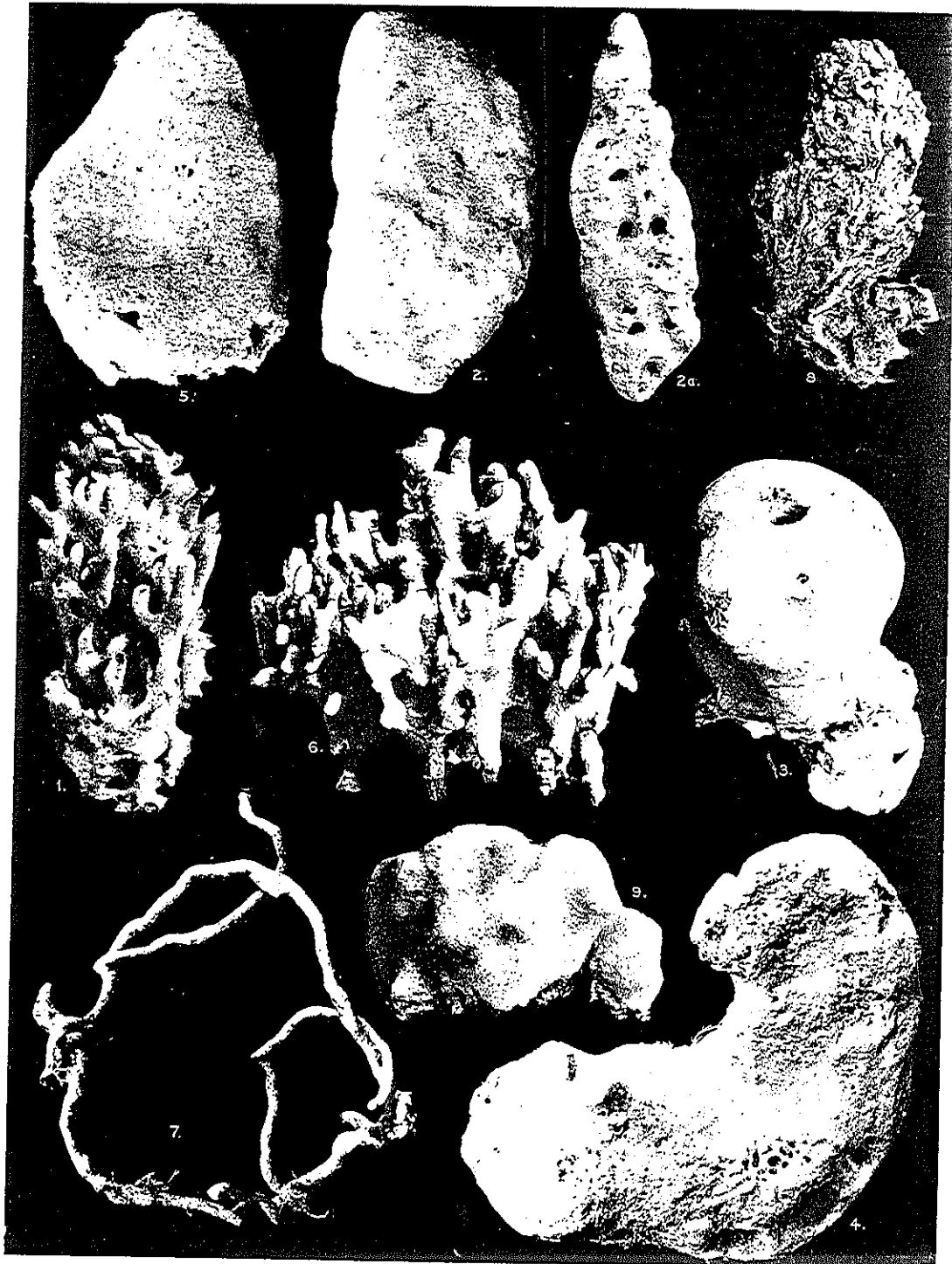
## POSTSCRIPT. JULY 1921.

The manuscript and illustrations for this Report were originally completed some years ago but the publication was delayed, first by the continuance of the war and later by financial difficulties arising therefrom. In the meantime some of the more interesting results have been made use of in other papers, especially in my recently published memoir on *The Tetraxonid Sponge-Spicule:—A Study in Evolution* [1921], which deals in a comprehensive manner with the spiculation of the Tetraxonida in general and must be regarded as expressing my latest views on the subject.

The Euceratosa of the "Sealark" Expedition still remain undescribed and it will not, I fear, be possible to include them in the present series of Reports.

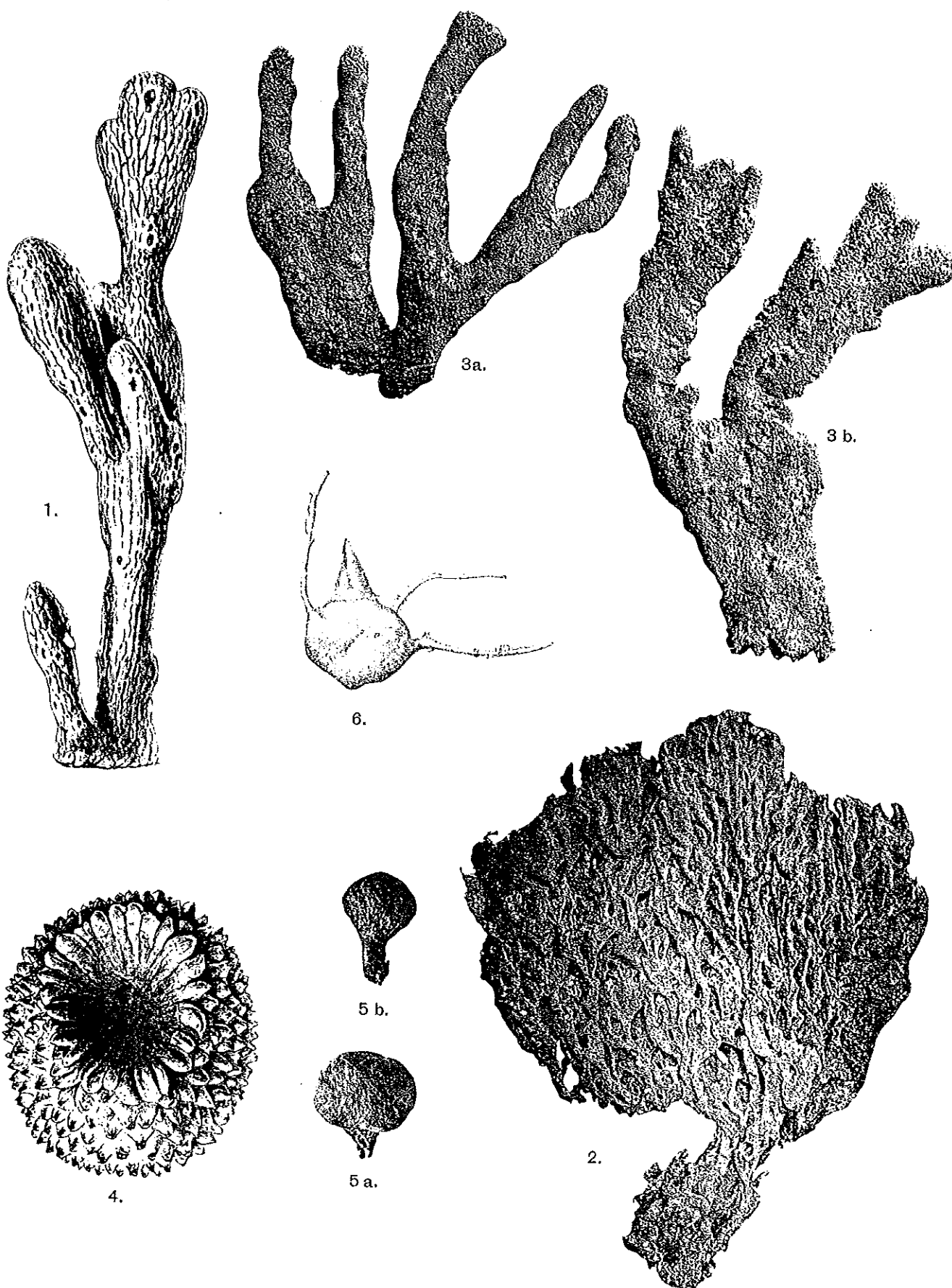
The type-specimens of the new species of sponges described in these Reports will be found in the Natural History Department of the British Museum.



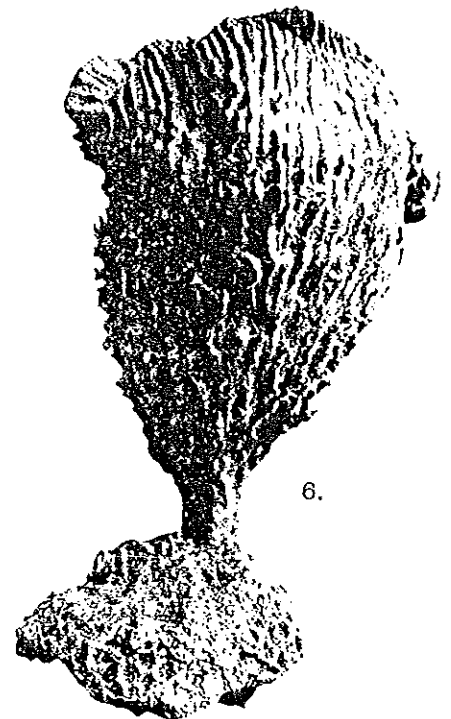
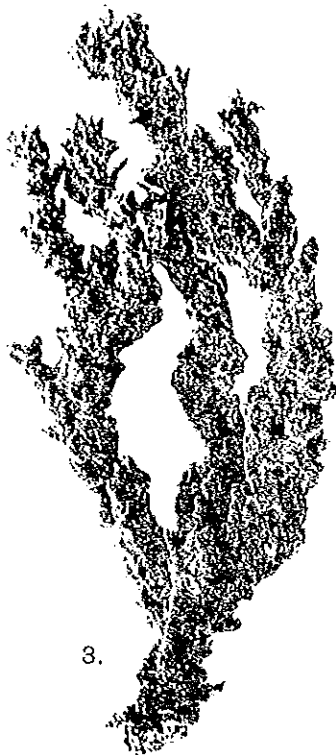
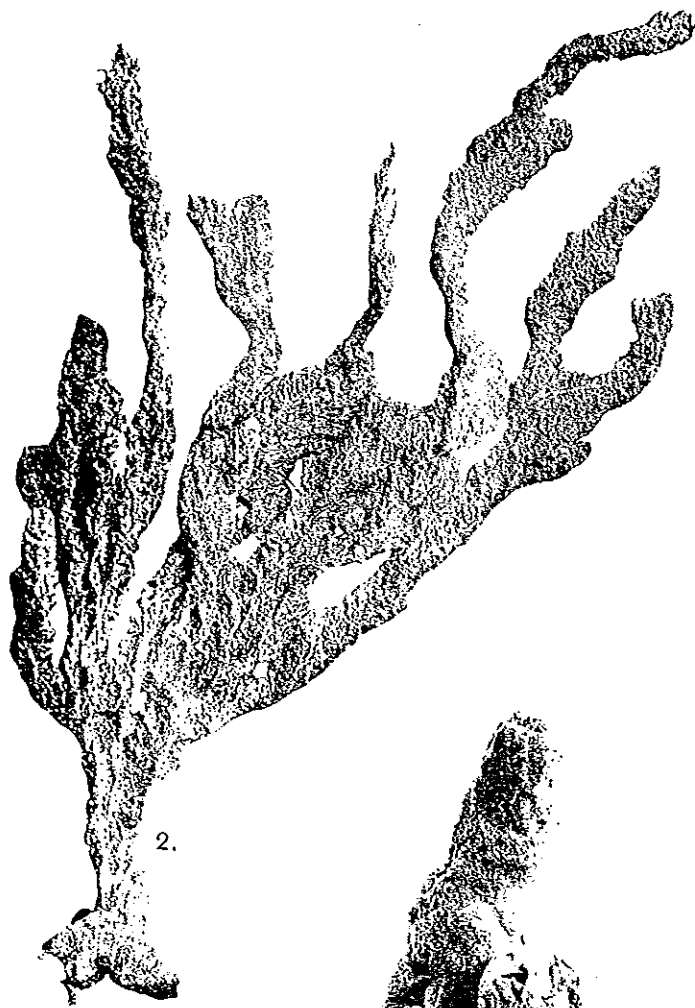




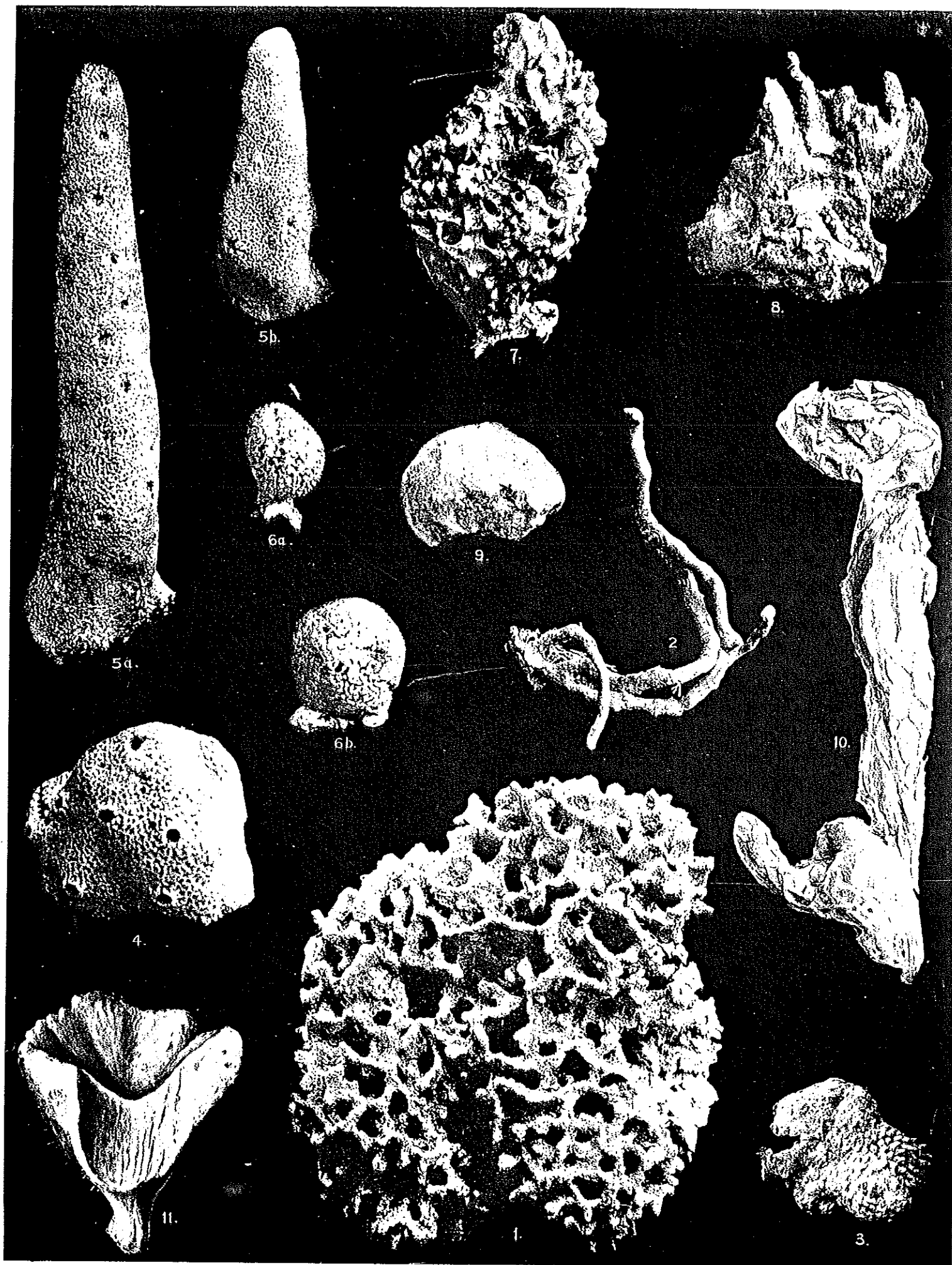




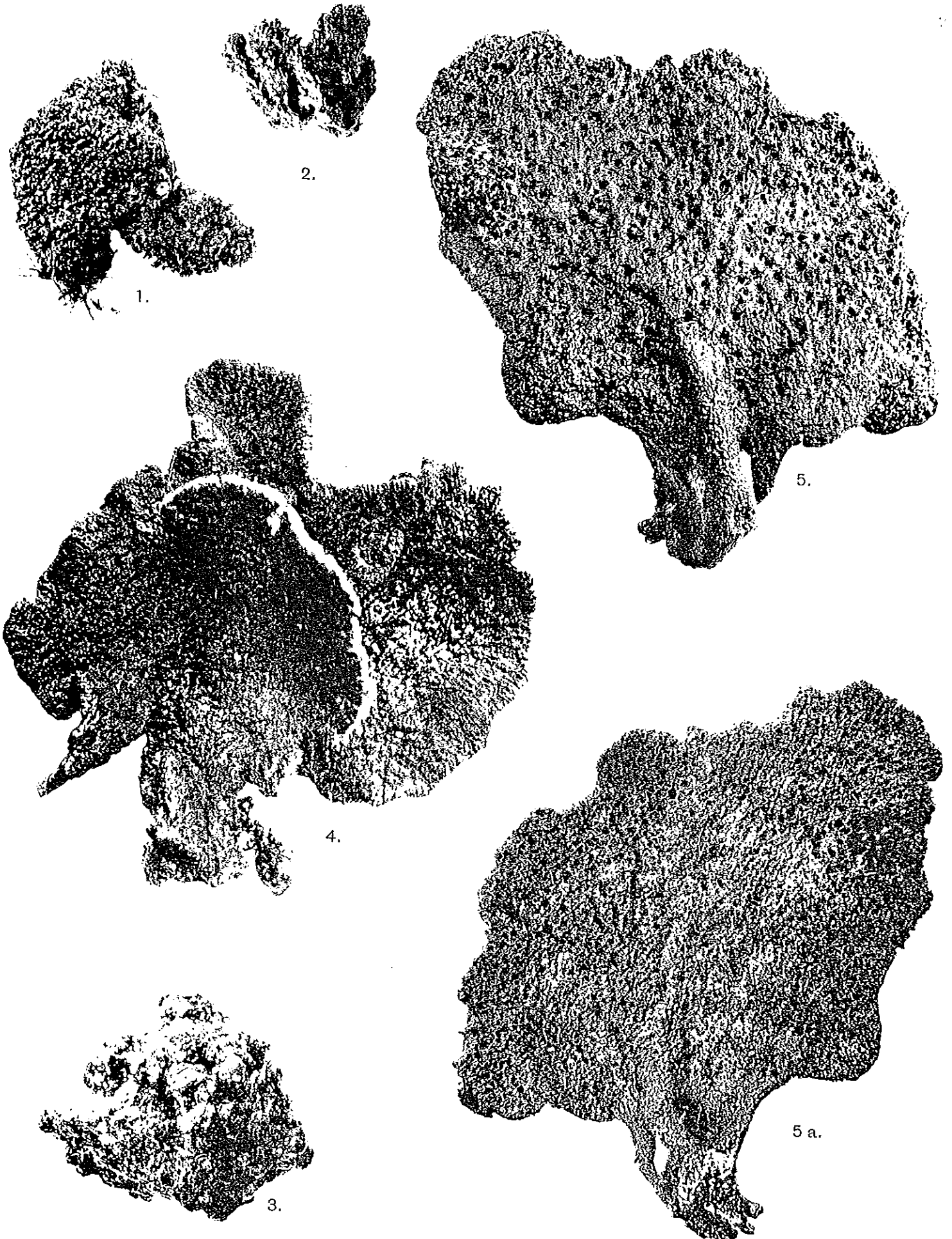
SEALARK TETRAXONIDA



SEALARK TETRAXONIDA

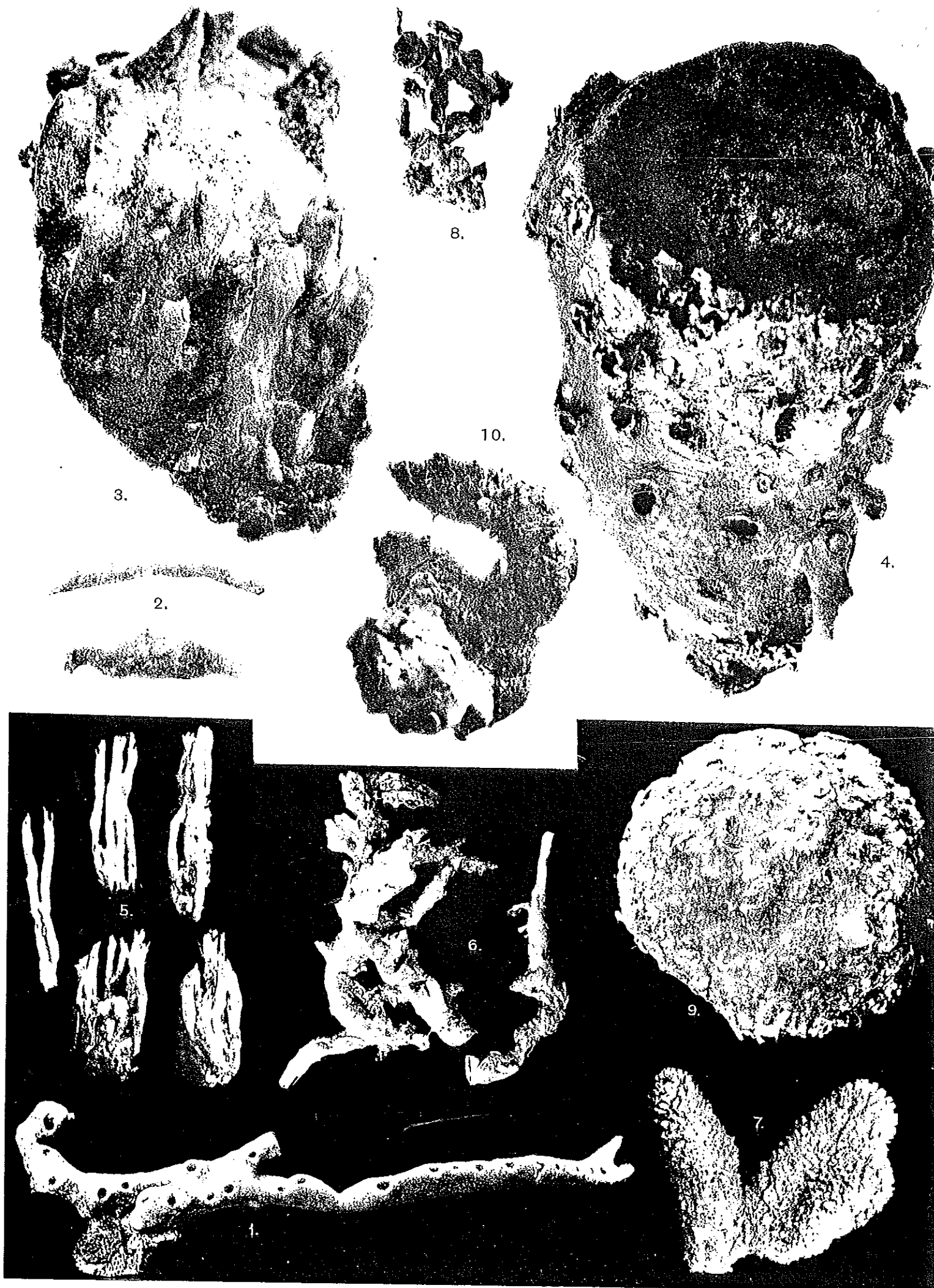


SEALARK TETRAXONIDA

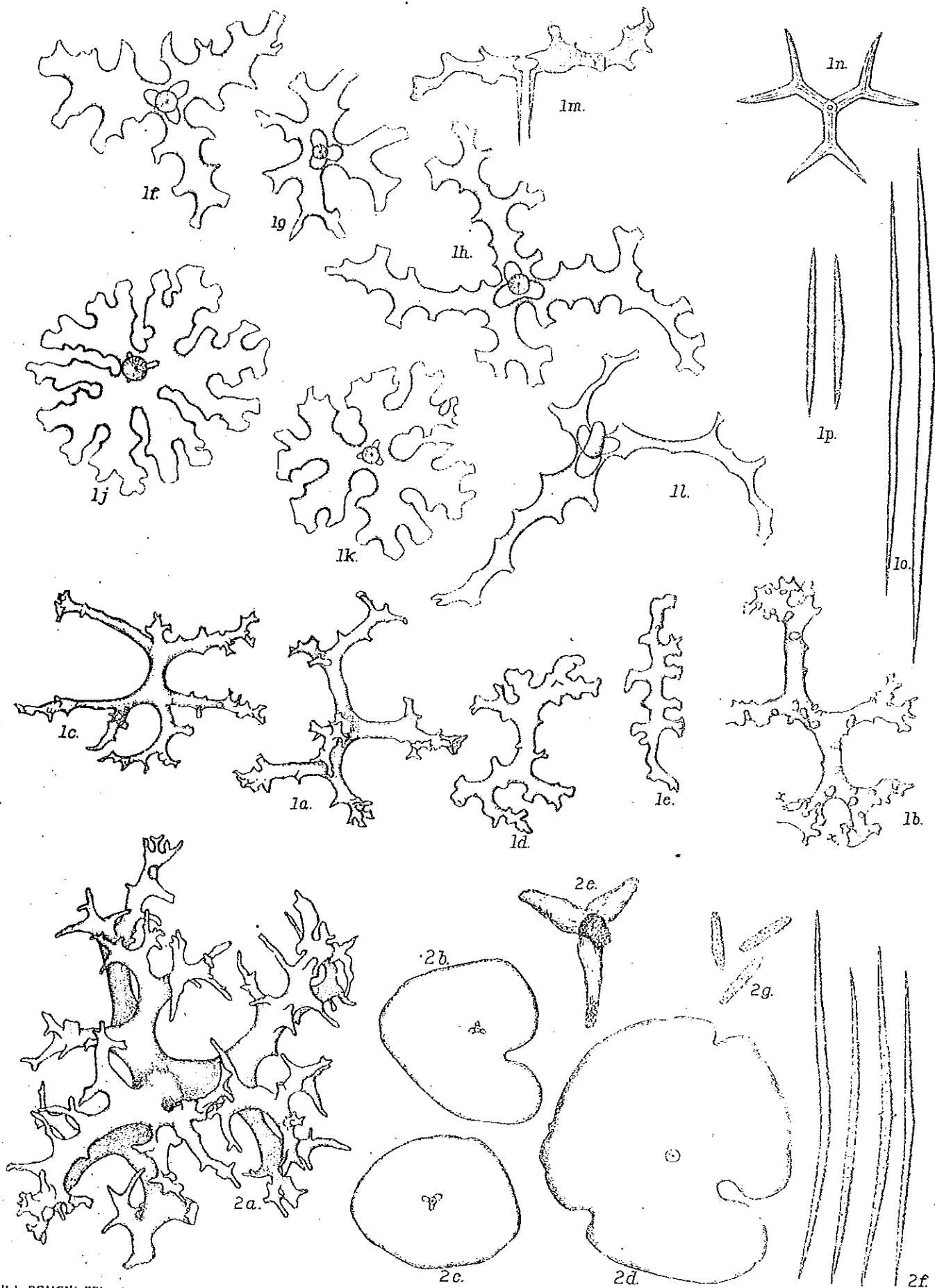


SEALARK TETRAXONIDA





SEALARK TETRAXONIDA

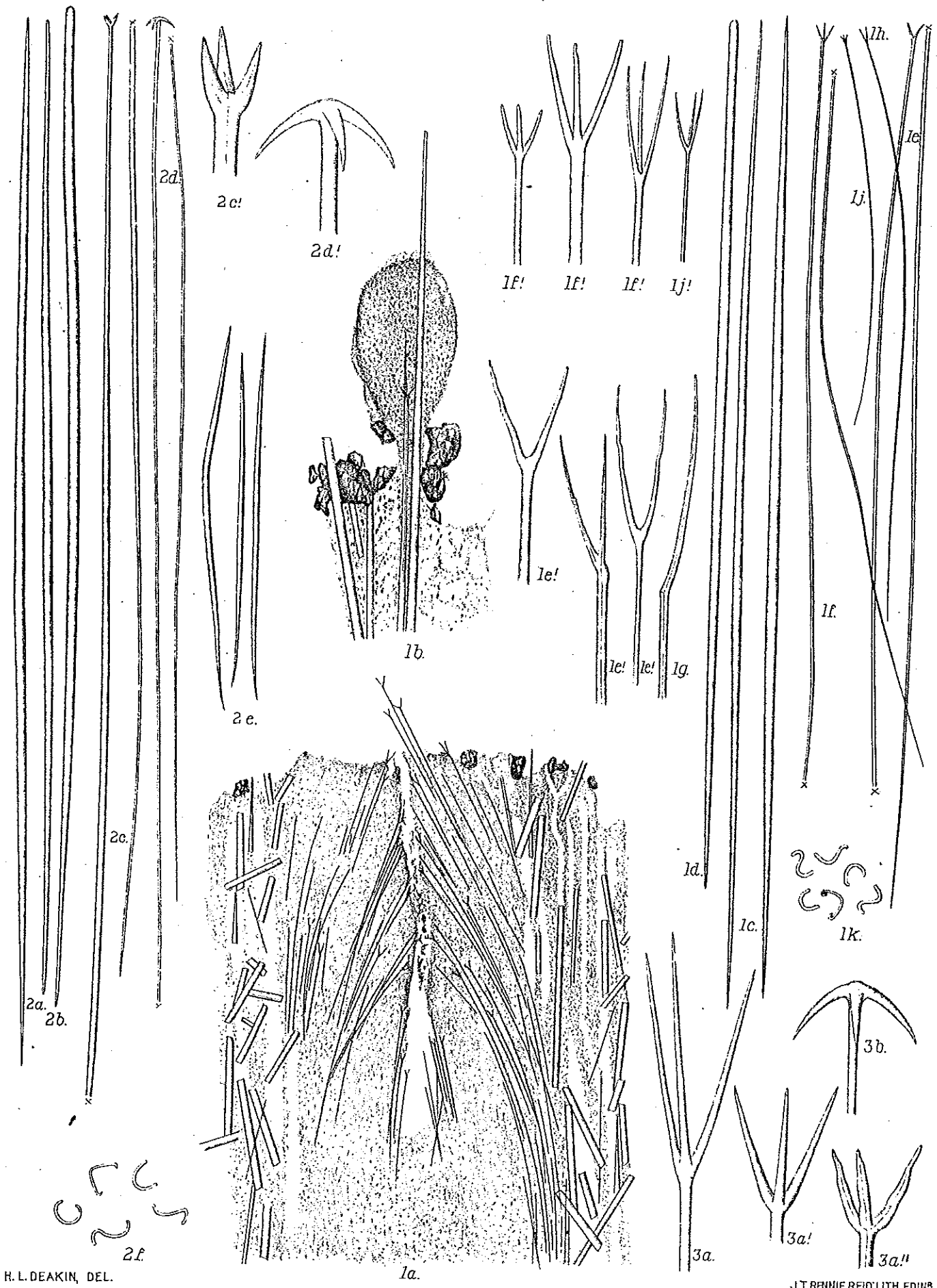


H. L. DEAYIN DEL.

J. T. RENNIE REID, LITH. EDINB.

SEALARK TETRAOXONIDA.





H. L. DEAKIN, DEL.

J. T. RENNIE REID, LITH. EDINB.

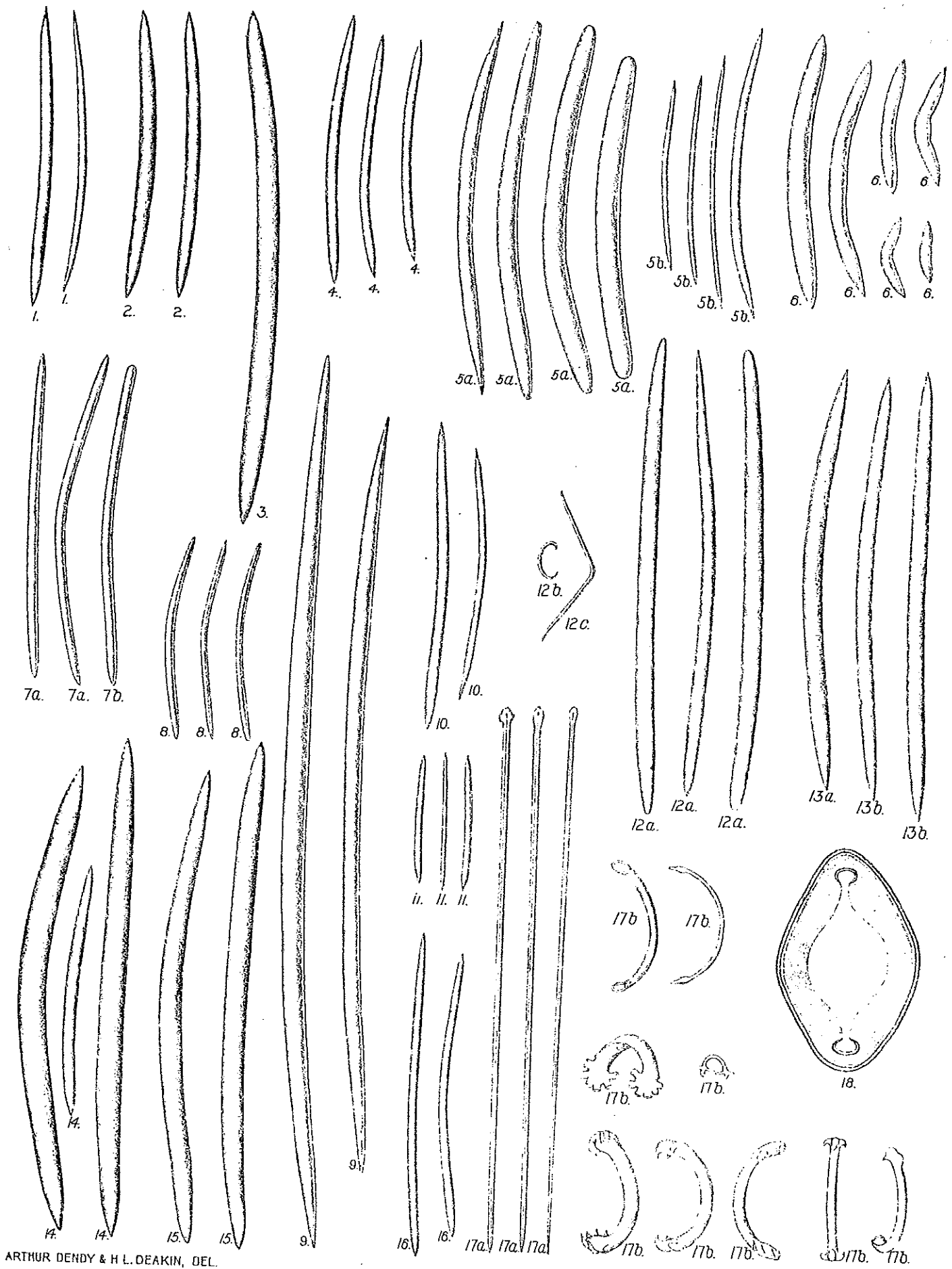
SEALARK TETRAXONIDA.



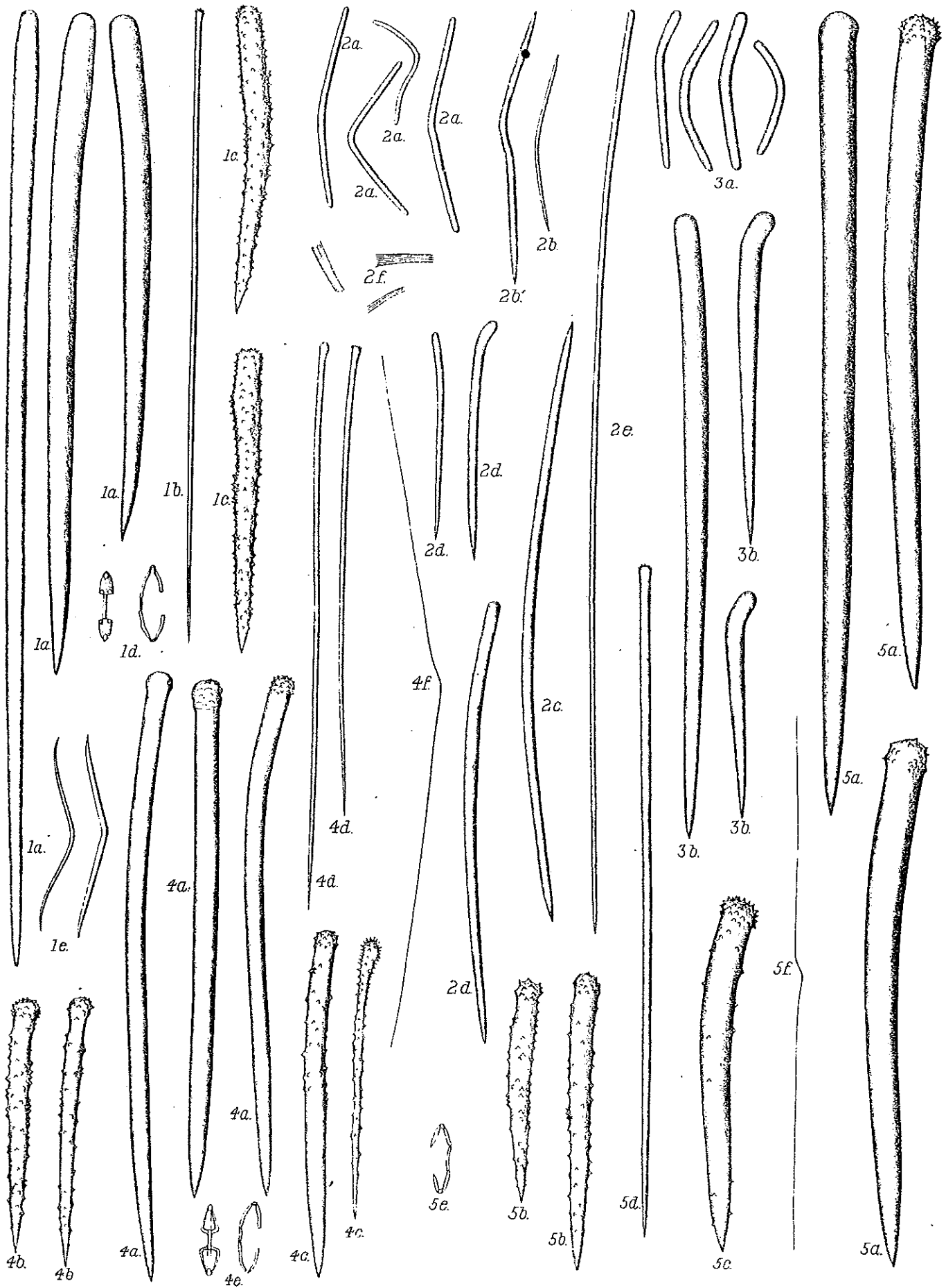
H.L. DEAKIN DEL.

J.T. RENNIE REID, LITH. EDINB.

SEALARK TETRAXONIDA.



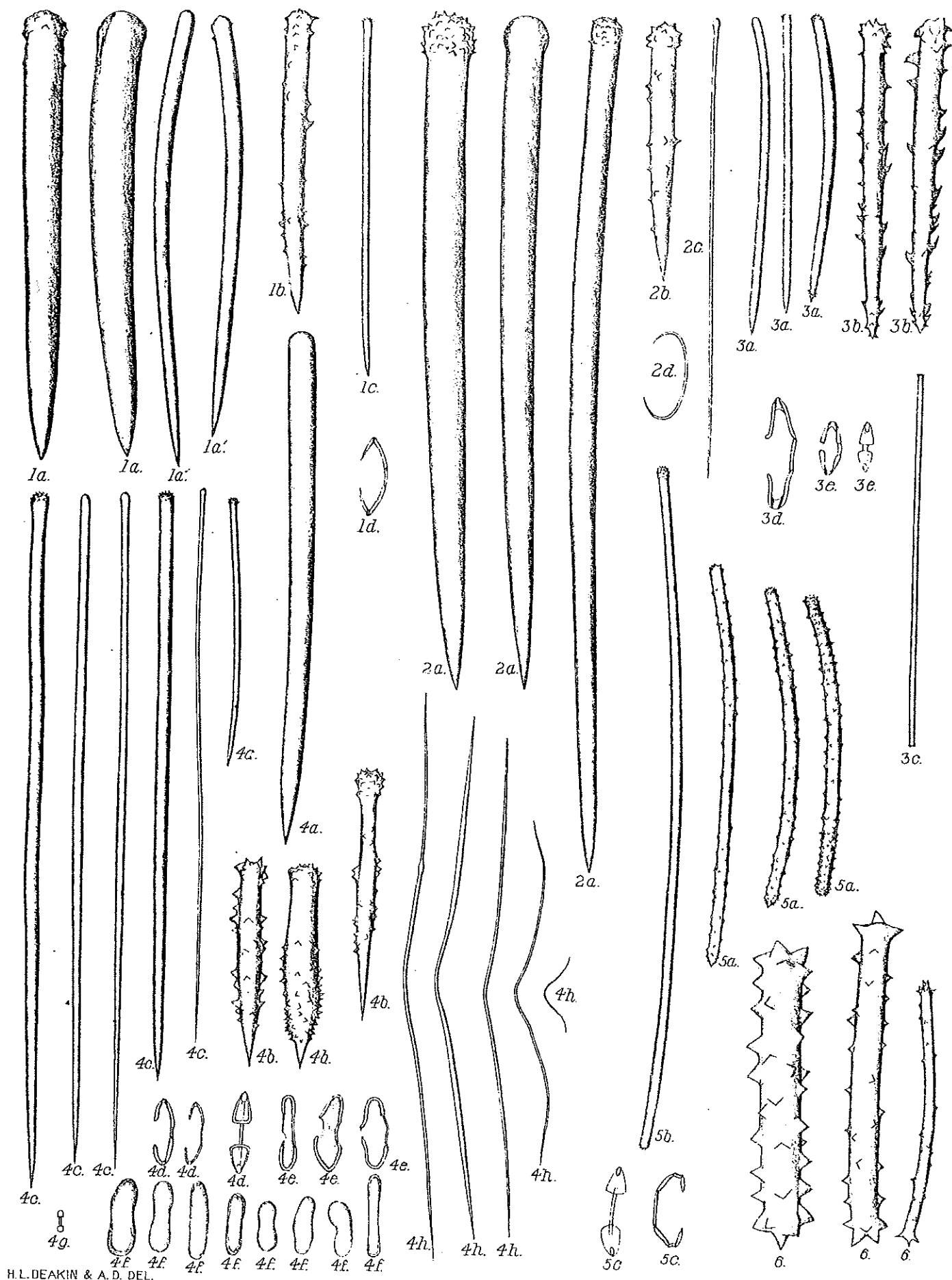
SEALARK TETRACONIDA.



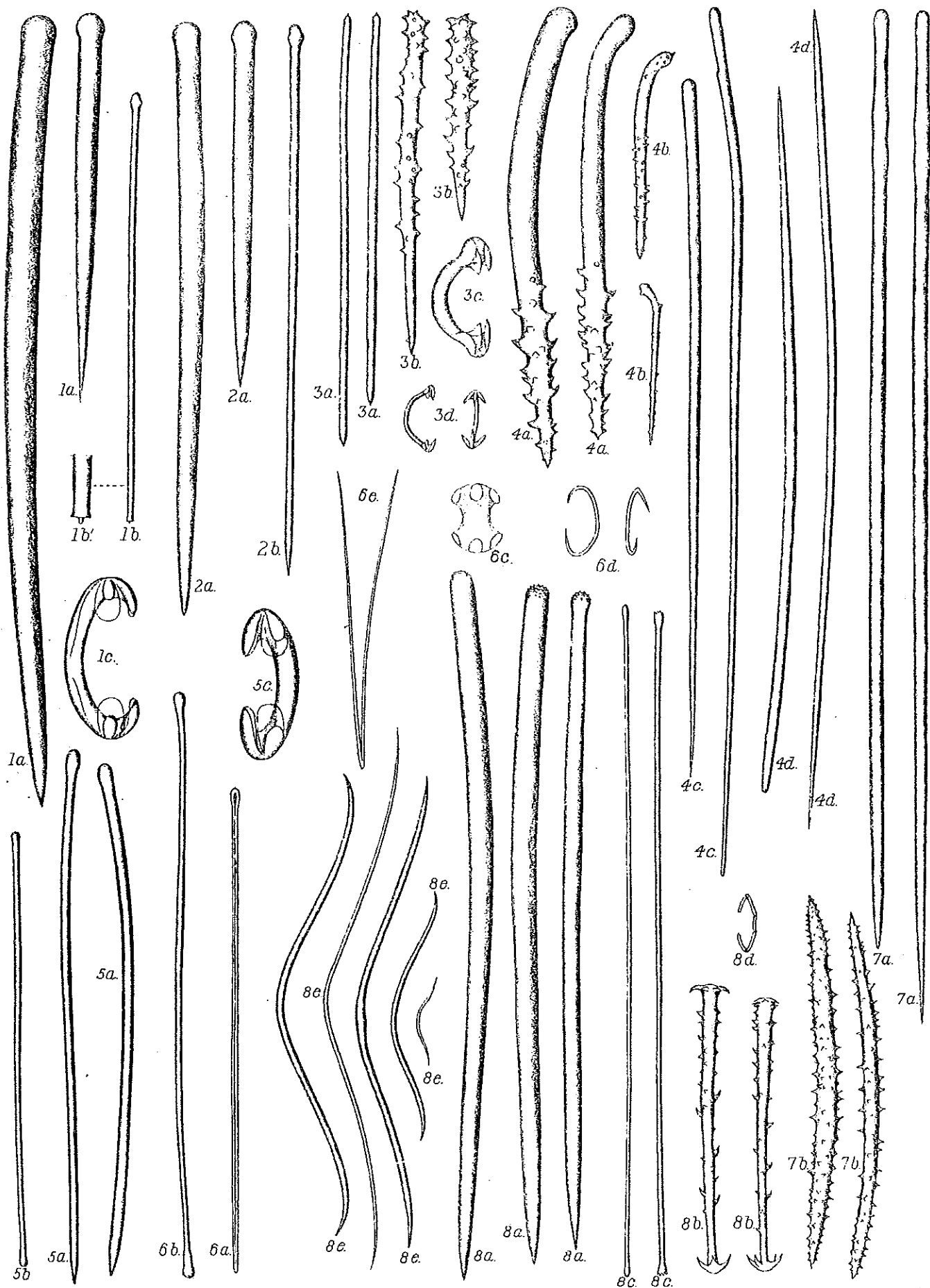
ARTHUR DENDY & H.L. DEAKIN DEL.

SEALARK TETRAXONIDA.

J.T. RENNIE REID, LITH. EDINB.



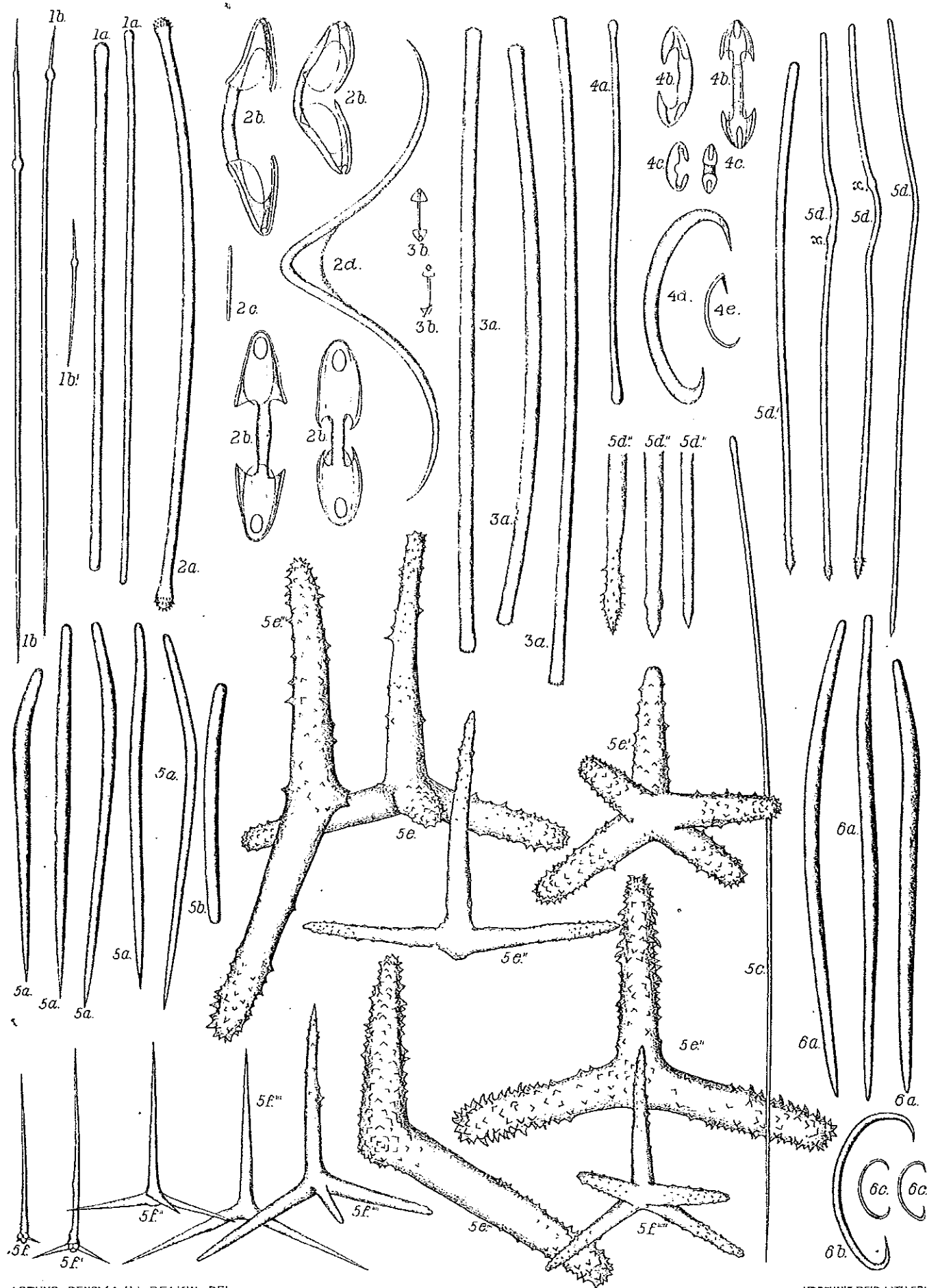
SEALARK TETRAXONIDA.



ARTHUR DENDY & H.L. DEAKIN, DEL.

SEALARK TETRAODONIDA

J.T. REYNIE REID, LITH. EDINB.

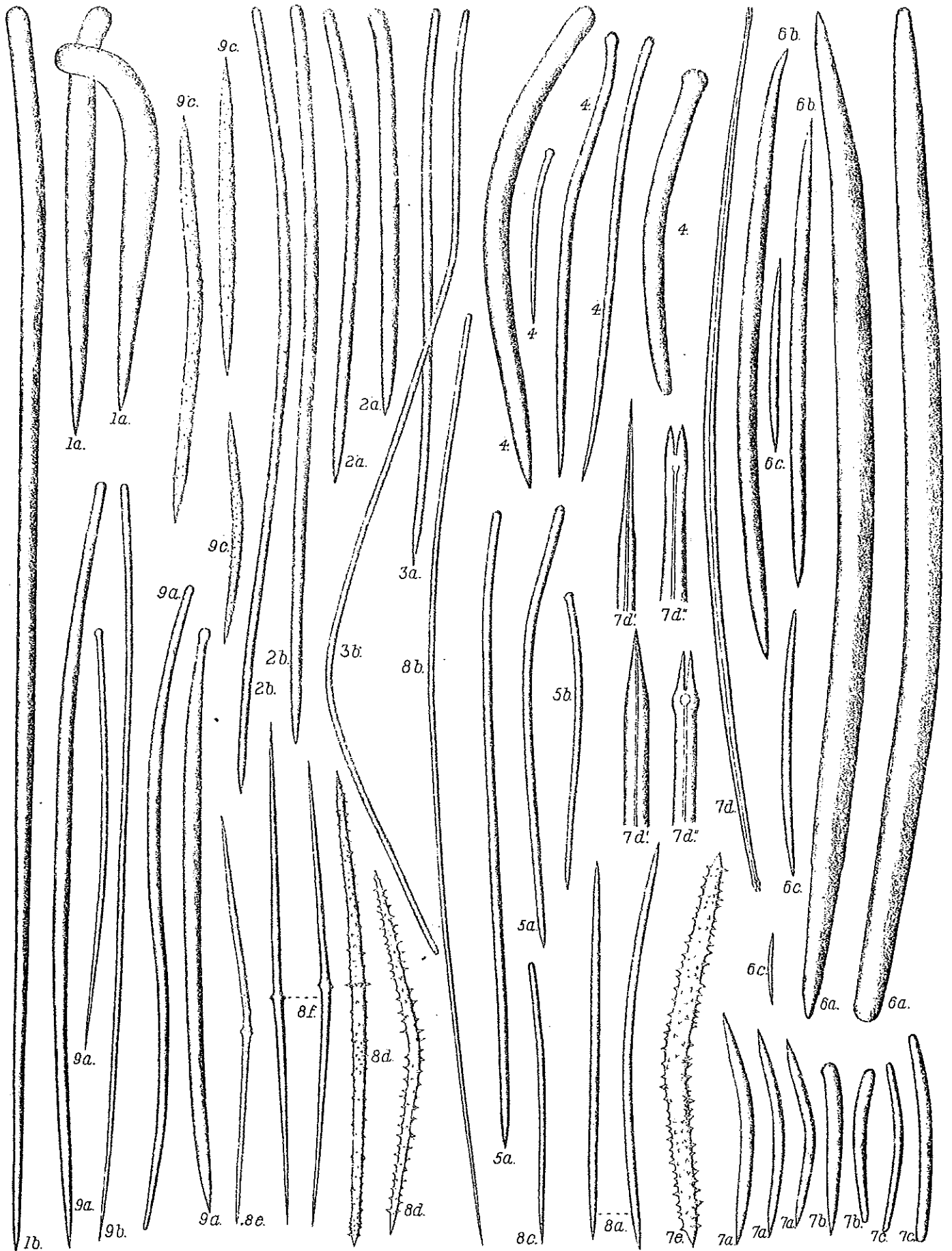


ARTHUR DENDY & H.L. DEAKIN, DEL.

SEALARK TETRAXONIDA.

J.T. REINIE REID, LITH. EDINB.

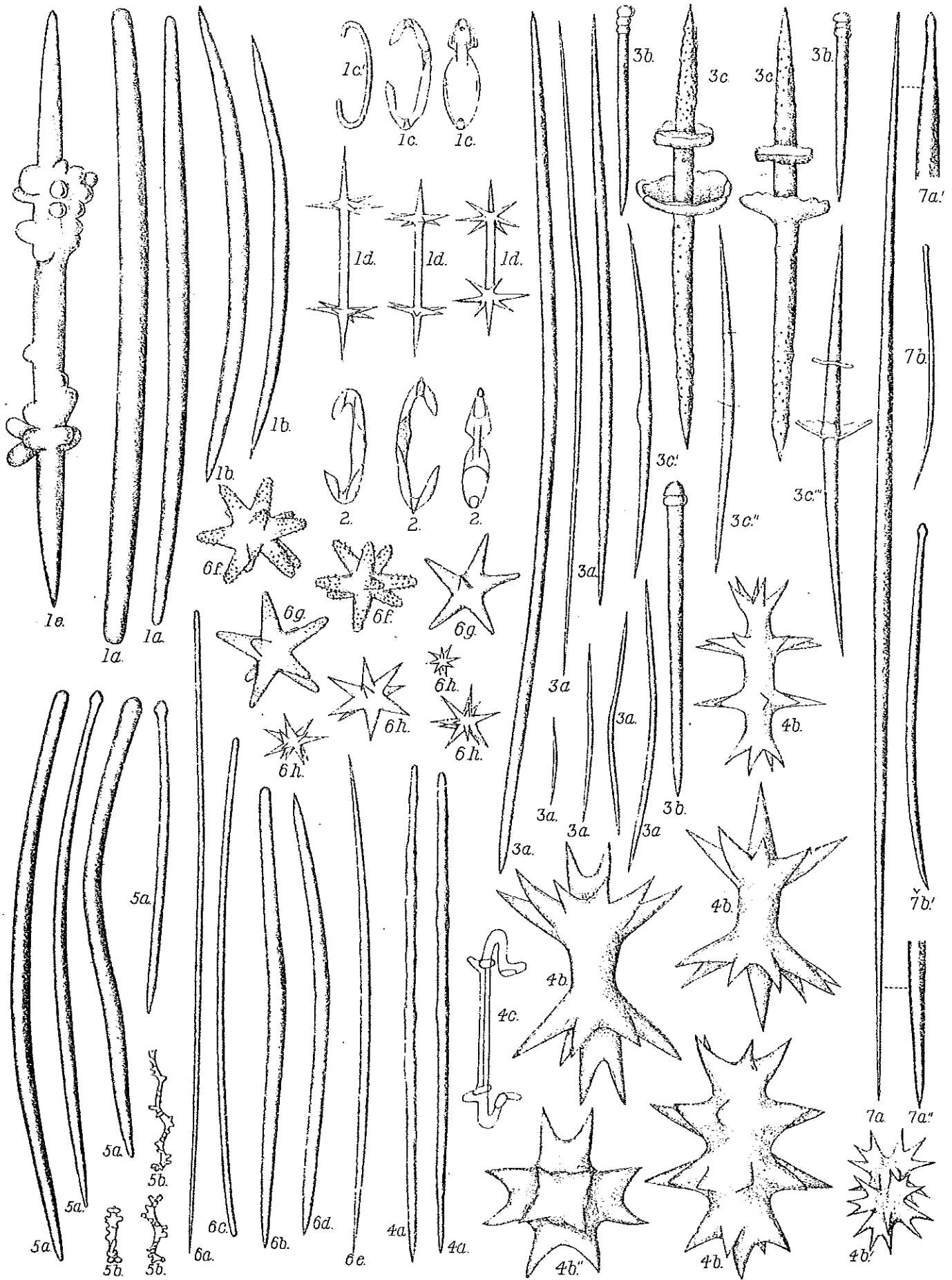




ARTHUR DENDY & H. L. DEAKIN, DEL.

J. T. RENNIE REID LITH. EDINB.

SEALARK TETRAXONIDA.



ARTHUR DENDY & H.L. DEAKIN DEL.

J.T. RENNIE REID, LITH. EDINB.

SEALARK TETRAXONIDA.