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PORIFERA.

PART I.—NON-ANTARCTIC SPONGES,

BY

ARTHUR DENDY, D.Sc., F.R.S.,

Fellow of King's College and Professor of Zoology in the University of London.

WITH FIFTEEN PLATES.



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I.—INTRODUCTION.

It was originally arranged, in 1914, that my late colleague, Mr. R. W. Harold Row, B.Sc., should co-operate with me in the production of this Report. The outbreak of the European War, however, made it necessary for both of us to turn our attention largely or entirely to other work, and Mr. Row's untimely death, in February 1919, ended all hope of a joint resumption of the task. As it was, he was able to do little more than assist in the preliminary sorting out of the collection and took no share in writing the Report itself. Into the preliminary work he threw himself with his customary ardour, interesting himself especially in searching for the small encrusting sponges which form such an interesting part of the collection, some of which might well have escaped observation but for his enthusiasm. Almost from the beginning, however, I have been obliged to carry on the work single-handed, save for the valuable help of my skilled laboratory assistant, Mr. Charles Biddolph, who has done most of the section-cutting and photography, of Mr. T. P. Collings, who has drawn many of the external forms, and of Miss Hilda Deakin, who is responsible for the best of the spicule drawings. I have to express my gratitude to all these for their excellent work, and to the Trustees of the British Museum for financial assistance in this connexion.

29 APR 1924

II.—GENERAL NOTES.

The "Terra Nova" collection of sponges was divided by the authorities of the Natural History Department of the British Museum into two parts, Antarctic and non-Antarctic, and it is the latter that form the subject of this Report. As a matter of fact, nearly all the non-Antarctic specimens came from the north of New Zealand, the only exceptions being *Chondrilla nucula* from South Trinidad, *Hali-chondria magellanica* from east of the Straits of Magellan, and *Mycale magellanica* and *Mycale lilliei* from north of Cape Horn.

In these introductory remarks I shall confine myself exclusively to the New Zealand species. These number no less than eighty-eight, of which sixty have had to be described as new. Of the remaining twenty-eight, twenty-four have been definitely assigned to previously known species, while four have been more or less doubtfully identified. It will thus be seen that the percentage of new species is extremely high, but the remarkable character of the collection is even more strongly emphasised by the fact that it has seemed desirable to propose no less than nine new genera, most of which are of great intrinsic interest.

We are thus presented with a very large and important addition to our knowledge of the New Zealand marine fauna, and that in a group which has hitherto been very much neglected so far as New Zealand is concerned. Perhaps the most remarkable thing about this addition is that it was made in such a short time and over such a very limited area. It appears from the list of collecting stations that the "Terra Nova" was cruising off the north of New Zealand from July 16th to September 24th, 1911. Most of that time, however, seems to have been occupied in plankton work, and dredging or trawling was carried on only at six stations, viz. 90, 91, 95, 96, 134, 144. Sponges were obtained from all of these with the curious exception of 95, but this exception is probably apparent only and due to incomplete labelling, for there are two sponges in the collection from "Off North Cape, Sandy Bottom, 30-14 fathoms, August 2nd, 1911," which, if not actually Station 95, must be very close to it. There are also a few other cases in which a locality is given without a station number.

Station 90, near the Three Kings Islands, at a depth of 100 fathoms, with a rocky bottom, yielded the most remarkable results, viz. thirty-eight species of sponges, of which twenty-seven were new, belonging to twenty-eight genera of which six were new. Station 96, seven miles east of North Cape, at a depth of 70 fathoms, with bottom sand and rock, proved almost equally rich, with twenty-six species (twenty-one new) belonging to twenty-one genera (two new), to which should doubtless be added two more new species from the same locality but without station number attached.

These two cases give a good idea of the astonishing richness of the sponge

fauna of these waters and of the great variety of genera and species. There are never many specimens of the same species in the collection, they are nearly all different, and seem to have grown together with little, if any, segregation. This mixture of species in the same area seems to be characteristic of sponges generally, for I have had just the same experience in dredging in Australian waters.

There is another feature of the "Terra Nova" collection that strikes one at once, and that is the abundance of species exhibiting a very definite and remarkable external form, often of large size. Amongst these may be mentioned *Symplectella rowi*, a new genus and species of Hexactinellida, of large size and very beautiful form; a number of large Stellettids, mostly new; two beautiful, new, cup-shaped Geodias, one (*Geodia rex*) of very large size and with a crust of sterrasters so large as to be individually visible to the naked eye; a beautiful new Lithistid (*Aciculites pulchra*); an extraordinary double-fan-shaped *Gellius* (*G. imperialis*, n. sp.); a very curious, large, trumpet-shaped *Siphonochalina* (*S. latituba*, n. sp.); a fine tubular *Isodictya* (*I. cavicornuta*, n. sp.); two handsome Clathrias; two Raspailias; a very fine and well-characterised *Tedania*, and a very interesting species of a new genus (*Tedaniopsis turbinata*), which not only has a striking external form but seems to undergo a metamorphosis between the young fixed stage and the adult condition. The curious bladder-like Cœlosphæreæ are represented by new species of the remarkable and little-known genera *Pylocladus*, *Inflatella*, *Amphiaspella* and *Histodermella*.

There are only six species of calcareous sponges, but three of these are new and striking. Doubtless many more would have been obtained in shallower water. Much more remarkable is the small number of true horny sponges (Euceratosæ), only three species having been obtained; and there are no representatives of the family Spongiidæ, to which the bath-sponge belongs.

One more feature of the collection remains to be noticed, and that is the encrusting sponges. These are usually much neglected by collectors, as they are small and inconspicuous, but they well repay the trouble of searching for them, since they include some of the most remarkable sponges known, especially as regards spiculation. A small block of black basalt, measuring about 6 × 4 × 2 inches, from Station 90, furnished no less than ten species of encrusting sponges, including six new species and two new genera. Of these, *Lepidospongia incrustans*, n. gen. et sp., is an extraordinarily aberrant Lithistid, with the spiculation almost entirely reduced to a thin crust of scales; *Dotonella mirabilis*, n. gen. et sp., is a form with wonderful spirulæ resembling those of *Dotona*; *Esperiopsis macrosigma*, Stephens var., *novæ-zealandiæ*, nov., and *Esperiopsis megachela* are remarkable for their large and very beautiful chelæ. Unfortunately the block, with its rich growth of sponges, was dried.

A small pebble from the same station was encrusted by *Discorhabdella incrustans*, n. gen. et sp., one of the gems of the collection, with a most curiously reduced and modified acanthotylostyle, a type of spicule previously known only in the fossil state, from the early tertiary deposits of siliceous earth at Oamaru in the

South Island of New Zealand, and exhibiting a slightly more advanced stage in reduction as compared with the fossil form.

Had more stones been examined and preserved there can be little doubt that many more encrusting sponges would have been obtained.

Another encrusting species—*Desmacella vestibularis*—occurs frequently on the surface of several species of Stellettidæ, sometimes almost, if not quite completely, covering them, and the question arises whether or not we may have here a true case of commensalism.

It will be seen from the figures given above that 71.4 per cent. of the identifiable species have had to be regarded as new. This indicates a high degree of peculiarity for the New Zealand sponge fauna, but perhaps not higher than might be expected when we consider the isolated position of the area in question. There is, however, an evident relationship with the Australian sponge fauna, as indicated by the following species known only from Australia and New Zealand—*Leucosolenia stolonifer*, *Grantessa poculum*, *Pachychalina aurantiaca*, *Siphonochalina stellidermata*, *Chalinopsilla palmata*, *Megalopastas elegans* and *Spongelia hirciniformis*. *Phoriospongia kirkii* is also a well-known Australian species, but extends as far as India, and the Australian affinity is further strengthened by the occurrence of the well-characterised genus *Trachycladus*, represented by a species closely related to the common Australian one. There is a suggestion of an Antarctic affinity in the presence of a variety of *Guitarra antarctica* and of the genus *Tedaniopsis*, but in the present state of our knowledge of sponge distribution it would hardly be safe to go beyond this.

The preservation of the specimens left much to be desired, but that could hardly have been otherwise under the circumstances. It was evidently found impossible to find jars enough to contain such a large amount of material, especially as many of the specimens were of large size. Consequently we found a good deal of overcrowding. A large number of specimens had been placed in spirit in a copper tank, with the result that they were stained a deep green colour. Others had been dried. In some cases the contents of an entire jar appeared to have been treated with osmic acid, so that they were almost black, and their histological condition was not improved. Osmic acid should only be employed with the usual precautions on small pieces selected for the purpose, but this is a laborious business which can hardly be undertaken profitably where large masses of material have to be dealt with rapidly. The best general preservative is good methylated spirit, changed at least once, and overcrowding should be carefully avoided. Formalin, according to my experience, is worse than useless in most cases, and it would be better to dry the specimens. Indeed, if small pieces are cut off, carefully labelled, and preserved in strong spirit, there is no reason why drying should not be generally adopted for large specimens.

The classification adopted is that which I have employed in previous papers,

especially those dealing with the sponges of the "Sealark" Expedition. Generic diagnoses are given only in the case of new genera and of those that I have not previously had occasion to make use of. I have also followed my usual system of registering the individual specimens. R. N. stands for Register Number. The Roman numerals are the numbers of the jars or other receptacles in which the sponges reached us; Arabic numerals (and sometimes letters) are used to denote different specimens in cases where there were more than one in a receptacle. It is thus possible not only to refer to individual specimens in the text but also to trace them back to their original associations, which may be a matter of some importance in cases of the occurrence of foreign spicules or accidental post-mortem staining.

III.—LIST OF SPECIES.*

ORDER CALCAREA.

FAMILY HOMOCÆLIDÆ.

1. *Leucosolenia stolonifer*, Dendy.

FAMILY LEUCALTIIDÆ.

2. *Leucettusa tubulosa*, n. sp.
3. „ *lancifer*, n. sp.

FAMILY HETEROPIIIDÆ.

4. *Grantessa poculum* (Poléjæff).

FAMILY GRANTIIDÆ.

5. *Grantia ramulosa*, n. sp.
6. *Ute syconoides* (Carter)?

ORDER HEXACTINELLIDA.

FAMILY ROSSELLIDÆ.

7. *Rossella ijimai*, n. sp.
8. *Symplectella rowi*, n. gen. et sp.

ORDER TETRAXONIDA.

SUB-ORDER ASTROTETRAXONIDA.

FAMILY STELLETTIDÆ.

9. *Stelletta maori*, n. sp.
9^a. „ „ var. *bistellata*, nov.
10. „ *crater*, n. sp.
11. „ *columna*, n. sp.

12. *Ancorina progressa*, Lendenfeld,
var. *diplococcus*, nov.

13. *Ancorina stalagmoides*, n. sp.

14. „ *alata*, n. sp.

15. „ *osculifera*, n. sp.

16. „ *novæ-zealandiæ*, n. sp.

17. *Penares tylotaster*, n. sp.

18. *Jaspis novæ-zealandiæ*, n. sp.

19. *Asteropus simplex* (Carter).

20. *Spongosorites novæ-zealandiæ*, n. sp.

FAMILY GEODIIDÆ.

21. *Geodia regina*, n. sp.

22. „ *rex*, n. sp.

23. *Geodinella vestigifera*, n. sp.

FAMILY CHONDROSIIDÆ.

- (24. *Chondrilla nucula*, Schmidt.)

SUB-ORDER SIGMATOTETRAXONIDA.

FAMILY LITHISTIDÆ.

25. *Aciculites pulchra*, n. sp.

26. *Lepidospongia incrustans*, n. gen.
et sp.

FAMILY TETILLIDÆ.

27. *Craniella zetlandica* (Carter).

28. *Cinachyra uteoides*, n. sp.

* In this classified list the names of species not coming from New Zealand are enclosed in brackets.

FAMILY HAPLOSCLERIDÆ.

SUB-FAMILY GELLIINÆ.

29. *Gellius flagellifer*, Ridley and Dendy.
 30. *Gellius petrocalyx*, n. sp.
 31. „ *imperialis*, n. sp.
 32. „ *tubulo ramosus*, n. sp.

SUB-FAMILY RENIERINÆ.

33. *Petrosia coralloides*, n. sp.
 (34. *Halichondria magellanica*, n. sp.)

SUB-FAMILY CHALININÆ.

35. *Chalina oculata* Bk. var. *novæ-zealandiæ*, nov.
 36. *Pachychalina aurantiaca* (Lendenfeld).
 37. *Ceraochalina pergamentacea* (Ridley).
 38. *Siphonochalina communis* (Carter).
 39. „ *minor*, Dendy, var. *regalis*, nov.
 40. *Siphonochalina latituba*, n. sp.
 41. „ *stellidermata* (Carter).
 42. *Chalinopsilla palmata* (Carter).

SUB-FAMILY PHLÆODICTYINÆ.

43. *Oceanapia* (?) *arcifera*, n. sp.
 44. *Phlæodictyon fistulosum* (Bk.) ?
 45. „ *aberrans*, n. sp.

FAMILY DESMACIDONIDÆ.

SUB-FAMILY ESPERELLINÆ.

SECTION *Isodictyæ*.

46. *Isodictya cavicornuta*, n. sp.

SECTION *Guitarreæ*.

47. *Guitarra antarctica*, Hentschel, var. *novæ-zealandiæ*, nov.

SECTION *Mycalæ*.

- (48. *Mycale magellanica* (Ridley).)
 (49. „ *lilliei*, n. sp.)

50. *Mycale novæ-zealandiæ*, n. sp.
 51. *Esperiopsis edwardii* (Bk.).
 52. „ *macrosigma*, Stephens, var. *novæ-zealandiæ*, nov.
 53. *Esperiopsis megachela*, n. sp.
 54. *Artemisina jovis*, n. sp.
 55. „ *elegantula*, n. sp.
 56. *Desmacella vestibularis* (Wilson).
 57. *Biemna novæ-zealandiæ*, n. sp.
 58. „ sp.

SUB-FAMILY ECTYONINÆ.

SECTION *Iophoneæ*.

59. *Iophon lævistylus*, n. sp.
 60. *Iophonopsis* sp., n. gen.

SECTION *Clathriæ*.

61. *Bubaris oxeata*, n. sp.
 62. „ *elegans*, n. sp.
 63. „ *ornata*, n. sp.
 64. „ *vermiculata* (Bk.).
 65. *Clathria scotti*, n. sp.
 66. „ *terræ-novæ*, n. sp.
 67. *Raspailia topsenti*, n. sp.
 68. „ *inæqualis*, n. sp.
 69. *Rhabderemia coralloides*, n. sp.

SECTION *Hymedesmieæ*.

70. *Hymedesmia lundbecki*, n. sp.

SECTION *Myxilleæ*.

71. *Anchinoë fristedti*, n. sp.
 72. „ *novæ-zealandiæ*, n. sp.
 73. *Myxilla novæ-zealandiæ*, n. sp.
 74. *Phoriospongia kirkii* (Carter).

SECTION *Crelleæ*.

75. *Crellomyxilla intermedia*, n. gen. et sp.

SECTION *Tedaniæ*.

76. *Tedania crista-galli*, n. sp.
 77. *Tedaniopsis turbinata*, n. gen. et sp.

SECTION *Cælosphæreæ*.

78. *Pylocladus demonstrans*, n. sp.

79. *Amphiastrella kirkpatricki*, n. sp.

80. *Inflatella spherica*, n. sp.

81. *Histodermella australis*, n. sp.

SUB-FAMILY AXINELLINÆ.

SECTION *Heteroxyea*.

82. *Parahigginsia phakellioides*, n. gen. et sp.

FAMILY CLAVULIDÆ.

SUB-FAMILY SPIRASTRELLINÆ.

83. *Discorhabdella incrustans*, n. gen. et sp.

84. *Trachycladus stylifer*, n. sp.

85. *Dotonella mirabilis*, n. gen. et sp.

SUB-FAMILY SUBERITINÆ.

86. *Suberites carnosus* (Johnston), var. *novæ-zealandiæ*, nov.

87. *Polymastia conigera*, Bowerbank.

88. *Microtylostylifer anomalus*, n. gen. et sp.

ORDER EUCERATOSA.

FAMILY DARWINELLIDÆ.

89. *Megalopastas elegans* (Lendenfeld).

FAMILY SPONGELIIDÆ.

90. *Spongelia hirciniformis* (Carter).

91. „ *spiculivora*, n. sp.

IV.—DESCRIPTION OF SPECIES.

ORDER CALCAREA.

FAMILY HOMOCÆLIDÆ.

1. *Leucosolenia stolonifer*, Dendy [1891].

There is a single colony of this sponge in the collection, consisting of three tubular "persons" united basally by a tubular spongorhiza, of which, however, only a fragment remains. The external appearance is perfectly typical and agrees closely with the figure given by me in 1891. The agreement in anatomical features is also very close. In fact the only differences as compared with typical Victorian specimens concern certain details of spiculation. The apices of the facial rays of the quadriradiates are blunted instead of being sharply pointed. The large oxea are much more slender in their proximal portions, while the inner extremity is more or less sharply bent to one side; the apices again seem to be bluntly rather than sharply pointed, but as the outer end of the spicule is almost invariably broken off it is necessary to speak with some reserve on this point.

The most characteristic feature of this species is unquestionably afforded by the fact that some of the quadriradiate spicules develop enormous crooked apical rays projecting into the gastral cavity. These are very numerous and very strongly developed in the "Terra Nova" specimens. As in the type, all the radiates seem to have apical rays, either large or small.

Previously known Distribution.—Near Port Phillip Heads, Victoria (Dendy).

Register No., Locality, &c.—XLVII. 2; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

FAMILY LEUCALTIDÆ.

2. *Leucettusa tubulosa*, n. sp. (Pl. I, figs. 1-10.)

There are several specimens of this sponge in the collection. The external appearance of the best two is well represented in figs. 1, 2. Each of these consists of a group of three tubular branches, separating from one another close to the base of attachment and each having a single terminal vent. The form of the branches, or "persons," as they may perhaps be considered to be, differs somewhat in the two specimens. In R. N. XIX. 3 (fig. 2) they are approximately straight and nearly cylindrical, enlarging but very slightly towards the free end, which contracts somewhat suddenly to the circular vent. The longest, from which the other two come off as branches, measures about 50 mm. in height, with a maximum diameter of about 7 mm. In R. N. XIX. 2 (fig. 1) they are much more club-shaped and rather strongly curved, and the vent has more the form of a slit. The largest measures about 60 mm. in height, with a maximum diameter of about 17 mm.

The outer surface is smooth, but the large tangential radiates of the dermal cortex are clearly visible under a pocket lens. The vents have thin margins, but there is no distinct collar and no spicular fringe. The colour of the specimens was probably white in life, but they have been stained black with osmic acid.

The wall of the tubular "persons" is about 1.5 to 2 mm. thick and the wide central cavity is continued practically to the base, without interruption by trabecular ingrowths. Hence there is a well-defined gastral surface, perforated by the numerous apertures of the exhalant lacunæ. The differentiation of the sponge wall into cortical and medullary layers is well marked, but the latter is very much thicker than the former, in the ratio of about 7 to 1.

The medullary portion is almost co-extensive with the chamber-layer, there being only a thin gastral membrane around the central cavity. The dermal cortex consists of a gelatinous collenchyma in which the large radiates are embedded. It contains numerous large granular cells, most of which are evidently the contracted epithelial cells of the inhalant channels.

The canal system is typically leuconoid, the flagellate chambers, thickly scattered in the chamber-layer, being sub-spherical and about 0.1 mm. in diameter. The thickly scattered dermal pores lead, through irregular canals in the cortex, into the large, radially disposed, inhalant lacunæ, which interdigitate with similar exhalant lacunæ opening on the gastral surface.

Although the material has been treated with osmic acid its histological condition is very poor, and we have been unable to make out the position of the nucleus in the collared cells, which are completely contracted into spherical vacuolated bodies, mostly separated from the walls of the chambers.

The skeleton is chiefly developed in the dermal cortex, which is crowded with large triradiate and quadriradiate spicules disposed tangentially in several layers.

These spicules vary greatly in size, the smaller ones being for the most part on the outer side. The larger ones are nearly all quadriradiate, and the large apical ray projects at right angles into, and it may be nearly through, the chamber layer. Around the margin of the vent the ordinary dermal cortical skeleton gives place to a dense feltwork of sagittal triradiates, orientated in the usual way, with the paired rays parallel to the oscular margin. The chamber layer contains a few large, scattered radiates, but has no other spicules which can properly be said to belong to it, unless it be a few of the reduced pigmy radiates, but most of the pigmy radiates belong to the walls of the central gastral cavity and of the exhalant lacunæ, which are echinated by their projecting rays.

Spicules:—(1) Large triradiates (fig. 4); regular; rays long, stout or slender, conical or nearly cylindrical, often irregular in outline, especially towards the apex, which is usually rather bluntly pointed; measuring up to about 0.79 by 0.062 mm., but very variable.

(2) Large quadriradiates (fig. 3); similar to the regular triradiates, but attaining a somewhat larger size, and with a strongly developed, long, straight, stout apical ray, which may be more than 0.776 mm. in length.

(3) Sagittal triradiates (fig. 9); with the oral or paired rays variously bent, sometimes extended in a straight line with one another, sometimes with the distal portion bent backwards or forwards, but apparently always with the proximal portions of the three rays meeting at angles of 120°. These spicules vary a good deal in size, but are, on an average, very distinctly smaller than the large regular triradiates. They are found, as already stated, at the margin of the vent.

(4) Pigmy triradiates (figs. 8, 10); varying from regular to sagittal, but apparently always equiangular; rays ranging from slender and sharply pointed to stout and very strongly club-shaped; size variable, say about 0.035 by 0.005 mm. (length and diameter of ray).

(5) Pigmy quadriradiates (fig. 6); similar to the pigmy triradiates, but with an apical ray which may be enormously developed, especially in the lining of the gastral cavity, where they are very abundant in the neighbourhood of the vent. Two very characteristic specimens, with club-shaped facial and enormous apical rays, are shown in fig. 6. In one of these the apical ray measures as much as 0.2 by 0.0075 mm., while the facial rays measure only about 0.03 by 0.0075 mm.

The pigmy radiates often show a strong tendency for the rays to separate from one another at the centre of the spicule (cf. fig. 7), especially in the case of the apical rays of the quadriradiates. I do not think that this can be due to the action of the osmic acid used in preserving the sponge, for the spicules show little, if any, sign of erosion.

(6) Reduced pigmy radiates with only two rays (fig. 5); much smaller than the ordinary pigmy radiates and sparsely scattered in the tissues of the medullary layer. The two remaining rays are somewhat fusiform and sharply pointed, measuring each

about 0.0125 by 0.0025 mm. The third ray seems to be represented by a minute knob.

This species is certainly nearly related to *Leucettusa imperfecta* (Poléjæff) from near Port Jackson. It agrees with that species in external form and general anatomy, and in the presence of large quadriradiates, but it differs much in the characters of the pigmy radiates. The highly characteristic gastric quadriradiates with club-shaped facial rays and enormously developed apical rays appear, to judge from Poléjæff's description [1883], to be entirely wanting in *Leucettusa imperfecta*, and the reduced pigmy radiates with only two rays are also quite different.

The tendency of the rays of the pigmy radiates to be swollen out at the extremities into a club-like form, which is such a characteristic feature of our species, is also seen in *Leucettusa corticata* (Hæckel), but that species differs widely from ours in external form, which is that of a reticulate colony, and in the entire absence of quadriradiates.

Register Nos., Localities, &c.—XIX. 2, 3; LV. 1. *b* (attached to surface of *Tedaniopsis turbinata*, LV. 1. *c*), all from Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

3. *Leucettusa lancifer*, n. sp. (Pl. I, figs. 11–18.)

This species is represented in the collection by two specimens, each consisting of an oval body tapering below into a longish cylindrical stalk and bearing a single prominent vent above. The body is more or less filled with gelatinous tissue and the thin wall in both specimens, but especially in R. N. XIV. 2 (fig. 17), is partially collapsed by shrinkage. The stalk is also cored by the gelatinous medullary tissue, but is firmer and more rigid. In R. N. XIV. 2 the stalk is attached below to a pebble, in R. N. XLIII (fig. 16) it is broken off short. The single apical vent is situated on a slight elevation and surrounded by a thin margin; in R. N. XIV. 2 it is somewhat eccentric in position, in both specimens it measures only some 4 or 5 mm. in maximum diameter. The surface of the sponge is smooth, but the large tangential triradiates of the dermal cortex are very distinctly visible under a pocket lens. R. N. XIV. 2 measures about 50 mm. in total height; the maximum diameter of the swollen body is 21 mm., while the diameter in the middle of the stalk is only 5 mm. R. N. XLIII is rather smaller. The colour of R. N. XLIII, in spirit, is white; R. N. XIV. 2 has been stained black with osmic acid.

The dermal cortex in the body of the sponge is about 0.63 mm. thick; the medullary portion of the sponge wall extends into the central gastral cavity as an irregular network of trabeculæ, so that there is no properly defined gastral surface. The flagellate chambers, which are thickly crowded in the outer portion of the medulla, are only very sparingly scattered in the central network, which is composed principally of gelatinous mesogloea and flattened epithelium. The gelatinous mesogloea is also very strongly developed in the dermal cortex,

Except for the partial blocking up of the central gastral cavity as above described, the canal system resembles that of *Leucettusa tubulosa*, being typically leuconoid, with subspherical or oval flagellate chambers about 0.14 mm. in diameter. The collared cells are completely rounded off and the position of the nuclei cannot be determined satisfactorily in our preparations.

The skeleton is almost confined to the dermal cortex, which is crowded with large triradiates, arranged tangentially in several layers. The medullary portion of the sponge contains nothing but pigmy radiates, scattered in the walls of the exhalant lacunæ; very numerous in some places, but almost or quite absent in others. Large quadriradiates appear to be entirely lacking. Around the margin of the vent, where this happens to be intact, there is a narrow zone of sagittal triradiates of smaller average size than the ordinary cortical triradiates, arranged in the usual manner, with the paired rays parallel to the oscular margin, although occasionally this arrangement seems to be reversed.

Spicules:—(1) Large triradiates (fig. 13); regular, with long and rather slender rays, almost cylindrical for the greater part of their length, but gradually and fairly sharply pointed. Size very variable, the rays measuring up to about 1.0 by 0.062 mm.

(2) Sagittal triradiates. Owing to injury to the oscular margin these spicules have been observed only in one place (in R. N. XIV. 2). They closely resemble the corresponding spicules in *Leucettusa tubulosa*, the paired rays being usually bent back so as to lie almost in the same straight line, but sometimes bent forward, while all three rays meet in the middle at angles of 120°.

(3) Pigmy triradiates (figs. 12, 15); usually, if not always, more or less sagittal, but equiangular, the sagittal character being due to differentiation in shape or size, or both, between the basal and paired rays. The basal ray may be longer than the orals and is usually sharply bent near its apex. The rays are usually nearly cylindrical for the greater part of their length, but the orals may be slightly club-shaped; they always seem, however, to be fairly sharply pointed. The oral rays commonly measure about 0.04 by 0.0055 mm., with the basal only a little longer.

(4) Pigmy quadriradiates; some of these differ from the pigmy triradiates only in the addition of a comparatively small apical ray (fig. 18), but the typical form is very peculiar and characteristic (fig. 11). The basal ray is considerably longer than the orals, more or less crooked and rather sharply bent inwards from the gastral membrane in which the spicule lies. The oral rays curve towards one another like a pair of horns, so as to assume together a crescentic form, and their tips tend to curve outwards from the gastral membrane. All three facial rays are fairly gradually and sharply pointed. The apical ray is enormously developed; very straight and smooth in outline, gradually and sharply pointed. It may be more than four times the length of the basal ray and projects almost at right angles from the centre of the spicule, though, owing to the curvature of the basal ray, the two may appear,

from one point of view, to lie almost or quite in the same straight line. In a typical example the basal ray measured 0.077 by 0.0066 mm., the oral rays 0.044 by 0.0088 mm., the apical ray 0.182 by 0.0066 mm. In another specimen, in which the end of the apical ray was broken off, the remaining portion measured as much as 0.367 mm. in length. The specific name, *lancifer*, was suggested by the presence of these enormous, lance-like apical rays. They appear to be most strongly and abundantly developed near the vent.

(5) Reduced pigmy radiates with only two, very rarely three, rays (fig. 14); these closely resemble the corresponding spicules in *Leucettusa tubulosa*, the rays being somewhat fusiform, sharply pointed, and measuring about 0.013 by 0.004 mm., or narrower.

This species is readily distinguished from *Leucettusa tubulosa*, which occurs in the same locality, by its external form, by the ingrowth of the medullary tissue into the central gastral cavity, and by the shape of the pigmy quadriradiates; also, perhaps, by the absence of large quadriradiates, which I have been unable to find. The endogastric proliferation of the medullary tissue occurs also in *Leucettusa dictyogaster*, Row MS., but that species is at once distinguished by the presence of microxea.

Register Nos., Locality, &c.—XIV. 2; XLIII; both from Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

FAMILY HETEROPIIDÆ.

4. *Grantessa poculum* (Poléjæff). (Pl. I, fig. 19.)

Amphoriscus poculum, Poléjæff [1883]; *Heteropia patulosculifera*, Carter [1885-6];
Grantessa poculum, Dendy [1892]; *Grantessa poculum*, Dendy and Row [1913].

This fairly well-known Australian species is represented in the collection by a single rather small specimen which we identify with Poléjæff's species on the strength of direct comparison with the "Challenger" type in the British Museum collection. The specimen before us has the form of a cylindrical tube about 19 mm. in length and 3 mm. in diameter, bent almost at right angles at a point not far from the middle. The two ends are damaged, so that it is impossible to say whether or not they carried vents, but there is a single slightly prominent vent on the outer side of the curve at the point where the tube is bent.

The "Terra Nova" specimen differs in certain minor details from the "Challenger" example as described by Poléjæff, but we are inclined to think that these discrepancies are apparent rather than real. They concern chiefly the following points:—(1) Poléjæff describes no special peristomial skeleton, saying simply that "the individual is bare-mouthed". Our specimen has a normal peristomial skeleton of alate triradiates (which occasionally develop a short apical ray) and a fringe of hair-like oxea, all of which, however, are broken short so that the "mouth" appears to be "bare". It is not

clear whether or not Poléjæff examined the vent of his specimen microscopically. (2) The large oxea have broad, flattened lance-heads at their distal extremities. Poléjæff says that these spicules are "usually spindle-shaped, often lanceolate, sharp-pointed," and gives a figure which is by no means typical. The spindle-shaped and lanceolate forms which he distinguishes are probably merely different views of the same form. As he remarks, the outer ends are usually broken off, but in our preparation of the "Challenger" type we find one perfect specimen with a beautiful flat lance-head, closely resembling those of the "Terra Nova" sponge (fig. 19).

Previously known distribution.—Off Port Jackson, Australia (Poléjæff); neighbourhood of Port Phillip Heads (Carter, Dendy).

Register No., Locality, &c.—XIX. 1. *a*; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

FAMILY GRANTIIDÆ.

5. *Grantia ramulosa*, n. sp. (Pl. 2.)

There is a large quantity of this very remarkable sponge in the collection. It seems to have grown freely on the sea bottom as a tangled mass of long, slender tubes, resembling so much vermicelli, with a very few much wider pieces more like macaroni. There are no recognisable points of attachment. The tubes (figs. 1–5) vary in diameter from about 1 mm. to about 10 mm., the wider ones being flattened. The usual diameter is only about 2 mm. Although fairly soft and quite flexible they readily break across, and it is impossible to say what length they may attain. One of the longest measures about 100 mm., with a diameter of about 2 mm. They are sparingly and irregularly branched, but there appears to be no true anastomosis of the branches; very rarely, however, two tubes lying side by side may become adherent. The vents are terminal or lateral, in the latter case more or less prominent. They usually, perhaps always when perfect, have a delicate peristomial fringe of hair-like oxea. The surface of the sponge is minutely hispid; the colour in spirit is white.

The wall of the tube is thin in comparison with the width of the central gastral cavity. In a tube having a total diameter of about 4 mm. the wall measures only about 0.34 mm. in thickness. The dermal and gastral cortices are both fairly well developed, each about 0.051 mm. thick, where the thickness of the chamber layer is 0.238 mm. The flagellate chambers are thimble-shaped and extend radially through the chamber layer from gastral to dermal cortex. Sometimes two, or possibly more, unite together to open through a short common exhalant canal into the central gastral cavity. The nuclei of the collared cells are, as might be expected, apical.

The skeleton of the dermal cortex consists of several layers of slender-rayed triradiates, tangentially disposed, but without any other definite orientation. That of the gastral cortex consists partly of a very sparse layer of slender-rayed tangential quadriradiates orientated in the typical manner, but largely of the paired rays of the

subgastral radiates, which have a strong tendency to lie parallel with one another in dense bundles, the bundles forming a loose network in the deeper part of the gastral cortex. The skeleton of the chamber layer consists chiefly of the centrifugal basal rays of the subgastral radiates, which extend right through it, commonly in bundles, and may project slightly beyond the dermal surface. There are also, however, a few triradiates whose paired rays are extended in the chamber layer itself, parallel to and at various depths between the dermal and gastral cortices, while the basal ray is directed outwards. These triradiates, though no longer related to individual chambers, may probably be taken to represent the articulate tubal skeleton. The chamber layer is further supported by the proximal portions of large, radially arranged oxea, which commonly extend right through the chamber layer and project beyond the dermal cortex for about one-third of their length, while their inner extremities may project slightly into the gastral cavity. The gastral surface is abundantly echinated by the short, sharp, apical rays of the gastral quadriradiates, and also by the very peculiar, slender, saw-like oxea. There is a well-developed oscular skeleton, consisting, in the first place, of a dense layer of alate radiates, some of which develop a short apical ray, and which are arranged in the usual manner, with the oral rays parallel to the oscular margin, and, in the second place, of a dense fringe of long, hair-like oxea arranged longitudinally, and springing from inside the feltwork of alate radiates.

Spicules.—(1) Dermal triradiates (fig. 11); irregular, but with a sagittal tendency, two rays being usually shorter than the third, often unequal, however, and making an angle of less than 120° with one another; rays slender, almost cylindrical, straight or slightly crooked, sharply or bluntly pointed.* In a typical example the basal ray measured 0.265 by 0.015 mm., and the two others 0.15 by 0.015 mm. and 0.22 by 0.015 mm. respectively.

(2) Triradiates of the chamber layer (fig. 12); more or less sagittal, but with the basal ray not much longer than the other two; paired rays often bent and curved towards one another in a plane at right angles to the facial plane; rays moderately stout, gently tapering, sharply or bluntly pointed; size very variable; in a typical example the basal ray measures about 0.165 by 0.015 mm., one of the paired rays measures about 0.135 by 0.015 mm., and the other about 0.125 by 0.015 mm.

(3) Subgastral sagittal triradiates (fig. 6): the three rays usually meet at approximately equal angles, but the paired rays are bent sharply backwards at a short distance from their origin, so as to lie almost in line with one another and almost at right angles to the basal ray; the three rays lie throughout their length in approximately the same plane. The rays are long and slender, nearly cylindrical, very straight except for the sharp backward bending of the paired rays above referred to; usually bluntly pointed when seen in facial view in preparations boiled out with

* It is just possible that the blunting of the apices may be partly due to the action of caustic potash upon boiled out spicules, as they certainly seem to be sharper when seen *in situ*.

caustic potash; the paired rays much more sharply and finely pointed when viewed edge on, as when the gastral cortex is looked at from the inside (apparently all three rays are somewhat flattened in the facial plane, and this is probably true of most radiates). In a typical example the paired rays measured about 0.26 by 0.01 mm. and 0.24 by 0.01 mm. respectively, and the basal ray about 0.28 by 0.01 mm., but the paired rays may be very unequal in length. These spicules may occasionally develop a short apical ray.

(4) Gastral quadriradiates (fig. 8); sagittally differentiated, but very variable in the relative lengths of the rays. The basal ray is straight and may be longer or shorter than the orals, the latter being more or less crooked and frequently unequal. The apical ray is short, slightly curved and sharply pointed. The facial rays are usually long and slender, of nearly uniform diameter for by far the greater part of their length; apparently much more sharply pointed when seen edge on than in facial view. In a typical example the basal ray measures 0.25 by 0.01 mm., one of the oral rays the same, and the other 0.155 by 0.01 mm.

(5) Radiates of the oscular skeleton (fig. 7); alate, with the paired rays extended at right angles to the basal ray; basal rays usually long, but, to judge from boiled out preparations, may be greatly reduced and quite short. Frequently these spicules develop a short apical ray; they are connected by forms intermediate in shape and position with the gastral quadriradiates.

(6) Large oxea (fig. 10): stout, subfusiform, slightly curved, somewhat flattened and much more refringent when viewed edge on; proximal half tapering more gradually and to a finer point than distal half, which is rather broadly rounded in flat view. Typical examples measure about 0.53 by 0.25 mm.

(7) Trichoxea; the hair-like oxea of the oscular fringe; straight and very slender; say about 0.07 mm. in length.

(8) Saw-like oxea (figs. 9, 9 a). These spicules are very peculiar; they are long and rather slender, more or less bluntly pointed at each end and gently curved in one plane in the form of a very open **S**. The margin of the distal fourth or fifth is serrated on the concave side. When viewed edge on (fig. 9 a) the spicule appears straight and the serrations are seen to form a double row; in this position also the spicule is more highly refringent. Typical examples measure about 0.27 by 0.005 mm. They project for the greater part of their length from the gastral surface and are abundant in places. (The above description is taken from preparations boiled out in caustic potash; when seen *in situ* the spicules appear finely pointed, at any rate at the outer ends, and we are inclined to think that the potash may have had some effect in blunting the extremities.)

This is a remarkably well characterised species and nothing at all resembling it seems to have been described hitherto. The external form and mode of growth remind one of *Leucilla saccharata*, but on a much smaller scale. The peculiar saw-like oxea are, so far as I know, quite unique.

Register No., Locality, &c.—XVI; Mouth of Bay of Islands, New Zealand 20 fathoms, September 28, 1911.

6. *Ute syconoides* (Carter)?

? *Aphroceras syconoides*, Carter [1885-6]; ? *Ute syconoides*, Dendy [1892], Dendy and Row [1913].

The single specimen in the collection was obtained from the base of a specimen of *Geodia* (R. N. XXXII. 3). It is very small, having the form of a single cylindrical person about 5.5 mm. in height by 1 mm. in diameter. There is a fringe of long, slender oxea around the vent and the surface is covered with an armour of colossal longitudinal oxea, between which lie a few microxea. The radial chambers are very short, but this is probably to be attributed to the youth of the specimen.

Except for the presence of the peristomial fringe of hair-like oxea the specimen agrees very well with Australian specimens of *Ute syconoides*, though there may be minor differences in the form of some of the spicules. Unfortunately, in our memoir on the Classification and Phylogeny of the Calcareous Sponges [1913] we have, by an oversight, placed *Ute syconoides* in the section of the genus without microxea, although Mr. Carter laid stress upon the presence of such spicules ("mortar-spicules") as distinguishing his species from *Ute glabra*, Schmidt.

Previously known Distribution.—Near Port Phillip Heads (Carter, Dendy); Port Jackson (Dendy).

Register No., Locality, &c.—XXXII. 3. c; Station 96, 7 miles East of North Cape, New Zealand, 70 fathoms.

ORDER HEXACTINELLIDA.

FAMILY ROSSELLIDÆ.

7. *Rossella ijimai*, n. sp. (Pl. III, fig. 5; Pl. IV, figs. 1-16.)

The single specimen (Pl. III, fig. 5) by which this species is represented in the collection is a sessile, goblet-shaped sponge, slightly compressed in a vertical plane, so that the wide terminal aperture is oval in outline. The colour in spirit is greyish-white. The maximum height is about 93 mm. and the maximum width 76 mm. The opening of the cup is surrounded by a narrow, thin, vertical marginal membrane, but without any special skeletal peculiarities. The wall of the cup, as a whole, is very thick and the texture rather soft, compressible, and resilient. Both outer and inner surfaces, though very uneven, are fairly smooth, there being no projecting spicules visible to the naked eye. The surfaces, however, are not glabrous but have a granular appearance. The most remarkable feature of the species is the highly cavernous character of the thick wall, which is pierced in every direction by a system of very wide, branching canals, communicating with the exterior by

numerous, irregularly scattered, rounded apertures on the outer surface of the sponge, of much smaller diameter than the canals or vestibules themselves, into which they open laterally. A somewhat similar system of wide canals is continued outwards from the central cavity of the cup, of which they are merely extensions and into which they open by much wider apertures than those on the outer surface of the sponge. This second system extends to close beneath the dermal surface, and may even communicate occasionally with the exterior by small rounded apertures, and in the same way the first-mentioned system may, I think, occasionally communicate with the central cavity. Whether or not, or to what extent, the two systems of canals communicate with one another it is impossible to determine without destroying the specimen, but one may safely say that, taken as a whole, they form distinct systems.

The cavernous character of the sponge wall, just described, is evidently very similar to that described by Ijima [1904] in his *Crateromorpha corrugata*.

The ends of the comparatively very narrow, true inhalant and exhalant canals, communicating with the flagellate chambers, appear to be normally covered over by a thin, pore-bearing membrane; where this has been, presumably, abraded, the outer surface of the sponge appears pitted between the relatively large circular openings.

The arrangement of the skeleton is normal. The main skeleton is a very loose and irregular network, formed of bundles of diacts, with many loose diacts scattered between. The differentiation of this skeleton to form a special subdermal and subgastral reticulation is not strongly marked, and the different bundles or fibres appear everywhere to cross one another without making any firm junctions.

Immediately below the dermal surface the paratangential rays of the large hypodermal pentacts form a polygonal-meshed network supporting the pore-bearing dermal membrane, while their unpaired rays are directed inwards (centripetally). A few variously orientated, rough-rayed hexacts are mingled with these pentacts. On the gastral surface the pentacts are few or absent and the hexacts more numerous, the typical orientation, of course, being with four rays disposed paratangentially.

The lining membrane of the wide canals or vestibules ("intercanals" of Ijima), which run in from beneath the dermal surface, appears to be devoid of both hexacts and pentacts, and to be supported only by a loose network of diact bundles or fibres, so that we can hardly say, as Ijima does of *Crateromorpha corrugata*, that the intercanals "are throughout lined with the dermal layer."

Spicules:—(1) Diacts: long and slender, but very variable in size and proportions. Often, especially the shorter ones, slightly angulated in the middle and with approximately central inflation. Ends roughened, usually pointed, sometimes more or less enlarged. Two principal forms occur, connected by intermediates:—

(a) Very long and slender, up to at least 5.2 by 0.006 mm.; or shorter and stouter, e. g. 4.0 by 0.012 mm.

(b) Relatively short and stout, e. g. 0.63 by 0.0082 mm. (Pl. IV, fig. 1.)

(2) Hexacts (fig. 2): regular, with approximately equal, usually sharp-pointed rays, more or less roughened, especially towards the tips; usually smooth towards the base; measurement of ray about 0.1 by 0.006 mm. Occasionally reduced to pentacts (fig. 3).

(3) Pentacts (fig. 4): with straight and approximately equal rays, only slightly roughened at the tips; tapering gradually to sharp points. Ray measuring about 0.225 by 0.0164 mm. The sixth ray usually represented by a very distinct, rounded knob or boss.

(4) Oxyhexasters (figs. 5-11): very abundant throughout the sponge; varying in total diameter from about 0.033 to about 0.086 mm. Rays smooth and slender; principals very short; secondaries long and tapering gradually to fine points, varying in number from 4 to 1 on each principal. Extreme modifications of these spicules are the remarkable curved diacts shown in figs. 7 and 8.

(5) Calycocomes (figs. 12-15): fairly abundant throughout. Secondary rays varying from about 6 to 1 on each principal, terminating in very small knobs. There are two chief forms of this spicule, connected by intermediates:—

(a) Small, about 0.053 mm. in total diameter, with comparatively short rays (figs. 13, 14).

(b) Large, about 0.082 mm. in total diameter, with comparatively long and very slender rays (figs. 12, 15).

(6) Irregular discohexasters (fig. 16): so rare that I was only able to find a single broken specimen for drawing, and probably to be regarded merely as abnormalities of the calycocome.

There is nothing remarkable about the spiculation of this species, the chief distinctive character of which is undoubtedly the cavernous character of the sponge wall, which, so far as is known, appears to be unique in the genus *Rossella*, though met with, as already stated, in the closely related genus *Crateromorpha*.

Register No., Locality, &c.—XVIII. 1; Station 96, 7 miles east of North Cape, New Zealand. Depth 70 fathoms; bottom sand and rock.

Genus SYMPLECTELLA, n. gen.

Sponge directly attached, without stalk and without root-tuft. Consisting of a number of wide, thin-walled, more or less upright, laterally anastomosing tubes, the upper ends of which, lying all at the same level, are covered over by a large, common sieve-plate. There are a few small accessory vents situated on lateral projections, but the sponge-wall, generally speaking, is imperforate. The main skeleton consists of loosely interwoven bundles of diacts, without firm junctions. Large, stout, short-rayed hexacts occur abundantly scattered through the parenchyma. The dermal skeleton is very poorly differentiated, consisting chiefly of hexacts of various sizes. Oxyhexasters and calycocomes are present. No floricomes.

This interesting genus seems to come most naturally in the family Rossellidæ, but appears to be not without affinities with the Euplectellidæ.

8. *Symplectella rowi*, n. sp. (Pl. III, figs. 1-3 ; Pl. IV, figs. 17-39.)

This very beautiful and remarkable species, which I dedicate to my late friend and colleague, R. W. Harold Row, is represented in the collection by three specimens, two in spirit and one dry. The last-named is not labelled, but the presumption is that they all come from the same locality. The larger of the spirit specimens (R. N. XV) had, unfortunately, been crammed into a jar that was much too small for it and was consequently much damaged. The smaller (R. N. XXVI) was also a good deal damaged on one side, but is still in a fair state of preservation. The dry specimen (R. N. XXXIII. 11), of about the same size as the larger spirit specimen, was reduced to the condition of a shapeless mat, and must be neglected for purposes of description.

R. N. XV (Pl. III, fig. 1) may be regarded as the type of the species. Taken as a whole it may be described as roughly columnar in form, with an approximately circular, depressed top, formed by the common sieve-plate. It is really, however, made up of a number of very wide, thin-walled tubes, ascending almost vertically and anastomosing with one another laterally by short cross-tubes of similar width, or branching out from one another as they ascend. The total height is about 130 mm., and the diameter at the top about 170 mm. Unfortunately the sponge has been torn off from its attachment in such a way that there is no clue to the nature of the latter ; the smaller specimen, however, to be described later, to some extent supplies this deficiency.

The component tubes are approximately cylindrical in shape and about 33 mm. in diameter, with walls not more than 2 or 3 mm. in thickness.

The terminal sieve-plate may be said to be common to the whole of the tubes, but the grouping of the apertures still shows, to some extent, its composite character, for they are interrupted where the walls of the tubes reach the surface. These apertures are rounded or polygonal in form and average about 4 mm. in diameter, they are separated by trabeculæ about 1.5 mm. in diameter.

The outer or dermal surface of the tubes shows a fine lattice-work of closely interwoven trabeculæ, with rounded or oval meshes varying greatly in diameter (up to about 3 mm.). These meshes are the openings of pits of varying depth, which never appear to penetrate right through the wall. Occasionally a conical prominence on the wall of a tube bears at its apex a small accessory vent, but these are rare. Nowhere are there any projecting spicules visible to the naked eye.

The gastral surface of the tubes is subglabrous, covered over by a thin, pore-bearing, gastral membrane.

The texture of the sponge is fragile, compressible and resilient ; the colour light

brown, apparently artificially stained, for the other spirit specimen is very pale yellow and the dry specimen greyish-white.

The smaller spirit specimen (R. N. XXVI) is about 65 mm. in height and 68 mm. in diameter at the top. It shows clearly (figs. 2, 3) that the component tubes spring from a contracted base and branch off from one another as they ascend. The base is a good deal damaged, but there is no sign of a stalk or root-tuft, and the existence of a small pebble and other bottom débris, attached to the surface, indicates that it was directly attached to the sea-bed. In this specimen there are a good many small perforations piercing right through the walls of the tubes.

The main skeleton is a very loose and irregular interlacement of bundles of diacts and loose diacts, without any firm junctions. Amongst these are abundantly scattered the large, stout, short-rayed hexacts so characteristic of the species. In sections taken at right angles to the surface of the sponge wall these large hexacts are seen to be roughly disposed in loose columns, corresponding to the trabeculæ of sponge-tissue which separate the principal canals, which themselves run at right angles to the two surfaces.

Immediately beneath the gastral and dermal surfaces the network of diact-bundles or fibres is more or less concentrated paratangentially to form a subgastral and subdermal skeleton respectively. On the gastral side this is overlaid by a network of single diacts, or very slender bundles, supporting the thin, pore-bearing gastral membrane.

There are no gastral hexacts (or pentacts), and even the hexasters are absent from the gastral membrane. At the dermal surface, however, there is a layer of medium-sized, regular hexacts, which seem typically to have four rays disposed paratangentially, though there is much irregularity in the orientation and no special differentiation of any of the rays. The rays of these spicules are smooth, conical and sharply pointed, measuring about 0.164 by 0.02 mm., but smaller forms, with more slender rays, also occur, which even seem to form transitions to the oxyhexasters, which are very abundantly scattered in the dermal membrane, while, on the other hand, transitions to the large, stout hexacts of the parenchyma are not wanting.

At the surface of the trabeculæ of the terminal sieve-plate the medium-sized hexacts are either absent (or nearly so) or replaced by pentacts of similar form, with the unpaired rays inwardly directed. The trabeculæ themselves are composed chiefly of stout bundles of diacts, with a superficial layer of soft tissue containing numerous oxyhexasters in addition to the above-mentioned pentacts.

Spicules:—As it is impossible to distinguish sharply between dermalia, hypodermalia, perenchymalia, and so forth, I propose to describe the different forms of spicules chiefly as they appear in boiled out preparations (R. N. XV), without attempting to classify them according to their positions in the sponge.

(1) Diacts: very variable in size and proportions, but distinguishable roughly into the following categories:—

(a) Long and comparatively stout (Pl. IV, fig. 19); more or less gradually and sharply pointed at each end; ends not roughened, but frequently irregular, occasionally one end broadly rounded off. The concentric lamination of the silica on these spicules is often very obvious, and though they usually taper evenly to the extremities, there is sometimes a sudden diminution in diameter as shown in the figure. A typical example measured about 5.0 by 0.0246 mm.

(b) Long and very slender, almost cylindrical (fig. 18); ends roughened; a typical example measured about 3.8 by 0.0082 mm.

(c) Short, slender, nearly straight (figs. 20–22); ends varying from smooth and fairly sharp-pointed to roughened and broadly rounded; a typical example measured about 1.15 by 0.012 mm. It is only rarely that these spicules exhibit any central inflation (fig. 17).

(2) Hexacts:—(a) Large and stout (fig. 23); with much thickened, conical rays and large centrum. The whole spicule may somewhat resemble a large spheraster; about 0.34 mm. in total diameter, i. e. from tip to tip of opposite rays. These are the characteristic parenchymal hexacts as they appear when fully developed. They are by no means always so stout.

(b) Medium-sized (fig. 24); little inferior to (a) in total diameter, but with less thickened rays and centrum. The dermal hexacts are of this type, which, by reduction, gives rise to a comparatively few pentacts (figs. 25–27) and very rare stauracts (fig. 28).

(c) Rather small (figs. 29, 30); commonly with some or all of the comparatively slender rays roughened at the tips. Spicules of this type occur in the dermal or subdermal skeleton, and I suspect them to be immature forms of the larger dermal hexacts. A pentact reduction form of this type has also been observed (fig. 31).

(3) Oxyhexasters: very abundant, especially in the dermal membrane, where the commonest form is that with only 6 slender rays (fig. 32), which might easily be interpreted as a dermal hexact, but which is connected by intermediates with more typical forms (figs. 33 and 34), in which one or more of the rays is divided near the base into two branches. An interesting variety is one in which the slender rays are bent into hooks (figs. 35 and 36). The total diameter of the oxyhexaster ranges up to about 0.086 mm.

(4) Calyccomes: rather scarce, with slender secondaries bearing very minute terminal knobs. The secondaries are almost straight, and diverge only slightly from the end of each principal. This spicule occurs in two chief sizes, the larger (fig. 37) about 0.127 mm. in total diameter, and the smaller (fig. 38) about half as much, but of course intermediates occur.

(5) Very minute discohexasters (fig. 39): with stout primary and numerous very slender secondary rays. Total diameter about 0.02 mm. Apparently very scarce.

Register Nos., Locality, &c.—XV, XXVI; Station 96, 7 miles E. of North Cape, New Zealand. Depth 70 fathoms; bottom sand and rock; XXXIII. 11 (Dry), Station 96?

ORDER TETRAXONIDA.

SUB-ORDER ASTROTETRAXONIDA.

FAMILY STELLETTIDÆ.

9. *Stelletta maori*, n. sp. (Pl. VII, figs. 8-11.)

The single specimen in the collection is laterally compressed, cushion-shaped, with a meridional ridge produced into an irregular base of attachment at one side, where it has apparently been torn off from the substratum. The surface is coarsely granular and marked with shallow, meandering grooves. Over a limited area only (one part of the ridge) it is coarsely hispid, elsewhere it is sparsely and shortly hispid or not hispid at all. There are no apertures visible to the naked eye or with a pocket lens. The colour externally is very dark greyish brown, internally light yellowish brown. The texture is fairly compact but not hard, and moderately compressible. Height about 20 mm.; greatest breadth about 22 mm.; thickness about 14 mm.

There is a sharply defined cortex about 1 mm. thick, clearly differentiated into an outer collenchymatous layer and an inner fibrous layer, the outer layer being somewhat thicker than the inner.

Numerous minute pores are scattered over the surface of the sponge. These lead into narrow canals which unite with one another in the outer layer of the cortex to form the chones, and then penetrate the inner layer as single canals to open into the large or small subcortical crypts. Well-developed sphincters are present around these canals in the deeper part of the fibrous layer. Most of the cortical canals and dermal pores thus described are probably inhalant, but some are probably exhalant, though I have not been able to distinguish between the two in my sections. Some of the subcortical crypts are very large and penetrate deeply into the choanosome. None of the canals in the choanosome appear to be provided with diaphragms, and there is very little collenchyma accompanying them.

The skeleton is rather lax and sparse, but the arrangement is typical, the megascleres being arranged in loose, radiating bundles. The best developed spicules are the triænes, arranged in more or less dense brushes, lying for the most part in the cortex, with the cladi at or near the surface. In the choanosome there are practically no triænes, the megascleres being oxea, usually very long and very slender, arranged in very loose radial bundles. The microscleres (asters) are enormously abundant in the choanosome but sparse in the cortex, except for an ill-defined dermal layer.

Spicules :—(1) Dichotriænes (Pl. VII, fig. 8); with the primary cladi coming off at the normal angles, but the secondaries bent back so as to lie almost at right angles to the shaft. Shaft and cladi typically stout, the former varying greatly in length and tapering gradually to a fine point; the latter bifurcating at about half their length, the secondaries conical and fairly sharply pointed. In a well-grown specimen the shaft measured about 1.8 by 0.068 mm. and the cladome about 0.5 mm. across; the primary cladi having a thickness of about 0.05 mm. Numerous small triænes with unbranched cladi (fig. 8 a) occur amongst the larger ones, but are evidently only young forms of the latter, as shown by intermediates.

(2) Oxea (fig. 9); very variable in dimensions, for the most part very long and often very slender, gradually sharp-pointed at each end. They may be as much as 5 mm. in length, with a diameter of not more than about 0.01 mm., or they may be considerably shorter and stouter, as in the figures, measuring, for example, about 2.55 by 0.034 mm.

(3) Oxyasters (fig. 10); ranging from comparatively large (up to 0.036 mm. in diameter), with few rays and no centrum, to comparatively small (about 0.02 mm. in diameter), with many rays and fairly large centrum. The rays are usually rather slender, smooth, conical and sharply pointed.

(4) Tylasters (fig. 11); of much the same form and size as (3), but differing in the appearance of slight knobs at the ends of the rays.

We might almost say that there are four kinds of aster, viz. large and small oxyasters and large and small tylasters, but there are so many intermediate forms that it would be equally reasonable to recognize one kind only. The larger oxyasters are by far the commonest, occurring chiefly in the choanosome, while the smaller forms occur chiefly in the thin surface layer. The tylote forms are comparatively rare.

This species is evidently closely related to Sollas's [1888] *Stelletta phrissens*, from Patagonia, and Topsent's [1904] *S. (Astrella) tuberosa*, from the Azores. It differs from *S. phrissens*, but agrees with *S. tuberosa*, in the absence of anatriænes. It differs from *S. tuberosa*, however, in the absence of the comparatively large, single oscula. In *S. tuberosa*, moreover, the asters are distinctly roughened, a feature which is rarely recognisable in the "Terra Nova" sponge.

Register No., Locality, &c.—L. 10; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

9 a. *Stelletta maori*, var. *bistellata*, nov.

A single small specimen, from the same locality as the type of the species, differs in certain interesting particulars. The specimen, which is attached by a broad base to an epipolamid sponge (L. 6, *Jaspis novæ-zealandiæ*), is roughly hemispherical in shape and about 10 mm. in maximum diameter. The surface is granular but not hispid. In its present condition, which is somewhat damaged, there are no apertures

large enough to be seen with a pocket lens, and I think it may safely be assumed that there were no conspicuous vents even in life. The colour, of surface and interior alike, is pale, dull yellow; the texture compact but fairly compressible.

The structure of the cortex and the chones is closely similar to that of the type. The differences consist chiefly in the spiculation and may be summed up as follows:—

(1) The megascleres are on the whole rather more robust and there are not nearly so many slender oxea.

(2) The asters are very sharply differentiated into two categories, distinguished chiefly by their size, viz. large oxyasters, usually with about six or seven smooth, conical, sharply-pointed rays and hardly any centrum; and minute oxyspherasters, with moderate centrum and rather more numerous, short, conical or truncated rays. The former measure about 0.04 mm. and the latter about 0.008 mm. in total diameter. The small asters form a thin but well-defined surface layer, and also occur sparsely along with the large ones and a few intermediates in the choanosome.

(3) None of the asters appear to have tylote rays.

It will be seen that as regards the asters this variety comes much nearer to Sollas's *Stelletta phrissens* than does the type of the species, but it still differs from *S. phrissens* in the complete absence of anatriænes.

It is of considerable interest to find two apparently well-marked varieties of *S. maori* occurring together in the same locality.

Register No., Locality, &c.—L. 6. d; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

10. *Stelletta crater*, n. sp. (Pl. IX, fig. 5; Pl. VII, figs. 5–7.)

There are two and a half fine specimens of this sponge from Station 96 and a fragment from Station 134. The most perfect is R. N. XXXII. 15 (Pl. IX, fig. 5), which may be regarded as the type of the species. The external form is evidently very characteristic, resembling a very thick-walled goblet, with broadly rounded margin and a broad base of attachment. The type specimen is very symmetrical, but in R. N. XXXII. 2 the wall of the cup is deficient on one side and the base of attachment is subdivided into three irregular areas. The three specimens are all of about the same size. The height of the type is about 124 mm.; the outside diameter just below the margin of the cup about 122 mm.; the diameter of the opening, measured from the middle of the rounded margin, about 100 mm.; the depth of the cavity about 60 mm., the lower part of the sponge being solid. The fragment from Station 134 is apparently a piece broken out from the wall of a similar cup-shaped specimen, including part of the margin.

In all the specimens the entire surface, except where accidentally abraded, is covered with a thin layer of an encrusting sponge belonging to the genus *Desma-*

cella,* filling up the intervals between the ends of large triænes and oxea, which project in dense brushes beyond the cortex of the *Stelletta* and, were it not for the encrusting *Desmacella*, would form a thick surface pile. The *apparent* surface of the sponge, however (really the surface of the *Desmacella*), is not hispid, but minutely granular, and on the outside of the cup is more or less deeply corrugated. In R. N. XXXII. 2 both surfaces are also sparsely studded with commensal polyps, possibly Palythoids. In most of the specimens no pores or vents are recognisable with the naked eye, but in R. N. XXXII. 16 the inner surface of the cup exhibits numerous minute, oval or slit-like punctures, which appear to be the vents of the *Desmacella*, and probably serve also as those of the *Stelletta*. The texture in spirit is firm, compact, and scarcely compressible. The colour of all but R. N. L. 9 is deep green throughout, owing to copper staining, but R. N. L. 9 is pale wax-yellow throughout (in spirit).

R. N. XXXII. 16 has been cut in half, and shows that the *Desmacella*-layer is much thicker on the outside than on the inside of the cup, measuring about 3.5 mm. in thickness in the former and 1.5 mm. in the latter case.

There is a fibrous cortex about 0.85 mm. thick, absolutely sharply defined from the overlying *Desmacella*-layer. At the inner surface of the cup the principal exhalant canals, about 2 mm. in diameter, coming from the interior of the sponge, run up to the cortex, while others seem to form a system of subcortical or cortical canals running parallel with the surface. Finally, they open through the cortex by means of sphinctrate chones. At the outer surface the cortex is penetrated by numerous narrow, inhalant chones, provided with sphincters in the deeper parts. The flagellate chambers are about 0.02 mm. in diameter. I have been unable to satisfy myself as to their mode of opening.

The arrangement of the skeleton is of the usual type. Dense bundles of large, stout oxea curve upwards from the interior towards the surface of the sponge. As they approach the surface numerous large, stout triænes become intermingled with the oxea, and finally the surface-brushes, which begin beneath the cortex and penetrate both the latter and the superjacent *Desmacella*-layer, consist almost entirely of triænes, very many of the cladi being embedded in the *Desmacella*-layer.

Spicules:—(1) Triænes (Pl. VII, fig. 6); shaft stout, more or less curved, somewhat hastately pointed at the apex, measuring about 2.1 by 0.093 mm.; cladi stout, rather short, conical, usually gradually and fairly sharply pointed, with their apices more or less strongly incurved like the petals of a tulip, measuring about 0.23 by 0.06 mm. (without allowing for the curvature). Cladi occasionally abbreviated and bluntly rounded off (fig. 6*a*), or one may be altogether suppressed (diæne, fig. 6*b*).

(2) Oxea (fig. 5); very large and stout, fusiform, sharply pointed, more or less curved; size about 2.56 by 0.14 mm. Numerous young and slender individuals of both types of megasclere also occur.

* This is described below under the name *Desmacella vestibularis* (Wilson).

(3) Oxyspherasters (fig. 7); with numerous rather short, slender, conical rays, and a feebly developed centrum; measuring up to about 0.022 mm. in total diameter. Perhaps with slightly roughened rays.

This species is well characterised by the cup-like external form, and by the peculiar tulip-like shape of the cladome of the triænes. The most remarkable feature about it is, however, the presence of the uniformly encrusting layer of *Desmacella* in all the specimens. There is not sufficient evidence to justify us in saying that this association is constant, and, indeed, similar cases have been described in which it is certainly not so, as, for example, that of "*Seiriola compacta*," in which Hanitsch [1889] at first described an encrusting "Suberite" as an integral part of a stellettid sponge, the error being pointed out later by Sollas.

It should also be noted that the same species of *Desmacella* occurs in exactly the same association with several other stellettid species in the collection (*vide* under *Desmacella vestibularis*).

It seems certain that all our specimens of *Stelletta crater* must have both drawn and discharged their water-supply through the overlying *Desmacella*, probably making use of the canal-system of the latter, for no other means of communication with the exterior can be found, and the *Stelletta* is evidently in a perfectly healthy, growing condition.

Register Nos., Locality, &c.—XXXII. 2, 15, 16, Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms; L. 9, Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

11. *Stelletta columna*, n. sp. (Pl. V, fig. 4; Pl. VII, figs. 1–4.)

The single specimen (Pl. V, fig. 4) is massive, erect; attached below at several points to a mass of foraminiferal rock and shell-fragments; the attachments making up altogether a broad but interrupted base. The entire sponge seems to be made up of four subcylindrical columns, growing up side by side and fused together throughout almost their entire length. Two of the columns are sharply truncated at their upper ends, giving rise to two well-defined, flat, or slightly concave, oscular surfaces with irregularly rounded outlines, one much larger than the other. The two remaining columns taper out above, against the side of the larger one, to which they appear to form buttresses.

The total height of the specimen is about 145 mm.; the breadth at the base about the same. The maximum thickness, half-way up, is about 65 mm. The larger of the two oscular areas, at the top of the larger column, is somewhat oval in shape, and its longer diameter measures about 53 mm.

The texture is firm, compact, and incompressible, but rather brittle. The colour is now green, like that of the other specimens from the copper tank.

The lateral surfaces of the columns, in certain parts where they have been protected from friction, are coarsely hispid. How far this hispidation was general in

the living sponge it is impossible to say. Sections show at once that the surface is really coated with a layer, about 1.5 mm. thick, of another sponge, viz. *Desmacella vestibularis* (Wilson). This layer covers the flat, oscular surfaces at the tops of the columns, as well as the lateral surfaces.

The cortex beneath the lateral surfaces of the sponge is about 1 mm. thick and more or less fibrous throughout, but especially so in its inner half.

The outer portion contains numerous coarsely granular, darkly staining cells, embedded in a gelatinous matrix. Often layers of these granular cells alternate with layers of fibrous tissue.

Beneath the oscular surfaces the cortex is much thicker, up to about 4 mm., and its outermost portion is crowded with curious little sausage-shaped bodies, which appear to be perfectly homogeneous in structure and stain fairly darkly with borax-carmin. They measure about 0.016 by 0.004 mm. They are less numerous in the lateral cortex. They seem to bear some relation to the coarsely granular cells, from which they may possibly originate.

The choanosome is also densely crowded with large, rounded, coarsely granular cells about 0.02 mm. in diameter, which stain very deeply with borax-carmin. These are accompanied by numerous sausage-shaped bodies like those found in the outer layer of the cortex. These sometimes lie actually in the cells, more or less surrounded by the coarse granules, and sometimes free between the cells. I am inclined to regard all the granular cells as thesocytes containing storage products, but the state of preservation of the material does not admit of satisfactory histological observations.

For the same reason nothing can be said of the flagellate chambers, but the more superficial parts of the canal-system exhibit features of considerable interest. In the first place, the canal-system communicates with the exterior only through the overlying *Desmacella*-crust, and evidently not through mere breaks or discontinuities in the latter, but through its own proper canal-system, though everywhere the two sponges are absolutely sharply delimited from one another, and there is not even any admixture of microscleres. The only exception to this statement lies in the fact that the ends of many of the megascleres of the *Stelletta* project into the *Desmacella*, and this exception is apparent rather than real.

Dermal pores, about 0.017 mm. in diameter, are thickly scattered on the outer surface of the lateral cortex. Each of these pores forms the termination of an inhalant canal in the *Desmacella*-crust, and at the same time leads into a very short canal in the outer part of the *Stelletta* cortex. These short canals open in groups into very wide, irregular chones, which penetrate into the deeper part of the cortex, narrowing as they go, until they reach the sphincters which separate them from the wide, subcortical crypts.

Wide oscular tubes, up to about 3 mm. in diameter, run vertically up to the oscular areas. The ends of these tubes form a system of subcortical crypts, which

open through narrow sphincters, situate at the inner limit of the cortex, into wide chones. The latter are roofed over by a thin, pore-bearing membrane densely charged with minute asters. These exhalant pores are about 0.01 mm. in diameter and are arranged in groups corresponding to the chones, between which lie the brushes of megascleres. Over these pore-areas lie wide canals in the *Desmacella*-crust, and the water must find its way out through the vents of the latter, which are small and scattered, and rather slit-like.

The evident adaptation of their respective canal-systems to one another suggests something more than a mere accidental association of the two sponges, but, as we have already seen, the *Desmacella* occurs also on other sponges from the same locality.

The arrangement of the skeleton is normal. Loose bundles of large oxea, mingled with plagiatriænes, radiate from the interior to the surface of the sponge, spreading out into brushes as they approach the latter, and extending beyond it to the surface of the *Desmacella*-crust, which latter contains most of the cladomes of the plagiatriænes.

Spicules:—(1) Plagiatriænes (Pl. VII, fig. 1); with short, conical, fairly sharply pointed, slightly incurved cladi; and very long, slightly curved shaft, tapering gradually to a fairly sharp point. Shaft about 3.2 by 0.1 mm.; cladi about 0.34 by 0.076 mm.

(2) Oxea (fig. 2); long, stout, fusiform, slightly curved, tapering gradually to a fairly sharp point at each end. Size about 4.25 by 0.09 mm.

(3) Large oxyspherasters (fig. 3); with relatively small, but well-defined centrum, about 0.02 mm. in diameter, and long, conical, smooth, sharply pointed rays, about 0.048 mm. in length, and 0.008 mm. in diameter at the base. The number of rays varies from about seven to about fifteen.

(4) Minute oxyspherasters (fig. 4); with relatively large centrum and numerous short, conical rays; total diameter about 0.012 mm.

The two kinds of aster are very sharply contrasted with one another, and there are very few intermediates. The large ones are almost confined to the choanosome, while the small ones are abundant in a thin layer at the true surface of the sponge, and also in the walls of the larger canals.

Register Nos., Locality, &c.—XXXII. 4 and 5 (parts of same specimen); Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

Genus ANCORINA, Schmidt [1862].

Stellettidæ in which the microscleres include microrhabds in addition to euasters; the former are commonly minutely spined or roughened and usually form a dermal layer. There are no trichodragmata.

The much-needed revision of the Stellettidæ, to which I referred in my Report on the Astrotetragonida of the "Sealark" Expedition [1916 B], has not yet been carried

out, but in the meantime it seems sufficiently clear that the genera *Ecionemia* and *Ancorina* cannot be distinguished from one another and that the latter name must take precedence. I have therefore abandoned *Ecionemia* and transferred the diagnosis which I gave (*loc. cit.*) of that genus to *Ancorina*.

12. *Ancorina progressa*, Lendenfeld [1906], var. *diplococcus* nov.

A single, rather small, irregularly rounded specimen of this sponge occurs, along with other sponges, in a heterogeneous mass made up chiefly of *Histodermella australis*. The colour in spirit is light yellowish grey, and there are no visible vents. There is a very thick cortex, fibrous in its inner half and containing the cladomes and the greater part of the shafts of the dichotriænes, arranged in dense, radiating brushes. This variety differs from the type of the species chiefly in the dimensions of the spicules, typical examples of which measure as follows:

(1) Dichotriænes; shaft 0.93 by 0.076 mm., with cladome 0.63 mm. across.

(2) Oxea; up to 2.0 by 0.05 mm.

(3) Oxyasters (with slightly roughened rays); about 0.028 mm. in total diameter.

(4) Microrhabds (not quite so spiny as represented by Lendenfeld and distinctly double in appearance); only about 0.004 mm. long; resembling diplococci, whence the varietal name.

The microrhabds are thus only about one-third as long as those of the type of the species. The oxyasters are also considerably smaller than those of the type. The dichotriænes, on the other hand, are considerably larger than in the type, while the oxea are smaller. These differences are perhaps sufficient to merit specific distinction, especially considering the wide difference of locality, the type having been obtained from the Agulhas Bank, near the S. African coast, by the "Valdivia" [Lendenfeld, 1906].

Register No., Locality, &c.—L. 1. *a*; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

13. *Ancorina stalagmoides*, n. sp. (Pl. III, fig. 4; Pl. VII, figs. 12–15.)

There are two fine specimens of this sponge in the collection, both, unfortunately, dry. The external form is well represented in Pl. III, fig. 4, and is closely similar in the two cases. The sponge is massive, erect, very irregular, with a wide but shallow depression on top. The outer surface is deeply corrugated, with stalagmoidal outgrowths in the form of vertical ridges with outward- and sometimes downward-growing, bluntly rounded projections. The development and subsequent fusion of these projections causes a slight amount of fenestration. The attachment to the substratum has evidently been, not by a single wide base, but by a number of irregular areas of varying size. The depressed area at the top of the sponge resembles a flat-bottomed valley surrounded by a mountainous range, interrupted

in some places and rising to varying heights in others. Over the bottom of the depression a number of fair-sized vents, ranging up to 3 or 4 mm. in diameter, are very unevenly distributed. These vents, however, clearly belong primarily to an encrusting *Desmacella*,* and it is impossible to say what is their relation to the *Ancorina*. A few similar vents may sometimes be observed on the truncated or even depressed end of one of the processes projecting from the outer surface (R. N. XXXIII. 6). The height of the figured specimen is about 190 mm., and the greatest breadth about 170 mm. The colour of the dry specimens is light brown, and the texture hard and incompressible. The entire surface of both specimens appears to have been coated with a thin *Desmacella*-crust, similar to that of *Stelletta crater*. This very readily rubs off from the dry sponge, but much of it still remains.

It is impossible to give any details as to the canal system or histology, but vertical sections of the dry sponge suggest the presence of a collenchymatous rather than fibrous ectosome. In such a section the ectosome measures about 0.68 mm. in thickness and the *Desmacella*-layer nearly 1.7 mm.

The skeleton arrangement is typical. Dense sheaves of large, stout oxea curve from the interior and approach the surface, where they terminate in radially arranged brushes of large triænes, whose cladi occur partly in the ectosome but still more in the *Desmacella*-layer outside it, projecting far beyond the proper surface of the *Ancorina*.

Spicules:—(1) Dichotriænes (Pl. VII, fig. 12); shaft long, rather stout, tapering very gradually to a sharp or rounded apex, usually more or less curved; cladi stout, bifurcating near the middle, primaries projecting well forward, secondaries more outward; the latter conical and fairly sharply pointed. In a typical specimen the shaft measured 3.3 by 0.09 mm.; the primary cladi about 0.17 by 0.068 and the secondaries about 0.22 by 0.59 mm. Variations of this type occur, in which one, two, or all three of the cladi may remain unbranched (fig. 12 a), and occasionally an abnormality occurs in which an additional cladus springs from the shaft at some little distance below the cladome.

(2) Oxea (fig. 13); large, stout, fusiform, slightly curved, tapering gradually to a fairly sharp point at each end. A typical example measures about 3.9 by 0.1 mm.

(3) Oxyasters (fig. 14); with about ten rather slender, not very sharply pointed rays; varying up to about 0.02 mm. in total diameter.

(4) Microrhabds (fig. 15); very minute, about 0.006 mm. long, usually deeply constricted in the middle, Diplococcus-like.

This appears to be a well-marked species with a characteristic external form.

Register Nos., Locality, &c.—XXXIII. 1, 6; off Three Kings Islands, north of New Zealand.

14. *Ancorina alata*, n. sp. (Pl. V, figs. 1 and 2; Pl. VIII, figs. 1–7.)

There are two almost complete specimens of this species in the collection and

* *Desmacella vestibularis* (Wilson).

two fragments, all from the same locality. The external form appears to be characteristic,* the sponge being lamellar and incompletely folded into a funnel, produced at one side into a wing-like extension (Pl. V, figs. 1 and 2). In one specimen (R. N. XXXII. 6) there is a single stalk of attachment, in the other (R. N. XXXII. 8) there are two. In the former the wing-like extension of the funnel is very irregular and fenestrated. The margin is narrow, but rounded and slightly undulating. Both inner and outer surfaces are smooth and even sub-glabrous in spirit, but the outer surface (more especially) is uneven. There are no vents visible to the naked eye, but the inner surface is abundantly strewn with very minute procts, many of which are visible under a pocket-lens. These procts frequently appear to be collected into irregular, sieve-like areas. The outer surface bears the still more minute inhalant pores, visible only under the microscope. The two specimens are nearly of the same size; the larger measures about 280 mm. in greatest horizontal diameter and 170 mm. in height. The lamella, apart from the stalk, averages 10 mm. in thickness. The texture in spirit is firm, hardly compressible, and compact, but brittle. The colour is now green, owing to the action of copper from the vessel in which the specimens were preserved.

The inhalant pores, averaging about 0.05 mm. in diameter, are thickly scattered over the outer surface, and lead by means of chones through the thin, fibrous cortical layer and between the cladi of the triænes, into irregular subcortical crypts, from which the principal inhalant canals run in at right angles to the surface. The flagellate chambers are small and probably aphodal or diplodal. The principal exhalant canals run to the inner surface, where they open by means of the minute procts already mentioned, the latter varying up to about 0.17 mm. in diameter and being arranged in small groups over the ends of exhalant chones. Between the latter and the ends of the main exhalant canals is interposed a system of subcortical canals running parallel to the surface.

The preservation of the material is not sufficiently good to allow of a satisfactory description of histological details, but the following points may be observed. There is a large amount of collenchymatous tissue around the larger canals (both inhalant and exhalant), which are provided with diaphragms at frequent intervals. Beneath the thin, fibrous cortex of the inner surface there is, at any rate in places, a great thickness of apparently cystenchymatous tissue, the cells of which (thesocytes?) contain numerous minute brown granules. There are also numerous masses, about 0.016 mm. in diameter, of coarser and more darkly coloured, brown pigment granules, probably of the same nature as the foregoing, but scattered most abundantly beneath the margin of the sponge, and more conspicuous beneath the outer than beneath the inner surface. The presence of all this pigment leads one to conclude that the sponge was probably brown in life, but it is almost absent from the deeper parts of the interior.

* It is, however, conceivably due to local conditions, such as currents.

The arrangement of the skeleton presents no distinctive features. From this point of view the thickness of the sponge-lamella may be divided into outer, middle, and inner zones. The outer zone occupies about one-third of the total thickness, the middle zone rather more than one-third, and the inner zone about one-fourth. In the middle zone the skeleton consists of a loose and confused interlacement of stout oxea. In the outer zone it consists almost entirely of stout, radially arranged plagiotriænes, with their cladi extended in the thin, fibrous cortex. These spicules exhibit but slight indications of arrangement in bundles, and only a few large oxea are associated with them. There are also a few long, slender anatriænes, whose cladi may project beyond the surface, and a few short, hair-like oxea, arranged radially at and beneath the surface. The arrangement in the inner zone is essentially similar to that in the outer, but the bundles formed by the shafts of the plagiotriænes are more distinct and are continued inwards by the associated oxea.

Spicules:—(1) Plagiotriænes (Pl. VIII, fig. 2); large and stout, with gradually tapering and fairly sharply pointed shaft (occasionally rounded off broadly at the end); cladi conical, fairly sharply pointed, slightly reflexed towards the tips; rarely bifurcating close to the tip. Shaft about 1.9 by 0.051 mm., with cladi about 0.27 by 0.043 mm.

(2) Anatriænes (fig. 1); with long, slender shaft, tapering to a very fine point, and short, gently recurved, sharp, hook-shaped cladi. Shaft about 2.5 by 0.01 mm., cladome about 0.037 mm. across.

(3) Oxea (fig. 3); large, stout, gradually sharp-pointed, more or less curved, sometimes almost angulated in the middle; about 2.4 by 0.068 mm. These spicules are occasionally modified into stylote (fig. 4) or even strongylote (fig. 5) types.

(4) Oxea; short, very slender, hair-like; about 0.16 by 0.0013 mm. Arranged radially near the surface.

(5) Tylasters (fig. 7); with from about 4 to about 8 slender, minutely capitate rays, perhaps slightly roughened. Total diameter about 0.015 mm. Numerous, but unequally distributed through the sponge.

(6) Microrhabds (fig. 6); short, stout or slender, minutely roughened; may be slightly centrotylote. The stouter ones about 0.01 by 0.003 mm. Mostly collected in a thin layer on each surface, but also fairly abundantly scattered in parts of the interior.

This is a perfectly typical *Ancorina*, at any rate as regards spiculation. It evidently comes near to *Stelletta lobata*, Kieschnick [1898], from Amboyna.

Register Nos., Locality, &c.—XXXII. 6, 8, 12, 13; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

15. *Ancorina osculifera*, n. sp.

The single specimen forms a triangular fragment about 120 mm. in height and up to 40 mm. in thickness. Two sides of the triangle are formed by broken surfaces,

the third is the natural margin, broadly rounded and bearing numerous vents irregularly scattered over it, not in single series. These vents range in diameter from less than 1 mm. to about 4 mm., and form the terminations of vertical oscular tubes. Both surfaces of the sponge are smooth but rather uneven, and in spirit subglabrous, except where worn, and both are thickly beset with minute pore-sieves overlying small inhalant chones. The texture is hard, compact, and little compressible. The colour now is green throughout, owing to copper staining. Sections show an abundance of brown pigment in the more superficial parts of the sponge.

The skeleton is arranged as in *Ancorina alata*, but the radial bundles of plagiatriænes and stout oxea have associated with them numerous very long and slender oxea, which seem to take the place of the anatriænes of the former species, while anatriænes appear to be entirely wanting.

Spicules:—(1) Plagiatriænes; large and stout, with gradually tapering and fairly sharply pointed shaft (occasionally rounded off broadly at the end); cladi conical, fairly sharply pointed, slightly reflexed towards the tips; shaft measured up to 3.23 by 0.051 mm., but this is exceptionally long; a more ordinary size is about 2.7 by 0.055 mm., with cladi about 0.255 by 0.051 mm.

(2) Oxea; large, stout, gradually sharp-pointed, more or less curved, sometimes almost angulated in the middle; about 2.65 by 0.06 mm. May become stylote or even strongylote by rounding off of one or both ends.

(3) Oxea; long, very slender, almost cylindrical, but gradually and finely pointed at each end, straight, or nearly so; about 3.9 by 0.0127 mm.

(4) Oxea; short and very slender, hair-like; about 0.24 by 0.002 mm. (arranged radially near the surface).

(5) Tylasters; with slender, minutely capitate rays, up to about eight in number. Total diameter about 0.0082 mm.

(6) Microrhabds; short, stout or slender, minutely roughened, may be slightly fusiform, with blunt ends. The stouter ones about 0.008 by 0.0027 mm.

In most respects this sponge so closely resembles *Ancorina alata*, described above, from the same locality, that I at first regarded it as a mere variety of that species, distinguished by the arrangement of the vents. On discovering, however, that there were no anatriænes, and that the place of these was taken by the very characteristic long, slender oxea, I came to the conclusion that it was necessary to propose a new species. The smaller size of the microscleres is also, perhaps, characteristic, but, with the exception of the points mentioned, the spiculation so closely resembles that of *A. alata* that I have not thought it necessary to give any figures.

Register No., Locality, &c.—XXXII. 10; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

16. *Ancorina novæ-zealandiæ*, n. sp. (Pl. VIII, figs. 8–15 b.)

The single specimen is massive, irregular, tuberous, with (to the naked eye)

minutely roughened rather than hispid surface. The surface is almost everywhere intact, and very clean, and the sponge appears to have lain free on the sea-bottom. There are no visible vents. The texture is hard and compact and the colour in spirit white. The maximum diameter is about 118 mm.

Paraffin sections show numerous multisphinctrate canals running in at right angles from small, single apertures thickly scattered over the surface. These canals seem to increase greatly in diameter as they pass inwards. It is impossible to say whether they are exhalant or inhalant.

The ectosome is rather thin and very ill-defined, with only a moderate amount of fibrous tissue. In the choanosome the flagellate chambers are restricted to relatively small "islands," separated by large areas of gelatinous tissue containing an immense number of large oval cells with very small nuclei, and often highly granular cell-contents. These I take to be storage cells or "thesocytes."

The skeleton arrangement is typical. Bundles of large oxea, mingled with triænes, radiate outwards from the interior of the sponge and spread out in brushes as they approach the surface. At the surface there is a layer of small, slender oxea radially arranged and projecting beyond the surface so as to give it a densely but shortly hispid character. In the "pile" thus formed are included the projecting ends of large oxea, plagiotriænes, anatriænes and mesotriænes. At and below the actual surface is a dense crust of microrhabds, about 0.085 mm. thick.

Spicules:—(1) Plagiotriænes (Pl. VIII, fig. 12); with long, stout shaft, straight, or nearly so, and tapering gradually to the apex, which is rather abruptly pointed; with short, stout, conical, unbranched cladi,* only slightly recurved towards the apex; shaft up to about 4.0 by 0.093 mm., with cladi 0.22 by 0.068 mm.

(2) Anatriænes (fig. 11); with long, straight, slender shaft, tapering gradually to a fine point, and very strongly recurved, gradually sharp-pointed cladi; shaft up to about 4.5 by 0.025 mm., with cladi 0.12 by 0.017 mm.

(3) Promesotriænes (plagiomesotriænes) (figs. 10–10 *d*); with three wide-spread cladi turned forwards towards the tips and a fourth ray, shorter than the cladi, which appears as a forward prolongation of the shaft. The cladi are frequently unequal in length and taper gradually to more or less sharply pointed apices. The fourth ray is usually less sharply pointed. Sometimes only two cladi are developed (promesodiænes, fig. 10 *b*). In one specimen I have seen four (promesotetræne, fig. 10 *c*), and in another, the fourth ray, which appears as a prolongation of the shaft, is slightly bifid at the extremity (fig. 10 *d*), the axial canal following the bifurcation. The dimensions of these spicules are about the same as those of the anatriænes and their cladomes occur along with those of the latter in the surface pile, but less abundantly. They are fairly numerous in boiled out preparations and certainly a normal constituent of the spiculation. The inconstancy in the number of the cladi leads me to believe that the promesotriæne owes its origin to meristic variation in the number of primary

* Very rarely one cladus is bifurcate near the tip.

rays of the tetract spicule; one, and usually the only, additional ray being placed in the same straight line as the shaft.

(4) Oxea (fig. 9); long and stout, subfusiform; slightly curved; fairly gradually and sharply pointed at each end; measuring up to about 4.1 by 0.076 mm.; sometimes shorter and stouter.

(5) Oxea (fig. 8); relatively short, slender, fusiform, straight, finely pointed at each end; about 1.2 by 0.017 mm. These are the ectosomal oxea.

(6) Tylasters (fig. 13); with about seven long, slender rays, each ending in a small but distinct knob; without distinct centrum; total diameter up to about 0.01 mm.

(7) Tylospherasters (fig. 14); with large centrum and numerous short, cylindrical rays, each ending in a small knob; total diameter about 0.006 mm.

(8) Microrhabds (figs. 15-15*b*); cylindrical or fusiform, with broadly rounded ends; sometimes centrotylote or irregularly annulate; surface otherwise smooth; about 0.009 by 0.003 mm. Sometimes these spicules show a distinct axial rod, visible both in longitudinal and transverse optical section (figs. 15*a* and 15*b*).

There can be no doubt about the close relationship of this sponge to Bowerbank's *Ancorina* (*Ecionemia*) *acervus* [1873 B], which came from Fiji. The spicule categories, with the exception of the promesotriænes, are identical, and the spicules themselves exhibit only minute differences in form. Judging from Bowerbank's description and figures these differences are as follows:—(1) The cladi of the large triænes in his sponge are decidedly longer and more recurved, so that the spicule is an ortho- rather than a plagio-triæne; (2) the rays of the asters are not tylote (but the two kinds of aster are clearly distinguished); (3) the microrhabds are "tuberculated." Bowerbank calls attention to the fact that his sponge exhibits "very nearly the extremes in magnitude of the spicula," referring to the enormous difference in size between the megascleres, which are unusually large, and the microscleres, which are unusually minute. The same holds good with the New Zealand species.

The presence of the promesotriænes serves to distinguish *Ancorina novæ-zealandiæ*, not only from *A. acervus*, but, so far as I am aware, from every other known species of Stellettidæ. This very unusual type of spicule is known, however, in several species of *Geodia*.

Register No., Locality, &c.—X; Station 90, S.W. of Three Kings Islands, New Zealand, 100 fathoms.

17. *Penares tylostaster*, n. sp. (Pl. VII, figs. 16-19.)

The single specimen is massive, with a very irregular, nodular and corrugated surface. A good deal of coarse calcareous débris is included in the sponge, which seems to have lain freely on the sea-bottom. A few conspicuous vents, whose sharp margins lie flush with the general surface, are scattered singly in more or less prominent situations. These vents are subcircular in outline and range up to 3 or 4 mm. in

diameter. They are the openings of well-defined exhalant canals, converging towards them from deep down in the interior of the sponge. The surface (in spirit) is subglabrous, not at all hispid, and distinctly porous in many places. The colour is pale yellowish grey throughout. The texture is firm and rigid. The specimen measures about 75 mm. in maximum horizontal diameter by about 40 mm. in maximum thickness.

Surface sections show the dermal pores to be thickly and evenly distributed all over, and spaced at fairly regular intervals. Each one is circular in outline and about 0.15 mm. in diameter when fully open. There is an ill-defined, collenchymatous cortex about 0.14 mm. thick, densely charged with the characteristic cortical oxea ("microxea"). Beneath this lie large subcortical crypts, into which the dermal pores open directly after penetrating the cortex separately as short cylindrical canals, apparently without sphincters. There may be many such pores in the roof of one of the larger subcortical crypts. In other places the crypts appear to be quite small, possibly with only a single pore opening into each. The flagellate chambers are spherical, and about 0.02 mm. in diameter, with short, wide exhalant canaliculi.

The main skeleton, in the interior of the sponge, is a confused reticulation of large oxea, with a slight tendency to collect into loose bundles radiating towards the surface. Immediately beneath the cortex lie the cladomes of a single layer of dichotriænes, whose rather short shafts are directed contripetally. Outside these comes the cortical skeleton, composed of "microxea" interwoven tangentially in a dense feltwork interrupted only by the dermal pores.

Spicules :—(1) Dichotriænes (Pl. VII, fig. 16); stout, with rather short shaft, tapering gradually to a fairly sharp point; cladi outspread at right angles to shaft, point of bifurcation usually about the middle; secondary cladi conical, fairly sharply pointed, may be irregularly bent and (or) irregularly subdivided towards the apex. In an average specimen the shaft measures about 0.6 by 0.06 mm., with cladome about 0.6 mm. across and primary cladi about as thick as the shaft.

(2) Large oxea (fig. 17); fusiform, slightly curved, gradually and fairly sharply pointed at each end; measuring up to about 1.4 by 0.04 mm., but usually rather less.

(3) "Microxea" (figs. 18, 18a); ranging in size from about 0.034 by 0.004 mm. to about 0.34 by 0.017 mm. The smallest slightly curved, sausage-shaped, bluntly ended, and slightly centrotylote. The largest curved, fusiform, sharply and gradually pointed at each end. Often, instead of being simply curved, the spicule is twice angulated in the same direction. All gradations occur between the extremes, as regards both size and form. These spicules are almost entirely confined to the cortex.

(4) Tylasters (fig. 19); with about ten very slender rays, distinctly tylote, and either a small centrum or none at all. Total diameter about 0.008 to 0.012 mm. These minute asters are very abundant in the walls of the larger canals.

This is a very well-characterised species and forms a notable addition to the few species of *Penares* already described. It is obviously closely related to some

of Mr. Carter's Australian species of "*Stellettinopsis*," viz. *S. coriacea* [1885-6], *S. purpurea* [1886], and *S. lutea* [1886], which have a dermal layer of small oxea and minute, very slender-rayed tylasters, and are apparently epipolamid (lipotriænose) species of *Penares*, possibly all specifically identical.

Register No., Locality, &c. XXVII; 7 miles E. of North Cape, New Zealand, 70 fathoms.

18. *Jaspis novæ-zealandiæ*, n. sp. (Plate VII, figs. 20-23.)

Sponge very irregular in form; flattened, plate-like. The type-specimen (R. N. XXX. 1) forms a strongly curved, slightly fenestrated plate, with a tendency to grow out into short digitiform processes round the margin. There is no distinct evidence as to the mode of attachment. The general surface is coarsely granular and may be roughened by the slight projection of the large oxea. In some places, however, there is a separable, but closely adherent, smooth dermal membrane, bearing quite small, sphinctrate vents. The texture is firm and compact, the colour in spirit pale greyish yellow. This specimen measures about 81 mm. in maximum breadth and the thickness averages about 13 mm.

Two other fragments (R. N. L. 3 and L. 6), possibly of one specimen, came from a different station and differ from the type in their dark blackish grey colour. The small, sphinctrate vents, grouped in concave parts of the surface, are very distinct.

There is no distinct cortex, and the boundary between ectosome and choanosome cannot be made out even in stained preparations.

The main skeleton is a confused reticulation of large, stout oxea, extending right up to the surface, where there is a dermal, or better, subdermal crust of spherasters, varying greatly in thickness and density.

Spicules:—(1) Oxea (Pl. VII, fig. 20); fusiform, rather strongly curved, very stout, tapering gradually and symmetrically to a fairly sharp point at each end; size about 2.0 by 0.1 mm.

(2) Spherasters (fig. 21); with well-developed centrum and about a dozen short, stout, conical rays, often slightly roughened; total diameter about 0.016 mm. Characteristic of the dermal crust, decreasing to a minimum in the deeper parts of the sponge.

(3) Oxyasters (fig. 22); with few, long, slender, sharply pointed, slightly roughened rays and little or no centrum; total diameter about 0.032 mm. Characteristic of the interior.

(4) Small spherasters (fig. 23); with small centrum and about a dozen (or perhaps more) short, slender, cylindrical rays; total diameter about 0.012 mm. Characteristic of the zone beneath the dermal crust and in the sphincter membranes of the vents. Not very numerous, possibly young forms of (2).

In the possession of well-distinguished spherasters and oxyasters this species

resembles *Jaspis (Dorypleres) dendyi*, Sollas [1888] and *Jaspis (Coppatias) distinctus*, Thiele [1900], but appears to be quite distinct from both.

Register Nos., Localities, &c.—XXX. 1, Station 144, near Cape Maria van Diemen, 35–40 fathoms; L. 3, 6, Station 134, Spirits Bay, near North Cape, 11–20 fathoms. New Zealand.

19. *Asteropus simplex* (Carter).

Stellettinopsis simplex, Carter [1879, 1885–6]; *Asteropus simplex*, Sollas [1888]; *Asteropus haeckeli*, Dendy [1905]; *Asteropus simplex*, Hentschel [1909]; *Asteropus simplex*, Dendy [1916 A, B].

There is one specimen of this variable and widely distributed species in the collection, which presents some features of interest. It consists of two stout, digitiform processes, united below and torn off from the base. The larger of the two attains a height of 105 mm. and a maximum diameter of 46 mm. The smaller is about half as high. Both are somewhat compressed, and the breadth of the entire specimen below their junction is about 52 mm. The oscula are rather small and mostly situate about the two apices of the sponge. With the exception of a larger or smaller area at each apex, including the vents, and a very small area including a single vent on one side, the entire surface is encrusted with *Desmacella vestibularis*. Where exposed the surface is dark brown in colour, slightly and minutely conulose, and glabrous; covered by a distinct, thin, dermal membrane perforated by numerous scattered inhalant pores.

There is a strongly developed ectosome, about 1 mm. or more in thickness, mostly non-fibrous, but with a slight admixture of fibrous tissue. Scattered throughout the ectosome are very numerous large, oval, vesicular cells containing a dark brown pigment in the form of very well-defined, coarse granules, subspherical in shape. The cells themselves measure about 0.44 mm. in longer diameter and the granules about 0.004 mm. In addition to these pigment-containing cells there are even more numerous cystenchyme cells of about the same shape and size, with faintly staining, reticulate and finely granular contents, and very small, darkly staining nucleus, suspended in the middle of the cytoplasmic network. The pigment cells appear to be merely cystenchyme cells in which pigment granules have made their appearance. The entire ectosome should perhaps be described as cystenchymatous rather than collenchymatous.

The skeleton is a confused reticulation of large oxea, continued into the *Desmacella* layer.

Spicules:—(1) Large, stout, fusiform, slightly curved oxea; about 2.5 by 0.068 mm.

(2) Oxyasters; with comparatively few, long, slender, sharply pointed rays, very slightly roughened, and no centrum; total diameter about 0.04 mm.; or with more numerous and shorter rays and perhaps a small centrum. Very numerous in the choanosome.

(3) Sanidasters ; about 0.02 mm. long ; very numerous in the dermal membrane.

In boiled out preparations of the spicules I have found a very few triænes and triæne-derivatives, viz. one plagiotriæne, one mesotriæne and one curious hexact form. All these seem to belong to the sponge, but they cannot be regarded as normal constituents of the spiculation. I regard them merely as vestigial occurrences pointing to the derivation of the species from some triæne-bearing ancestor. It will be remembered that Sollas [1888, p. 201] records the occurrence of triænes, overlooked by Carter, in *Stellettinopsis (Algol) corticata*. The problem of the generic nomenclature of these species is very difficult. They seem undoubtedly to be reduced Ancorinas and might perhaps be included in that genus.

Hentschel [1909] notes that some of his specimens of this sponge from S.W. Australia were completely covered, except in the neighbourhood of the vents, with crusts of *Hymedesmia lophastræa*, which seems to play exactly the same part as the *Desmacella* in the New Zealand specimen. Hentschel suggests the possibility of a regular "Symbiosis" between the two sponges ; "Commensalism" would probably be a better term (*vide* under *Desmacella vestibularis*).

Previously known Distribution.—South-West Australia (Carter, Hentschel) ; Victoria, Australia (Carter) ; Indian Ocean (Ceylon, Okhamandal, Cargados Carajos) (Dendy) ; Hayti (Carter).

Register No., Locality, &c.—XXXII. 11 ; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

20. *Spongosorites novæ-zealandiæ*, n. sp.

There are in the collection two specimens of this species, closely resembling one another. Each is, on the whole, cylindrical in form, with a curious rolled appearance, and is penetrated by one or more longitudinal canals, about 3 mm. in diameter. These canals open terminally, on the truncated end of the sponge, and they lie for the most part just beneath the surface, where their course is marked by shallow grooves. Other grooves, ramifying on the surface, correspond to subsidiary canals. One of the two specimens is fenestrated, as if a branch had been given off and then joined up again, and it seems quite possible that the main longitudinal canals are formed by a process of folding or overgrowth. The surface is almost smooth, but in places where it has been protected from friction it tends to become hispid. One specimen measures 52 mm. in length by 17 mm. in maximum diameter. The other is shorter and thicker, about 20 mm. in diameter. The colour in spirit is light yellowish grey ; the texture hard, compact, and almost incompressible. The specimens appear to have lain freely on the sea-bottom.

The main skeleton is composed of large and small oxea densely felted together. A great many of the large ones are arranged radially, in thick, irregular bundles which terminate at the surface, where their ends are broken off short. Between these bundles is a compact feltwork of both large and small spicules. At the surface

the small oxea are so densely aggregated as to form a spicular cortex about 0.5 mm. thick, in which the spicules have no definite orientation. This cortex, in tangential section, is seen to be pierced by small, round, inhalant apertures, about 0.17 mm. in diameter, arranged in very irregular groups. Vertical sections show that each aperture leads into a narrow chone, which penetrates the cortex and opens into a large subcortical crypt. From these crypts rather wide, radially arranged, inhalant canals extend inwards for a long distance, giving off numerous much smaller branches. It is impossible to make out anything with regard to the form or arrangement of the flagellate chambers. The radial inhalant canals are surrounded by a rather thick layer of collenchyma. There is no fibrous tissue in the cortex.

Spicules:—(1) Large, stout oxea; slightly curved or angulate, occasionally biangulate; gradually, and usually sharply, pointed at each end, rarely blunted at one or both ends. Size variable, up to about 1.6 by 0.048 mm.

(2) Small oxea; similar to (1) but very much smaller and with very few intermediates; size about 0.24 by 0.01 mm.

(3) Very long, slender oxea; slightly bent or crooked; gradually and finely pointed at each end; size about 1.9 by 0.01 mm. These spicules are very much rarer than either of the above, but they seem to be quite characteristic.

This species appears to be quite distinct from any previously referred to the genus *Spongosorites*. Its characters seem to me rather to support Topsent's view [1900] as to the relationship of the genus to the so-called family *Coppatiidæ*. I therefore include it amongst the *Stellettids*.

Register No., Locality, &c.—LIII. *a, b*; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

FAMILY GEODIIDÆ.

21. *Geodia regina*, n. sp. (Pl. V, fig. 5; Pl. VIII, figs. 16–22.)

The single specimen (Pl. V, fig. 5) is cup-shaped, but with a very shallow cavity and very broadly rounded margin. It is attached below and on one side to a number of large rock or shell fragments, and bears rather a striking general resemblance to *Stelletta crater* from the same locality. The total height is about 112 mm., and the maximum transverse diameter is about the same, while the depth of the cup-shaped oscular depression is about 20 mm. The surface is smooth and, wherever uninjured, is covered with a finely porous membrane, except, perhaps, round the margin of the cup, between the inhalant and exhalant areas. Where this membrane is rubbed off from the outer surface the inhalant chones are exposed, piercing the cortex, and arranged at very regular intervals of about 2 mm. Removal of the pore-bearing membrane from the cup-shaped depression reveals a similar state of things with regard to the exhalant chones. The texture is hard and incompressible, and the colour in spirit is green owing to the action of the copper of the tank in which the specimen was preserved.

There is, over both inhalant and exhalant areas, a thick cortex (ectosome), differentiated into two chief layers, outer and inner, distinguished from one another by the presence or absence of sterrasters, which are confined to the inner layer. The outer layer is about 0.5 mm. thick, and consists of a gelatinous ground-substance more or less densely charged with subspherical or oval cells, each about 0.024 mm. in diameter, filled with darkly staining, coarsely granular contents. They are probably storage cells or thesocytes. This layer is limited at the surface by the thin, pore-bearing dermal membrane. The inner layer is about 1.7 mm. in thickness (rather thicker over the exhalant area). It is fibrous and densely charged with sterrasters, held together by radially arranged fibres of connective tissue in the well-known fashion. Its deeper part contains the very thick, very densely fibrous sphincters of the chones, inhalant or exhalant.

The inhalant pores, about 0.07 mm. in diameter, are thickly scattered over the outer surface of the sponge, reducing the dermal membrane to a sieve-like net. They lead into irregular subdermal cavities and then wider canals, which unite together to form the great inhalant chones penetrating the layer of sterrasters. These chones, and also the canals in the outer layer of the cortex, are provided with numerous thin, annular diaphragms arranged at frequent intervals. The main sphincters are very strongly developed, 0.5 mm. or more in thickness in the contracted state. They lie in the inner portion of the sterraster layer and form mammiform projections on the roofs of the large subcortical crypts. The latter run radially inwards and give off numerous much narrower, cylindrical, inhalant canals, which ramify through the choanosome. The subcortical crypts and inhalant canals are again abundantly provided with thin, annular diaphragms. The chamber-system is aphodal, with very long excurrent and very short (if any) incurrent canaliculi. The chambers themselves are approximately spherical, about 0.028 mm. in diameter.

The ground-substance between the chambers is finely granular, but around some of the larger canals there is a thick layer of collenchyma.

The exhalant canal-system closely repeats the characters of the inhalant, especially as regards the chones, external cortical canals, and subdermal cavities. The pore-bearing dermal membrane is, however, more delicate, the exhalant pores being larger than the inhalant (about 0.14 mm. in diameter) and the intervening strands of tissue narrower. The sphincters which separate the exhalant chones from the large subcortical crypts resemble exactly those of the inhalant chones.

The arrangement of the skeleton is very typical. In the choanosome are found the usual loose bundles of large oxea, running towards the surface. As they approach the cortex the oxea are replaced by loose brushes of large dichotriænes, whose shafts penetrate the layer of sterrasters, while their cladi are extended in the outer layer of the cortex, beneath the dermal membrane.

The stout shafts of the dichotriænes are often closely accompanied by the very much more slender shafts of protriænes, whose cladi also lie in the outer layer of

the cortex. This layer also contains very numerous short oxea, arranged in close-set radial brushes beneath the surface, with their outer ends projecting very slightly beyond the dermal membrane, while their inner ends reach only about half-way from the surface towards the layer of sterrasters.

Amongst these oxea, at any rate over the outer (inhalant) surface, are found a few very minute anatriænes. Larger anatriænes have been found, accompanying the dico- and pro-triænes, in the oscular area only.

The dermal membrane and the outer layer of the cortex are densely charged with minute spherasters. Similar minute spherasters are abundantly scattered through the choanosome, together with a much smaller number of relatively large oxyspherasters.

Spicules:—(1) Large, stout dichotriænes (Pl. VIII, fig. 20); shaft somewhat constricted just beneath cladome, tapering very gradually to a rather blunt apex, measuring about 4.6 by 0.1 mm.; cladi stout, with secondaries two or three times as long as primaries, gradually and fairly sharply pointed; total width of cladome about 0.85 mm.

(2) Protriænes (figs. 17–17 *d*); with very long and slender shaft and short, sharply-pointed cladi varying in number. Sometimes the shaft is prolonged to form an additional actine (promesotriæne, fig. 17 *d*). In a fairly well-developed specimen the shaft measures about 4.1 by 0.017 mm. and the cladi about 0.051 by 0.008 mm. In another, in which the cladome is represented only by a single true cladus and a short prolongation of the shaft, the shaft measures about 5.8 by 0.025 mm.; the single cladus about 0.068 by 0.011 mm. and the prolongation of the shaft about 0.051 by 0.008 mm.

(3) Anatriænes (fig. 18); with very long, slender shaft and short, strongly recurved, sharp-pointed cladi. In a typical specimen the shaft measured about 8.0 by 0.02 mm. and the cladi about 0.051 by 0.017 mm. In this specimen the shaft tapered very gradually to a narrow, rounded apex; in another example it was somewhat shorter and terminated, without much diminution, in a distinct knob.

(4) Cortical anatriænes; very minute, with hair-like shaft about 0.4 by 0.004 mm. and cladi similar to those of the larger anatriænes, but only about 0.006 mm. long. Rare, found *in situ* amongst the cortical oxea. Cladome sometimes reduced.

(5) Cortical oxea (fig. 19); short, fusiform, gradually and sharply pointed; measuring about 0.24 by 0.012 mm.

(6) Large oxea (fig. 16); only moderately stout, fusiform, tapering very gradually to a moderately sharp or blunted point at each end, slightly curved; a typical example measures about 4.25 by 0.06 mm.

(7) Sterrasters; perfectly typical, slightly elongated and slightly flattened, with the hilum in the middle of one of the flattened sides; measuring about 0.187 mm. in length by 0.153 mm. in greater transverse diameter.

(8) Oxyspherasters (fig. 21); with large centrum, sometimes very distinct, and numerous rather short, stout, sharply pointed, conical rays, which may be more or less roughened; total diameter when fully grown about 0.048 mm.; much smaller forms, with very slender rays, probably young, also occur.

(9) Minute spherasters (fig. 22); with very short, cylindrical, truncate rays, which may be reduced to mere knobs; total diameter about 0.004 mm.

Register No., Locality, &c.—XXXII. 3; 7 miles E. of North Cape, New Zealand, 70 fathoms.

22. *Geodia rex*, n. sp. (Pl. VI, fig. 4; Pl. VIII, figs. 23–28.)

Sponge (Pl. VI, fig. 4) cup-shaped, but with shallow cavity and broadly rounded margin; attached irregularly to rock-fragments. Resembling in general features *Geodia regina*, but more turbinate and much larger. The larger of the two specimens is about 190 mm. in height, with a maximum diameter across the top of 255 mm., the greatest depth of the cavity, which is very irregular, being about 50 mm. The smaller one is not very much less. The greater part of the surface is fairly smooth and not hispid, but in the larger specimen there are several patches of thick fur, formed by the projection of long spicules, as shown in the figure. Both specimens have been dried, and are now of a light brown colour, and very hard and incompressible owing to the very strongly developed cortex. Internally the sponge is of a much darker brown colour and very cavernous, owing chiefly to the drying up of the mesogloea.

Although it is not possible to make out details of the anatomy it is evident that the canal-system is arranged as in *Geodia regina*, both surfaces being covered with a thin, pore-bearing dermal membrane. Beneath this lies the very strongly developed cortex, in which the layer of sterrasters is about 6 mm. thick, while the outer layer, containing the cladomes of the orthotriænes, is hardly distinguishable in the dry material.

The skeleton arrangement is typical. When the sponge is sawn across the usual loose bundles of large oxea are seen radiating outwards at right angles to the surface and connected at frequent intervals by transverse spicules or spicule-bundles, or by spicules quite irregularly arranged. The outer ends of the radiating bundles pierce the layer of sterrasters and the cladomes of the orthotriænes are extended beneath the dermal membrane. The radiating brushes of small oxea in the outer layer of the cortex are very well developed.

The following account of the spiculation is taken from the smaller of the two specimens (R. N. XXXIII. 8).

Spicules:—(1) Orthotriænes (Pl. VIII, fig. 23); shaft long and comparatively slender, tapering gradually to a bluntly rounded apex; cladi well developed, straight or slightly curved, tapering gradually to blunt apices, apparently never bifurcating. In a typical example the shaft measures about 10.0 by 0.1 mm., with cladi 0.63 by

0.085 mm. (A note by Mr. Row records an orthotriæne 20.5 mm. in length, but I cannot confirm this.)

(2) Anatriænes (fig. 25); with very long, slender shaft, tapering very gradually to a more or less blunted apex and sinuous in boiled out preparations, and strongly recurved, sharply conical cladi. In a typical example the shaft measures about 17.0 mm. in length by 0.04 mm. at the thickest, with cladi about 0.14 mm. long. (A note by Mr. Row records an anatriæne up to 29 mm. in length, with the point broken off, but I cannot confirm this.)

(3) Cortical oxea; measuring about 0.6 by 0.017 mm.

(4) Large oxea (fig. 24); straight or nearly so; apparently never sharply pointed, and often so broadly rounded off at the ends as to become strongylote; tapering gradually from the middle to the extremities; a typical example measures about 9.3 by 0.093 mm.

(5) Sterrasters (fig. 26); very large, usually oval and somewhat flattened, with the hilum in the middle of one of the flattened surfaces; measuring about 0.48 mm. in length by 0.4 mm. in greater transverse diameter.

(6) Larger oxyspherasters (fig. 27); with more or less well-developed centrum and numerous slender rays tapering gradually to sharp points; smooth or nearly so; measuring up to 0.02 mm. in total diameter.

(7) Smaller oxyspherasters or oxyasters (fig. 28); with short rays which may be very slightly roughened, and may be blunted; total diameter about 0.01 mm.; characteristic of the dermal membrane.

This remarkable species bears a considerable resemblance to *Geodia regina*, but differs in several important respects, the chief of which is perhaps the replacement of the dichotriæne of the former by a simple orthotriæne. Apparently, also, there are no protriænes and no small, cortical anatriænes, but this is a difference upon which it would not be wise to insist, as such spicules may be found later on in more favourable material. The sterrasters are more than twice as long and as broad as in *G. regina* and are perhaps the largest known, and the size of the sponge and thickness of the cortex are very remarkable.

Geodia rex is perhaps more closely related to *G. (Cydonium) japonica*, Sollas [1888], re-described, with good illustrations, by Thiele [1898]. It differs, however, in important particulars, especially in the enormous size of the large oxea, the orthotriænes, and the sterrasters, although some of the specimens of *Geodia japonica* seem to have been at least as large as ours of *G. rex*. There also seem to be considerable differences in the smaller asters, and the cortex of *G. rex* appears to be nearly eight times as thick as that of *G. japonica*, in which also the outer surface is characteristically nodulated.

Register Nos., Locality, &c.—XXXIII. 4, 8; off Three Kings Islands (or off North Cape?), N. of New Zealand.

Genus GEODINELLA, Lendenfeld [1903].

Geodiidæ with a cortical layer of sterrasters, but with the cladi of the triænes more or less reduced to vestiges, or even absent, so that the triæne may become a style.

Lendenfeld's original diagnosis mainly emphasises the fact that the triænes lie in the interior, arranged in longitudinal bundles and forming an axial skeleton. There is no such axial skeleton in the species described below, and the chief distinguishing feature of the genus seems to be the reduction of the triænes; this is recognised by Lendenfeld in the new diagnosis given in the "Albatross" Report [1910].

So far as I am aware only two other species of *Geodinella* have been described, viz. Thiele's *G. cylindrica* [1898] from Japan, and Lendenfeld's *G. robusta* [1910] from the north-eastern Pacific (west coast of North America). All three species agree in the curious reduction of the cladomes of the triænes and form an interesting parallel to the case of my *Stelletta vestigium* from Ceylon [Dendy, 1905].

It is a matter of considerable doubt whether or not such a character should be regarded as of generic significance, but the existence of three species all sharing this peculiarity renders it convenient to retain the genus for the present.

23. *Geodinella vestigifera*, n. sp. (Pl. VIII, figs. 29-37.)

The single specimen is irregularly tuberous, broken off at one end; now about 40 mm. long by 20 mm. in maximum diameter. It has evidently been attached below to some foreign object. The surface is smooth, without any hispidation, but is partially encrusted by foreign growths. A few minute apertures, about 0.5 mm. in diameter, are scattered singly, here and there. Though very small, these are very well defined, and probably represent the openings of exhalant chones. The upper surface is light brown, shading to pale yellow below. The texture is hard and incompressible, owing to the very strongly developed cortex.

So far as can be made out, the canal-system is typical, with finely granular mesogloea between the chambers.

The entire cortex is occupied by the layer of sterrasters, about 0.85 mm. thick, covered over only by a thin dermal membrane charged with minute spherasters. The skeleton of the choanosome is extremely lax and confused, with a few very loose bands of megascleres running towards the cortex, but not penetrating it. There is no axial core of spicular fibre.

Spicules.—(1) Reduced triænes, for the most part represented by styli (figs. 29 and 29 a), with broadly rounded base usually directed outwards in the radial spicule-bundles, and tapering gradually from the base to the narrow apex, the extreme point of which, however, is usually rounded off. These spicules are usually slightly curved or bent, and a well-developed example measures about 1.4 by 0.025 mm. The triænal origin of these spicules is indicated (a) by their position and orientation

in the sponge, and (b) by the occasional (but rather rare) occurrence of a vestigial cladus on the base (figs. 30 and 30 a).

Certain abnormal forms (figs. 30, b-d), which look as if they had been produced by the grafting of one or more, usually long, rays on to the end of a style, are about as common as the reduced triænes. It is possible that we have here an illustration of the variability of vestigial structures, but the rays in question do not suggest vestiges so much as newly arisen monstrosities due to the activity of abnormally situated "initial cells."

A very few normal and well-developed anatriænes have been observed, of rather large size, these may be proper to the sponge or they may possibly be foreign.

(2) Long, slender oxea (fig. 33); tapering gradually to the two extremities; variously ended (gradually sharp-pointed, hastate, rounded off or irregular), measuring up to about 1.9 by 0.02 mm. Much more numerous than the styli.

(3) Gigantic, fusiform oxea (fig. 32); very stout, and tapering gradually to a sharp point at each end; measuring about 2.0 by 0.12 mm. Very scarce in comparison with the other megascleres, but probably normal; variously orientated in the choanosome.

(4) Short, curved oxea (fig. 31); fairly stout, gradually and fairly sharply pointed at each end; measuring about 0.48 by 0.017 mm.; scattered rather sparsely in the choanosome.

(5) Sterrasters; of quite ordinary form, elliptical and slightly flattened; measuring about 0.14 by 0.12 mm.

(6) Large oxyasters (fig. 34); with usually about nine rather slender rays, roughened distally, and no distinct centrum. Total diameter up to about 0.064 mm. The rays may be as few as five, and are usually more slender than represented in fig. 34. Found in the choanosome.

(7) Small oxyasters (fig. 35); with numerous smooth or nearly smooth rays; possibly young forms.

(8) Small strongylasters (fig. 36); with no distinct centrum and numerous slender, cylindrical, slightly roughened rays; total diameter up to about 0.024 mm. Choanosomal.

(9) Minute strongylospherasters (fig. 37); with large centrum and numerous short, blunt, cylindrical rays sharply differentiated from it; total diameter up to about 0.012 mm., often less. Thickly crowded in the dermal membrane.

Register No., Locality, &c.—L. 8; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

FAMILY CHONDROSIIDÆ.

24. *Chondrilla nucula*, O. Schmidt [1862].

A single specimen of this widely distributed and well-known species was collected on the shore between tide-marks at the Island of South Trinidad. It forms a flat

and rather thin crust, attached to rock, with small, scattered vents on the surface. The colour in spirit is pale yellowish brown. The spherasters are few, and up to about 0.028 mm. in diameter.

Previously known Distribution.—Almost cosmopolitan.

Register No., Locality, &c.—VIII; Island of South Trinidad, July 26th, 1910.

SUB-ORDER SIGMATOTETRAXONIDA.

FAMILY LITHISTIDÆ.

25. *Aciculites pulchra*, n. sp. (Pl. VI, figs. 1 and 1 a.)

There are in the collection two good specimens of this sponge in an excellent state of preservation. One of them (LVI. a) is complete, and consists of an ear-shaped lamella, slightly curved, and with broadly rounded margin. It has evidently been attached along one edge, which is very irregular, and to which numerous foreign bodies still adhere. The two surfaces are sharply differentiated, the one, which happens in this case to be convex, bears the numerous minute oscula; the other no doubt bears the much more numerous and more minute inhalant pores, which are apparently all closed. This specimen measures about 47 mm. in height, from the middle of the line of attachment to the margin, by about 69 mm. in breadth, along the line of attachment, and 11 mm. in thickness.

The second specimen is in two pieces (LVI. b, c). It is a good deal larger, but rather thinner and more fan-like in shape (Pl. VI, figs. 1 and 1 a). It measures about 118 mm. in breadth by 8 mm. in thickness, and 96 mm. in height, but the attachment is nearly all broken away. The lamella of which the sponge consists undulates somewhat, but on the whole the exhalant surface appears to be rather more concave than the inhalant. The numerous small vents are more or less stellate in appearance, and situate on very low protuberances. They are nearly all closed now by a thin, translucent membrane, which may be visibly perforated in the middle, and when this is removed a group of three or four minute apertures is revealed. The vents, or groups of vents, are separated by intervals of only about 2 mm. in width, in which can be seen a meandriform pattern caused by narrow, superficial, exhalant canals, ramifying beneath the thin dermal membrane. The inhalant surface (in this specimen only) shows rather faintly marked concentric furrows, evidently lines of growth. In this larger specimen narrow, meandering, superficial inhalant canals can be seen through the dermal membrane; they are hardly recognisable in the smaller one, which, except as indicated, agrees closely on both surfaces.

The colour in spirit is very light yellowish brown; the texture is compact and very stony.

The main skeleton is a very dense reticulation of monocrepid desmas, with a few scattered rhabdi (strongyla), for the most part radially arranged. The great majority of the rhabdi, however, form a dermal or subdermal skeleton, and the arrangement of this is very different on the two surfaces. On the inhalant surface

there are only radially arranged rhabdi with slightly projecting ends, springing from a well-defined layer of apparently young desmas, which are more slender and less complex in their branching than the deeper desmas. On the exhalant surface there is a layer of more or less closely interwoven rhabdi, arranged tangentially, and forming tent-like projections over the vents, as described by Sollas for *Aciculites higginsii*. Beneath this layer isolated young desmas are to be found, but there is no such definite reticulation of slenderer desmas as occurs beneath the inhalant surface. The layer of tangentially arranged rhabdi is continued over the broadly rounded margin, showing that this really belongs to the exhalant surface.

Spicules:—(1) Desmas; monorepid; much branched, and more or less richly tuberculated, especially at the ends, where they interlock; tubercles conical and rather sharp; maximum length in a straight line about 0.34 mm.

(2) Rhabdi; strongylote, slightly curved, approximately equal-ended, or with one end rather thicker than the other, or even slightly tylote; one or both ends may be minutely spined; length about 0.34 by 0.012 mm.

The spicules agree so closely with those of my *Aciculites orientalis*, figured in the Report on the Ceylon Sponges [1905], that it is unnecessary to give illustrations.

The New Zealand species differs from both *A. higginsii*, Schmidt [1879] (the type of the genus) and *A. orientalis*, Dendy [1905], which are probably specifically identical with one another, in its very definite and beautiful flabellate form.

Register Nos., Locality, &c.—LVI. a, b + c; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

GENUS LEPIDOSPONGIA, n. gen.

Sponge thinly encrusting. Desmas absent. Skeleton consisting of an upper and a lower layer of scale-like discotriænes or discs, with the choanosome between. Microrhabds present.

This remarkable genus evidently represents a reduction stage in the phylogeny of the Theonellidæ. However paradoxical it may seem to include a genus without desmas amongst the lithistid sponges, the relationship is quite obvious, and the case forms an interesting parallel to that of the lipotriænose Stellettidæ and the lipochelous Desmacidonidæ.

Topsent [1920] has shown that the larva of the curious boring sponge, *Alectona millari*, which in the adult condition possesses only pseudastrose microscleres and no megascleres, is provided with a cuirass of eight discotriænes symmetrically arranged and indistinguishable from those of *Discodermia*. There appears, therefore, to be no doubt of the theonellid ancestry of *Alectona*, and we have here a most beautiful instance of recapitulation. The new genus *Lepidospongia* may be regarded as representing an intermediate condition, in which the sponge has lost the desmas but still retains the discotriænes in the adult condition. It is interesting to observe how the reduction in spiculation is accompanied by change in habit, from the massive, through the thinly encrusting, to the boring condition. The genus *Cliona* appears to

have been similarly derived by change of habit from a spirastrelline ancestry, and its resemblance to *Alectona* seems to be due entirely to convergence.

Thoosa armata is another boring sponge which has been shown by Topsent [1903] to possess a cuirass of discs in the larval state, but the discs in this case appear to be monaxonid (probably diact), having a single straight axial canal; we have here very probably another case of convergence. All these cases seem to me to point to the polyphyletic origin of the boring sponges.

26. *Lepidospongia incrustans*, n. sp. (Pl. XIII, figs. 1-3.)

The sponge forms a thin crust spreading over the smooth but uneven surface of a small block of basalt, in company with numerous other organisms. It covers an irregular area, measuring about 19 by 10 mm., and has been partially rubbed off. As the specimen has been dried it is not possible to give a very satisfactory account of its structure, which would in any case be difficult owing to the thinly encrusting habit. The sponge consists now of two thin layers of overlapping, scale-like discs, separated (where intact) by an almost equally thin layer of dark brown, shrunken tissue. The lower layer of discs adheres closely to the surface of the stone, remaining behind when the upper layer has been rubbed off. The upper layer, forming the surface of the sponge, has a beautiful, silvery, scaly appearance under a pocket-lens, and is interrupted by fairly numerous minute apertures, each raised on a very slight, conical elevation.

There are no desmas, the skeleton consisting almost exclusively of the two layers of scale-like discs, or discotriænes; together with numerous microrhabds, congregated especially around the openings of the canal-system.

Spicules:—(1) Discotriænes (discs) (Pl. XIII, figs. 1 and 2). These are nearly all completely reduced to the thin, flat, disc-like cladome, without any trace of shaft; but a few still have a stout, well-developed shaft. The outline of the disc varies a good deal, but is seldom deeply indented, and may perhaps be described as approximately circular or oval. Some of the discs exhibit a reticulate sculpture, as shown in fig. 2, others appear to be perfectly smooth and structureless, showing no trace even of the axial canals. The diameter of the fully developed disc is about 0.25 mm.

(2) Microrhabds (fig. 3); fusiform, bluntly pointed, straight or slightly angulated in the middle, or slightly centrotylote; surface usually slightly roughened; size about 0.02 by 0.002 mm.

A few slender, rod-like megascleres, probably oxea or styli, are associated in a common bundle with each of the few remaining shafts of the discotriænes. The close association may be partly due to the drying of the sponge. In any case, these spicules can hardly be regarded as more than vestigial. They should be compared with the transient styles described by Topsent in the larva of *Alectona* [1920].

Register No., Locality, &c.—XXXV. m; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

FAMILY TETILLIDÆ.

27. *Craniella zetlandica* (Carter).

Tethya zetlandica, Carter [1872]; *Tethea simillima*, Bowerbank [1873 A]; *Tethya cranium*, var. 2, *zetlandica*, Norman [1882]; *Craniella Bowerbankii*, Sollas [1886]; *Craniella simillima*, Sollas [1888]; *Craniella zetlandica*, Sollas [1888]; *Tethyopsilla zetlandica*, Lendenfeld [1903]; *Craniella cranium, pars*, Topsent [1904]; *Tethyopsilla zetlandica*, Hentschel [1912]. (For other possible synonyms see Lendenfeld [1903].)

There is in the collection a single very typical example of this species. It is almost spherical in form, about 24 mm. in maximum diameter, and has a strongly hispid surface. There is a single small vent, situated on a slight conical projection. The colour in spirit is dirty white. I follow Carter, Sollas and Lendenfeld in regarding the absence of sigmata as a sufficient justification for separating this species from *C. cranium*, though there is a great deal to be said for the opposite view maintained by Topsent. The two forms are evidently most closely related, and illustrate very well the impracticability of maintaining Lendenfeld's genus *Tethyopsilla* for the asigmatose Tetillids. The case is quite parallel to that of the lipochelous Desmacidonidæ.

Previously known Distribution.—Various localities in the Atlantic, Indian and Pacific Oceans.

Register No., Locality, &c.—XXXVIII; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

28. *Cinachyra uteoides*, n. sp. (Pl. X, fig. 4.)

The single specimen (Pl. X, fig. 4) is pear-shaped, broadly rounded above, but with a truncated base which seems to have been lightly attached to a sandy substratum. About twenty small conical projections are scattered irregularly over the surface, more numerous in the upper than in the lower half of the sponge. These bear the openings of porocalyces in various states of contraction. When fully expanded the opening is wide (about 1 mm. in diameter) and the porocalyx is seen to be deeply cup-shaped. Sometimes the opening is blocked up by a gelatinous substance which may take the form of a sphincter. The projection bearing the porocalyx appears more or less conical or truncated according to the state of contraction of the opening. It is impossible, without injuring the sponge to an unjustifiable extent, to distinguish between the inhalant and the exhalant porocalyces, but I suspect that those on the broadly rounded summit of the sponge, which appear more conical than the remainder, are exhalant.* The surface of the sponge is not hispid, but between the porocalyces it is slightly corrugated and has a characteristic striated appearance under a lens, due to the paratangentially arranged cortical oxea. The height of the specimen is 26 mm.; the greatest transverse diameter about the same; the diameter of the truncated base about 15 mm. The

* I do not think they are simple oscula, but the possibility of this must not be lost sight of; in their closed condition it is very difficult to make sure.

conuli which bear the porocalyces attain a height of little more than 1 mm. The colour in spirit is very pale yellow, nearly white on the surface; the texture compact but rather yielding.

Stained sections demonstrate the existence of a thin cortex (about 0.34 mm. thick), fibrous in its inner portion. The walls of the porocalyces possess a very distinct fibrous layer, and in life are doubtless pierced by a very large number of pores, no longer distinctly recognisable. These sections also show that the gelatinous material which more or less blocks up so many of the porocalyces is really not part of the sponge-tissues, though it may be formed as a secretion. Nothing can be made out as to the structure and arrangement of the flagellate chambers, but it is worth noting that the choanosome is densely crowded with large, spherical, coarsely granular cells, about 0.012 mm. in diameter, which seem to be especially concentrated around the larger canals.

The main skeleton consists, in the first place, of rather slender bundles of long slender oxea and anatriænes, radiating from the interior of the sponge and ending at the surface after penetrating the cortex. The cladomes of the anatriænes echinate these bundles in groups, and the last group seems to lie just outside the cortex. Possibly some of the "grapnels" projected for some distance beyond the surface in the living sponge. Many of the shorter and stouter oxea occur irregularly scattered between the radiating bundles, but these spicules are especially abundant in the cortex, where they are arranged paratangentially in a dense layer. In this layer many spicules lie parallel to one another, forming different sets crossing one another at various angles.

An interesting feature of the skeleton is the presence of slender bundles of hair-like protriænes (trichotriænes) whose terminal ramifications hispidate the lining membrane of the porocalyces, as in several other species of *Cinachyra* [Dendy, 1921, p. 12]. Ordinary protriænes, of large size, occur in radial bundles in the conuli, associated with oxea. There is a ring of such bundles around each porocalyx, parallel with its long axis, their ends fringing the margin of the porocalyx, but now nearly all broken off. The bundles of trichotriænes seem to branch out from these very much stouter bundles towards the lining membrane of the porocalyx.

Spicules:—(1) Large protriænes; the cladi are equal or unequal, usually all three well developed, straight or nearly so, and gradually sharp-pointed; the shaft is at first fairly stout, then increases somewhat, and tapers very gradually to a very fine, long, hair-like terminal portion; it is almost invariably broken short in boiled out preparations, so that it is impossible to give the maximum length. In a large specimen the three cladi measured each about 0.14 by 0.011 mm. and the remaining portion of the shaft 6.3 by 0.025 mm., being stoutest at a considerable distance below the cladome; the hair-like terminal portion of the shaft, however, was broken off, and this may have measured another 2 mm. in length at least.

(2) Trichotriænes; resembling (1) but of very much smaller size, in fact of

hair-like dimensions throughout. These remain together in bundles in boiled out preparations and cannot be separately measured.

(3) Anatriænes; remarkable for the flatness of the curve of the cladome, the cladi coming off from the shaft almost at right angles, but slightly recurved, especially towards the apex. Another characteristic feature is the rapid narrowing of the shaft for a short distance below the cladome, after which it passes gradually into the very long-drawn-out, hair-like extremity. In a typical example the cladome measures about 0.12 mm. across and the cladi and shaft are all about 0.017 mm. in diameter at their origin, while the shaft is about 2.5 mm. long.

(4) Long, slender, straight, fusiform oxea; tapering very gradually from the middle to each sharply pointed extremity. A typical example measures about 4.3 by 0.05 mm. These are the characteristic oxea of the main skeletal bundles.

(5) Stout, curved, fusiform oxea; symmetrical; gradually and more or less sharply pointed at each end; varying greatly in size, up to about 2.6 by 0.08 mm., but usually smaller. The larger examples of these spicules occur irregularly and abundantly scattered through the choanosome. Smaller ones, placed paratangentially, form the characteristic cortical layer, but even here there is a small admixture of larger forms, just as there is some admixture of smaller forms in the interior.

(6) Sigmata; very slender, C and S-shaped; of the usual tetillid form; measuring about 0.012 mm. from bend to bend.

I have given a key to all the known species of *Cinachyra* in my report on the Sigmatotetragonida of the "Sealark" Expedition [1921], from which it will be seen that the sponge described above differs conspicuously from any previously known species of the genus in the presence of the cortical layer of *paratangentially* disposed oxea. This gives to the surface of the sponge a characteristic striated appearance, and has suggested the specific name *uteoides*.

Register No., Locality, &c.—XLII; Station 90, off Three Kings Islands, New Zealand, 100 fathoms.

FAMILY HAPLOSCLERIDÆ.

SUB-FAMILY GELLIINÆ.

29. *Gellius flagellifer*, Ridley and Dendy.

(For literature and synonymy *vide* Dendy [1921].)

This widely distributed species is represented by a small and very thin crust attached to the block of black basalt, R. N. XXXV. The spiculation differs from that of the type of the species chiefly in the smaller size of the oxea. These measure only about 0.21 by 0.008 mm.; the flagelliform sigmata about 0.064 mm. and the small, ordinary sigmata about 0.028 mm. in longest diameter from curve to curve.

Previously known Distribution.—Off Marion Island (Ridley and Dendy); Davis

Strait (Fristedt); Atlantic coast of Canada (Lambe); Gulf of Gascoyne (Topsent); Iceland (Lundbeck); Saya de Malha, Indian Ocean (Dendy).

Register No., Locality, &c.—XXXV. *y*; Station 90, near Three Kings Islands, N. of new Zealand, 100 fathoms.

30. *Gellius petrocalyx*, n. sp. (Plate VI. figs. 2 and 3.)

There are two specimens of this remarkable species in the collection, of which R. N. XXXII. 9 may be regarded as the type. This specimen (Pl. VI, fig. 3) forms an irregular, thick-walled cup, deeply funnel-shaped but truncated below, where it has apparently been attached, and with unevenly undulating margin. The inner surface bears numerous conspicuous vents, varying in diameter up to about 3 mm. These vents have sharply defined margins, flush with the general surface; each is the opening of a basin-shaped depression into which a group of exhalant canals discharge. They are scattered fairly uniformly over the whole of the inner surface, at intervals of usually not more than 5 mm. The outer surface, on the whole, is smooth, but has a worm-eaten appearance which may be due to rubbing off of the dermal membrane. The maximum height of the specimen is about 105 mm.; the greatest breadth of the cup, which is somewhat compressed, is 136 mm.; the thickness of the wall, half-way up, is about 21 mm., thinning out to the margin. The colour in spirit, now, is greenish grey.* The texture is compact, hard, and stony, like that of a Lithistid.

The second specimen (R. N. XXXII. 1, fig. 2) is of about the same size and the same general appearance, but fan-shaped and with a more even margin, the funnel being widely incomplete on one side, owing perhaps to the presence of a couple of solitary corals, one standing on top of the other, partially embedded in the sponge-wall. In this specimen also the vents (on the inner surface of the cup as before) are much less numerous and less conspicuous, evidently because the rather thick, and in this case easily separable, dermal layer has largely peeled off. The compact stony texture is just the same as in the other specimen.

The main skeleton is an extremely dense, sub-isodictyal network of single oxea, and there seem to be no fibres and no spongin, so that, in spite of its stony character, the sponge can easily be rubbed to powder between the fingers. There is a more or less readily separable dermal membrane in which the spicules lie tangentially, again forming a close network.

Spicules:—(1) Oxea; rather stout, more or less strongly curved, very sharply and fairly gradually pointed at each end; measuring about 0.184 by 0.012 mm.

(2) Sigmata; very slender, fairly symmetrically C-shaped; sometimes with a slight indication of angulation in the middle; varying greatly in size, up to about 0.03 mm. from bend to bend; sometimes rather larger in R. N. XXXII. 1.

(3) Toxa; very few, small; rather more abundant in R. N. XXXII. 1.

* The green tint is due to staining by the copper of the tank in which the sponge was preserved.

This species is sharply distinguished by its stony texture and characteristic external form, but there is nothing peculiar about its spiculation.

Register Nos., Locality, &c.—XXXII. 1, 9; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

31. *Gellius imperialis*, n. sp. (Plate IX, fig. 1.)

There are in the collection a large number of fragments of this remarkable and very beautiful sponge. All the larger pieces have been dried, but a few small bits have been preserved in spirit. So much of the sponge as can be safely reconstructed is represented in Pl. IX, fig. 1, which represents the two largest pieces put together, with the addition of a number of marginal fragments. Some large fragments remain over, and it is doubtful whether they could all have come from the same specimen. Evidently the sponge was "bivalvate," consisting of two thin, fan-shaped lamellæ diverging slightly from the end of a short, thick stalk. The outer surface of each valve is buttressed by two or three prominent ribs continued from the stalk, each rib bearing a row of marginal vents; while a little irregular ribbing, or rugosity, without vents, occurs elsewhere. The outer (or inhalant) surface, except for these rugosities, is smooth and covered by a thin, pore-bearing dermal membrane. The same is true of *both* surfaces of the prominent ribs. The inner surface is smooth, but exhibits a curious pock-marked appearance towards the margin, and may also be curiously marked by concentric lines of growth. It is everywhere perforated by close-set, minute openings, usually not more than 0.5 mm. in diameter, frequently less; these are the openings of narrow canals which penetrate the lamella at right angles and seem usually to run right through to the pore-bearing dermal membrane on the other side. Opposite the prominent ribs are rows of larger openings, up to 3 mm. in diameter, which lead into (oscular?) tubes which run through the ribs and open at their other ends as the large marginal vents, of about the same diameter. The margins of the lamellæ themselves are very thin and bear no vents. The height of the specimen, as restored, is about 380 mm., of which about 30 mm. is stalk, and the horizontal breadth is about the same. The thickness of the lamella in the middle is only about 3 mm. The colour, dry and in spirit, is light brown. The texture is fibrous but friable, and the general appearance and consistency of the sponge remind one of thin oat-cake.

The main skeleton is a loose felt-work of coarse spicular fibre running parallel to the two surfaces and concentrated longitudinally in the stalk. The fibres are about 0.25 mm. in diameter and composed of short oxea bound together apparently without any spongin, so that they are very brittle. Between the fibres is an irregular, sometimes unispicular reticulation of oxea. The dermal skeleton differs on the two surfaces of the lamella. On the inhalant (outer) surface it is a rather irregular, unispicular network, in which each side of each mesh is composed of a single spicule. On the exhalant (inner) surface it is a dense, thick felt-work of

interwoven oxea lying paratangentially; forming a sort of spicular cortex about 0.13 mm. thick, pierced by the innumerable small apertures above referred to.

Spicules:—(1) Oxea; short, stout, slightly curved, symmetrical; neither fusiform nor hastate, but sharply and fairly gradually pointed at each end; measuring about 0.24 by 0.016 mm.

(2) Sigmata; very slender, C-shaped, or slightly contort; measuring about 0.02 mm. from bend to bend.

As regards external form the nearest approach to this species known to me is *Cavochalina bilamellata*, as described by Carter [1885-6], from the south coast of Australia. The canal-system should be compared with that of *Phakellia*.*

Register Nos., Locality, &c.—R. N. XXIX; XXXIII. 3, 7, 14, 16, 17; XL; Station 90, off Three Kings Islands, New Zealand, 100 fathoms.

32. *Gellius tubuloramosus*, n. sp.

The single specimen is unfortunately much damaged. It consists of a long, slender, very compact, cylindrical stalk, slightly expanded to form a base of attachment below and bifurcating into two symmetrical branches above. The length of this stalk, to the point of bifurcation, is 92 mm.; the diameter, which is very uniform, about 3.5 mm. Each branch of the stalk continues for about 14 mm. and then begins to expand gradually into a tubular sponge-body. It is these soft and thin-walled tubes that have been so greatly injured. A large part of one of them has been torn away, but most of the other remains. One may assume that each had a wide vent at the summit, as in *Gellius calyx*, but no part of the original margin remains. The more perfect of the two tubes now measures about 95 mm. in length by 18 mm. in diameter, and its wall is barely 2 mm. thick. The two tubes lie parallel with one another, and at one point there is an anastomosis through which their cavities communicate. The outer surface is rather uneven and woolly looking, but there are no projecting spicules to render it hispid, nor is there any distinct dermal membrane. The colour in spirit is pale brown.

In the stem the skeleton consists chiefly of closely packed, dense, longitudinal bundles of oxea, but there is an abundant reticulation of more or less separate spicules between and around these. As the stem expands to form the tubular body its spicule-bundles separate out to form the slender fibres of a sparse reticulation in the body-wall. This is very poorly developed, and in its wide meshes are scattered numerous separate oxea. There appears to be no special dermal skeleton.

Spicules:—(1) Oxea; symmetrical, rather slender, slightly curved or angulated in the middle, gradually and sharply pointed at each end; size about 0.26 by 0.008 to 0.012 mm.

(2) Sigmata; very slender, C-shaped or slightly contort, about 0.024 mm. from bend to bend, abundant.

* *Vide* Dendy [1921, p. 118].

This very interesting species is evidently nearly related to *Gellius calyx*, Ridley and Dendy [1887], obtained by the "Challenger" Expedition off the mouth of the Rio de la Plata at a depth of 600 fathoms, but it differs in its branching habit and its much larger size, while the oxea are much smaller.

Register No., Locality, &c.—XXV; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

SUB-FAMILY RENIERINÆ.

33. *Petrosia coralloides*, n. sp. (Pl. XI, figs. 1 and 1 a.)

The external appearance of this species is highly characteristic (Pl. XI, figs. 1 and 1 a). The sponge forms a rather thin, flattened lamella, extended in apparently the horizontal plane, with a constricted area of attachment, like a very short, thick stalk (with a quantity of débris still adherent), excentrically placed on what is presumably the lower surface. The lamella exhibits a saddle-like curvature, and might be described as forming a very flat cup, with irregular and partially reflected margin and, on the whole, concave upwards. The maximum width of the specimen is about 114 mm.; the thickness of the lamella about 6 mm. The two surfaces are sharply differentiated from one another. The upper (presumably inhalant) is nearly smooth, subglabrous, but at the same time minutely granular, with no openings visible to the naked eye, though in reality covered by a thin, pore-bearing dermal membrane. The lower (presumably exhalant) surface is rather more coarsely granular and is perforated, at fairly close and regular intervals, by very numerous circular apertures, varying up to about 1.5 mm. in diameter,* and separated from one another by intervals of about 2 mm. These apertures are provided with membranous sphincters, some of which are completely closed, others fully open, and the remainder in various stages of contraction. The colour in spirit is dark grey, the texture hard, incompressible, but friable.

The character of the flagellate chambers can no longer be made out, but the general canal-system appears to resemble that of *Phakellia*. Wide canals penetrate the sponge lamina more or less at right angles to its two surfaces, commencing beneath the pore-bearing dermal membrane of the upper surface and terminating at the vents on the lower surface. These canals are to some extent branched, but as a whole they seem to run right through from surface to surface without interruption.† Their upper ends are dilated to form the wide subdermal cavities. Their walls are very ill-defined, and they give off or receive numerous smaller canals along their course. There is some evidence of the occurrence of inhalant pores also on the lower surface, between the vents.

* A very few are larger, up to 2.5 mm. in diameter; the usual diameter is about 1 mm. In the drawing these apertures are hardly represented as sufficiently numerous or as sufficiently definite in outline.

† Compare my observations on the canal-system of *Phakellia conulosa*, var. *mauritiana*, in the "Sealark" Report [1921].

The skeleton is that of a typical *Petrosia*. There appears to be no spongin, and the entire skeleton is a dense network of oxeote megascleres, separate and in bundles. On the upper surface sparse brushes of megascleres stand out at right angles from the outer layer of the main skeleton, their apices just projecting beyond the surface. These brushes support the thin dermal membrane, which has no spicules of its own. On the lower surface there is a subdermal reticulation of stout spicular fibre immediately below the dermal membrane, and dermal brushes are scarcely, if at all, developed.

Spicules:—Oxea; stout, slightly curved, fairly gradually and sharply pointed at each end, measuring about 0.25 by 0.016 mm. Numerous more slender forms also occur, probably young, and there are a good many foreign spicules of various kinds.

The resemblance of this species to the genus *Phakellia* is obvious, but it differs from typical species of that genus in its friable character, due to the absence of spongin, and in the oxeote in place of stylote spicules. The disposition of inhalant and exhalant surfaces appears to be just the reverse of what it usually is in cup-shaped sponges.

Register No., Locality, &c.—XXI; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

34. *Halichondria magellanica*, n. sp.

The single specimen is massive, encrusting and enclosing fragments of coarse black sandstone, and measuring about 62 mm. in maximum diameter. The surface, where uninjured, is smooth and even, covered by a rather thick, finely reticulate dermal layer. The vents appear to be represented by a few small round apertures lying flush with the general surface. The inhalant pores are scattered in the meshes of the dermal reticulation. Internally the sponge is cavernous, crumb-of-bread-like, with wide canals. Texture soft, compressible, friable, but firmer on the surface owing to the well-developed dermal layer. Colour in spirit yellowish grey.

The main skeleton is a very irregular, coarse reticulation of stout, ill-defined, spicular fibres, with numerous loose spicules scattered between. The primary lines run at right angles to the surface and support the dermal membrane. The dermal skeleton is a rather irregular reticulation of coarse spicular fibres, about 0.085 mm. in diameter, the meshes of which are subdivided by more slender fibres of the same character, and to some extent by single spicules. There is no recognisable spongin in any part of the skeleton.

Spicules:—Slightly curved oxea; sharply and fairly gradually pointed at each end; measuring about 0.26 by 0.012 mm.

The generic position of this species is somewhat doubtful. The skeleton arrangement is that of *Halichondria* (or *Petrosia*) rather than of *Reniera*, while the spicules are short for a *Halichondria* but long for a *Reniera*.

Register No., Locality, &c.—XLVIII. 2; Lat. 52° 23' S., Long. 63° 50' W., E. of the Straits of Magellan, April 13th, 1913.

SUB-FAMILY CHALININÆ.

35. *Chalina oculata*, Bowerbank [1866, 1874], var. *novæ-zealandiæ*, nov.

The single specimen in the collection consists of an elongated, subcylindrical stem, dividing dichotomously into four branches, three of which are very long and the fourth much shorter. The total length of the specimen is about 470 mm. and the diameter of the stem and branches about 8 mm. Numerous small vents, about 2 mm. in diameter, with prominent margins, are arranged, for the most part serially, along stem and branches. The colour in spirit (macerated) is light brown, the texture soft, compressible, resilient.

The main skeleton is a very wide-meshed network of stout horny fibre, rather sparingly cored with oxea, in single or multiple series. The network is very irregular and the fibres vary much in diameter, up to about 0.085 mm. The dermal skeleton is a much closer reticulation of fibres, each about 0.034 mm. in diameter, cored by a single series of oxea and echinated by oxea projecting at right angles to the surface.

Spicules:—Short, fairly stout oxea; straight or nearly so, subfusiform, gradually and sharply pointed at each end; measuring about 0.088 by 0.008 mm.

This variety differs from the common British form in its more sparingly branched character and the much greater length of the branches. In these respects it resembles more closely the common Australian species described by Carter [1885-6] under the name *Chalina polychotoma*, which, however, is a very variable form. It differs from both in the very coarse, open character of the skeletal network. The spicules are a good deal shorter than those of the British form and a good deal larger than those of the Australian specimens examined by me.

Lendenfeld [1887], in that hopeless work, "Die Chalineen des Australischen Gebietes," has identified with the British species—but under the name *Euchalinopsis oculata*!—a sponge from Port Chalmers, New Zealand, but as the spicules of this sponge are said to measure 0.26 by 0.004 mm. the identification must remain doubtful. (In the British form they measure about 0.12 by 0.008 mm.)

Gray's *Spongia ramosa*, re-described in my paper "On the Sponges described in Dieffenbach's 'New Zealand'" [1898], under the name *Chalina ramosa*, may be regarded as another variety of the same species.

Register No., Locality, &c.—XI; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

36. *Pachychalina aurantiaca* (Lendenfeld).

Cladochalina aurantiaca, Lendenfeld [1887]; *Pachychalina aurantiaca*, Dendy [1895].

There is a single dry specimen in the collection which I refer with some hesitation to this species. In external appearance it resembles the Victorian specimens described by me, but in skeletal features it seems to come nearer to the type.

The specimen consists of a single compressed lobe or lamella attached to a broken gastropod shell. The attachment is broad and the outline of the sponge obcordate, the margin showing a slight tendency to give off very short, digitiform processes. Numerous vents, 2–3 mm. in diameter, are scattered over both surfaces and along the margin. The height of the specimen is about 98 mm., the greatest breadth 78 mm., and the thickness in the middle about 20 mm. The texture is firm and rather hard, but compressible and fairly resilient, and the colour is light greyish brown.

The main skeleton is a rather coarse network of stout horny fibre, cored by numerous slender oxea, more abundant in the primary than in the secondary lines. The primary fibres curve outwards towards the surface and are about 0.12 mm. in diameter; the secondaries, about 0.05 mm. thick, meet them at right angles. The dermal skeleton is an irregular, more closely meshed network of slenderer but still multispicular fibres, not echinated by tufts of projecting spicules as described in my Victorian specimens (but not in the type).

Spicules:—Very slender, straight or slightly curved oxea, measuring about 0.08 by 0.002 mm.

Previously known Distribution.—South coast of Australia, Port Phillip and neighbourhood (Lendenfeld, Dendy).

Register No., Locality, &c.—XXXIII, 15; off Three Kings Islands, N. of New Zealand.

37. *Ceraochalina pergamentacea* (Ridley).

Cladochalina armigera, Schmidt, var. *pergamentacea*, Ridley [1881]; *Cladochalina pergamentacea*, Ridley [1884]; *Chalina pergamentacea*, Ridley and Dendy [1887]; *Ceraochalina papillata*, Lendenfeld [1887]; *Chalina pergamentacea*, Dendy [1895].

There is a single specimen of this common Australian species in the collection. It takes the form of an unbranched, flattened, digitiform growth attached to a lamellibranch shell. The total height, excluding the part attached to the shell, is about 90 mm.; the maximum width, near the apex, about 20 mm. Both flat surfaces bear numerous small vents (about 1 mm. in diameter), each on a rather prominent papilla. The surface is smooth and subglabrous in spirit, but finely granulated; the colour dark brown, and the texture rather firm, but compressible and resilient.

The main skeleton is a rather wide- and rectangular-meshed reticulation of stout horny fibre, sparsely cored by slender vestigial oxea, arranged multiserially in the primary lines and uniserially in the secondaries. There is a well-developed dermal reticulation of more slender fibres, uniserially cored, and sparsely echinated by vestigial oxea projecting at right angles to the surface.

Spicules:—Slender oxea, straight or nearly so, sharply pointed at each end, measuring about 0.044 by 0.002 mm. (vestigial).

I see nothing by which this sponge can be distinguished from Australian specimens. Lendenfeld [1887] has described three varieties of his *Ceraochalina papillata* from New Zealand, which seem to differ from one another and from our specimen in no important respect.

Previously known Distribution.—East coast of Brazil (Ridley); Torres Straits (Ridley); Bass Straits (Ridley and Dendy, Dendy); New Zealand (Lendenfeld).

Register No., Locality, &c.—XXXVI; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

38. *Siphonochalina communis* (Carter).

Tubulodigitus communis, Carter [1881]; *Patuloscula procumbens*, Carter [1882]; *Patuloscula procumbens*, Carter [1885–6]; *Siphonochalina intermedia*, Ridley and Dendy [1887]; *Siphonochalina procumbens*, Dendy [1890]; *Siphonochalina procumbens*, Dendy [1895]. (For other possible synonyms *vide* Dendy [1916 A].)

There are in the collection three dry specimens of this common and widely distributed species, all different as regards the shape and arrangement of the tubes but agreeing closely in skeletal characters. In R. N. XXXIII. 5, which has a well-developed stalk, the tubes tend to fuse together in one plane, fan-wise, as in Carter's var. *flabelliformis*, and an interesting feature of this specimen is the presence of numerous small, circular oscula, more or less serially arranged, on the outer surface of the lower part of the sponge, as seen so frequently in non-tubular Chalininae.

R. N. XXXIII. 2 closely resembles the Australian *Siphonochalina intermedia* as figured by Ridley and Dendy in the "Challenger" Report, while R. N. XXXIII. 10 has much smaller tubes, much more extensively fused together in a bushy fashion.

In all three the spongin is very strongly developed in proportion to the spicules, which are short, straight (or nearly straight), sharply pointed oxea, measuring about 0.04 to 0.06 by 0.004 to 0.006 mm.

Previously known Distribution.—West Indies, Indian Ocean, Australia.

Register Nos., Locality, &c.—XXXIII. 2, 5, 10; N. of New Zealand (? off Three Kings Islands).

39. *Siphonochalina minor*, Dendy [1916 A], var. *regalis*, nov.

There are several pieces of this sponge in the collection, all from the same locality, and possibly parts of the same colony. The piece which I regard as the type consists of a ramified stolon, about 8 mm. in diameter, probably procumbent in life, from which short tubular branches (about nine in number) of about the same diameter are given off serially on one side, the stolon itself not being tubular. Each tubular branch possesses a single terminal vent about 3 mm. in diameter and is itself about 10 mm. long. The maximum length of the specimen is about 115 mm. A slender connecting strand forms an anastomosis between two portions of the stolon, which was probably reticulate. The texture is very soft, compressible and resilient.

The colour is now black, but it has apparently been stained, like everything else in the jar, with osmic acid, and is in a very macerated condition.

The main skeleton is a subrectangularly, very wide-meshed network of spicular fibre about 0.05 mm. in diameter. The spicules are arranged multiserially in both primaries and secondaries, but there is a fairly thick coating of spongin. The dermal skeleton is a close-meshed reticulation of plurispicular fibre in which the sides of the meshes are often not more than one spicule in length. There is a fair amount of spongin in the fibre, but it does not form a complete investment. This dermal skeleton is abundantly echinated by oxea, projecting singly or in small groups.

Spicules.—Short, stout, slightly curved, fusiform oxea, gradually sharp-pointed at each end; measuring about 0.1 by 0.009 mm.

This variety differs from the type of the species in three chief features, none of which appears to me to deserve specific recognition. In the first place the dermal skeleton is somewhat differently arranged, being, in the type, an irregular, unispicular reticulation without obvious spongin, and without projecting oxea. In the second place the spicules are considerably stouter than in the type, though not quite so long; and, in the third place, there is more spongin throughout.

Previously known Distribution of Species.—Okhamandal, Indian Ocean (Dendy).

Register No., Locality, &c.—XIX. 1; Station 90, off Three Kings Islands, New Zealand, 100 fathoms.

40. *Siphonochalina latituba*, n. sp. (Pl. X, figs. 7 and 8.)

There are five specimens of this sponge in the collection, all from the same locality; of which the largest (R. N. III, Pl. 10, fig. 8) may be regarded as the type. This consists of a single, straight, unbranched, greatly elongated, thin-walled, trumpet-shaped tube, gradually increasing in diameter from the narrow base of attachment, which forms a solid stalk, to the wide opening at the summit. The outer surface is smooth but finely granular; the inner surface is perforated by very numerous minute apertures. The total height is 380 mm., the diameter at the base 10 mm., and at the apex (terminal opening) about 33 mm. The thickness of the wall is only about 2.5 mm., diminishing to a sharp edge at the margin of the terminal opening. The texture is soft and very compressible, so that the thin wall collapses more or less in spirit. The colour in spirit (of all the specimens) is pale brown, but all seem to be completely macerated, and the colour is that of the skeleton.

The remaining specimens, though smaller, closely resemble that described above. Only in one case (R. N. LVII. b) does any branching take place. In this specimen (fig. 7) a single, much more slender, secondary tube is given off from about half-way up the main tube, of which it repeats the structure on a smaller scale. Coming off at first nearly at right angles, it soon bends sharply upwards and runs parallel to the parent tube, without, however, reaching the same height.

The skeleton consists of a coarse-meshed network of horny fibre, of a rather

dark, yellowish-brown colour, cored throughout by small oxea. When viewed in transverse section of the wall the meshes appear rectangular or subrectangular; in paratangential section, polygonal. The meshes are widest, up to about 0.5 mm., in the inner portion of the wall, and become much smaller towards the surface. There appear to be no main longitudinal fibres running from the stem upwards, but the primary fibres run at right angles from surface to surface and are joined by secondaries of about the same diameter (say about 0.05 mm.). Both primary and secondary fibres are usually plurispicular and there is not much difference between them in this respect. In the inner portion of the wall the amount of spongin in proportion to the spicules is very great. Towards the outer surface, where the meshes become smaller and the fibres more slender, the proportion of spongin diminishes, and the outermost part of the network is echinated by little tufts or brushes of almost free spicules projecting at right angles to the surface.

Spicules:—Short, straight or very slightly curved oxea; fairly stout, subfusiform, gradually and sharply pointed at each end; measuring about 0.12 by 0.008 mm.

This very interesting species appears to be nearly related to Lendenfeld's *Chalinopsilla tuba*, from Torres Straits [1889, p. 133], which it resembles closely in external form, and which has very likely been derived from our species by loss of spicules.

Register Nos., Locality, &c.—III, LVII. *a-d*; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

41. *Siphonochalina stellidermata* (Carter).

Spongelia stellidermata, Carter [1885-6]; *Spongelia elastica* var. *stellidermata*, Lendenfeld [1889].

There is a single specimen in the collection which I refer with some hesitation to Carter's species. It is flabellate, and may be regarded as composed of a number of rather thick-walled cylindrical tubes, fused together laterally and radiating, fan-like, from below upwards. The specimen may have been stipitate, like the type, but the lower part has been torn off. The remaining portion is 68 mm. high by 86 mm. in breadth and 14 mm. in thickness. The surface shows radiating furrows between the component tubes, each of which latter has a wide, circular vent on the slightly uneven, curved margin. The vents vary up to about 7 mm. in diameter, and there are seven of them. The raised, stellate marking of the surface from which the specific name is derived is very strongly developed, but it sometimes passes into transverse ridges in the grooves between the tubes. The texture in spirit is very compressible and elastic, the colour greyish brown.

The main skeleton consists of stout primary fibres, running across the wall of the tube, approximately at right angles to the surface and at intervals of about 1.5 mm., connected by secondary fibres which run parallel with the surface and are

sparingly interconnected amongst themselves. The primary fibres are about 0.1 mm. in diameter and abundantly cored with sand. The secondaries are about 0.05 mm. in diameter and free from foreign matter. All the fibres are very distinctly laminated, and in balsam preparations many show numerous elongated black markings, due, apparently, to intrusion of air between the laminae. These markings disappear in stained paraffin sections. The characteristic dermal reticulation is formed by the younger of the secondary fibres, radiating from near the apices of the primaries. These appear to be softer than the older fibres, and have a curious shrivelled appearance, with very uneven surface. The youngest and most superficial of all are comparatively few in number, and very slender, only about 0.025 mm. in diameter. These have smooth outlines and are very densely charged with intrusive air. There is a good deal of coarse foreign matter, large foreign spicules, &c., between the skeleton fibres.

The poor state of preservation makes it impossible to give a satisfactory account of the canal-system. The flagellate chambers appear to be subspherical, about 0.04 mm. in diameter, eurypylous, and suspended in a lacunar, collenchymatous, but more or less granular mesogloea. The thin, transparent dermal membrane no doubt contained numerous inhalant pores, though these are no longer recognisable. The smaller exhalant canals open by numerous apertures into the wide oscular tubes.

I have very little doubt that this sponge is a pseudoceratose *Siphonochalina*, a conclusion which is supported alike by the characteristic external form, the skeleton arrangement, and the canal-system.

Previously known Distribution.—Port Phillip Heads, Victoria (Carter).

Register No., Locality, &c.—VI; off North Cape, Auckland, New Zealand, sandy bottom, 30–14 fathoms, August 2nd, 1911.

42. *Chalinopsilla palmata* (Carter).

Dactylia palmata, Carter [1885–6]; *Chalinopsilla arborea*, var. *macropora*, Lendenfeld [1889].

There is a single dry specimen of this species in the collection, agreeing very well with Carter's brief description and fairly well with Lendenfeld's fig. 10 (Pl. I, *op. cit.*). It consists of a bunch of much elongated, usually more or less flattened and sometimes expanded, dichotomously dividing branches, with numerous conspicuous vents, about 2–3 mm. in diameter, scattered over the surfaces, and to a slight extent only along the margins. The total height is 270 mm., the maximum width of any branch 35 mm. The texture is coarse, compressible, and resilient, the colour light brownish grey. The surface is still slightly sandy in places, but most of the dermal layer appears to have been removed, the specimen being completely macerated.

The main skeleton consists of stout primary fibres of spongin curving upwards and outwards to the surface at distances of about 0.8 mm., connected at right angles by more slender secondaries, which become more numerous towards the surface.

The primary fibres are about 0.085 mm. in diameter and are abundantly cored by sand grains. The secondaries are free from sand and about 0.05 mm. thick. There are mere traces of a sandy dermal reticulation.

I have no hesitation in regarding this sponge as a Chalinine which has completely lost its spicules, and therefore as being pseudoceratose.

It is very doubtful whether the species is distinct from Carter's *Dactylia chaliniformis*, described in the same place. Were it not that the name had been previously used under the forms *Dactylium* and *Dactylus* I should not hesitate to give Carter's genus priority over Lendenfeld's.

Previously known Distribution.—Australian Seas, Port Phillip Heads (Carter), Port Jackson (Lendenfeld); New Zealand, Port Chalmers (Lendenfeld).

Register No., Locality, &c.—XXXIII. 9; off Three Kings Islands, N. of New Zealand.

SUB-FAMILY PHLÆODICTYINÆ.

43. *Oceanapia* (?) *arcifera*, n. sp. (Pl. XIII, figs. 4 and 5.)

This species is represented in the collection by a somewhat frayed fragment of a rather thin-walled fistula, with a small portion of the wall of possibly another fistula adhering to it. The larger fragment measures about 33 by 6 mm. and is now of a dark blackish-grey colour, apparently due to staining by osmic acid.

The skeleton consists of a dense dermal felt-work of tangentially disposed oxea, backed up by stout longitudinal bundles of similar oxea anastomosing with one another here and there to form a loose, coarse network. Although the longitudinal bundles form well-defined spicular fibres there appears to be little if any spongin cement.

Spicules:—(1) Oxea (Pl. XIII, fig. 4); rather slender, slightly curved or angulated in the middle, gradually and very sharply pointed at each end; measuring about 0.24 by 0.008 mm.

(2) Toxa (fig. 5); rather strongly and usually sharply angulated in the middle, with short, fine, recurved apices; rather stout, but varying very greatly in size, up to about 0.08 by 0.003 mm. Very abundant. Numerous short, slender forms met with are probably young.

Although so inadequately represented, this species seems worth describing, as it seems likely to be readily recognisable when again met with. It may be nearly related to *Oceanapia toxophila*, Dendy [1921], from the Indian Ocean, but is sharply distinguished by the absence of sigmata and the character of the oxea.

Register No., Locality, &c.—LV. 3; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

44. *Phlæodictyon fistulosum* (Bowerbank)?

(For references and synonyms *vide* Dendy [1905].)

There are in the collection two much elongated and irregularly curved, thin-

walled, cylindrical fistulæ, open at both ends, which may be regarded as certainly belonging to the genus *Phlæodictyon*, and probably to the species named. The longer of the two is about 70 mm. in length and 4 mm. in diameter. The colour (in spirit) is now almost black, but the specimens have evidently been treated with osmic acid, like others in the same jar.

The skeleton consists of an internal bast-like layer of stout longitudinal bundles of oxea, sometimes branching and anastomosing, and an external layer consisting of an irregular reticulation of single oxea, placed tangentially and overlapping one another freely in all directions. The oxea are slightly curved, sharply and fairly gradually pointed at each end, and measure about 0.3 by 0.017 mm.

The spicules seem to be rather more robust than is usual in the species, but not sufficiently so to require specific distinction.

Previously known Distribution.—Almost cosmopolitan [see Dendy, 1921].

Register Nos., Locality, &c.—LV. 8, 12; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

45. *Phlæodictyon aberrans*, n. sp.

The more perfect of the two specimens (R. N. XIX. 9) consists of a short, subcylindrical body, broken off below and tapering above into a group of long and rather slender, thin-walled fistulæ. There appear to have been five of these fistulæ, all erect and some of them more or less fused together. Except when broken off they terminate in narrow, tapering, blind extremities. There are no recognisable vents. The transverse diameter of the body is about 20 mm., the total height of the specimen 71 mm., the length of the longest fistula about 45 mm. Both specimens have evidently been treated with osmic acid, and are nearly black externally; yellowish grey internally. The surface, of both body and fistulæ, is characteristically granular, or minutely sub-hispid. The body is fairly firm and compact, but compressible; crumb-of-bread-like internally. The fistulæ are rather soft and flabby, with the cavity traversed by an open reticulation of gelatinous-looking tissue. The second specimen has all the fistulæ broken off quite short, but otherwise closely resembles that described above.

The main skeleton of the body is an irregular reticulation of short oxea, chiefly in stout, loose fibres or tracts, apparently without spongin; interrupted by extensive masses of lacunar collenchyma without skeleton. There is no distinct, bast-like, subdermal layer of spicular fibre, as in typical specimens of *Phlæodictyon*, and the dermal skeleton is represented only by close-set brushes of short oxea, whose projecting ends give the characteristic sub-hispid appearance to the surface. In the fistulæ the skeleton is more typical, with a distinct, subdermal, bast-like reticulation of spicular fibre, in which the deeper and stouter fibres run more or less longitudinally. The surface brushes are perhaps less well-developed than on the body.

Spicules:—Of one kind only, viz. rather short, slightly curved or angulate, fairly

stout, subfusiform oxea, gradually and sharply pointed at each end; measuring about 0.25 by 0.013 mm.

The sponge contains, especially in its outer portion, an immense number of "cellules sphéruleuses"—which appear as dense clusters of spherical granules staining deeply with osmic acid. In paraffin sections, from which their contents have apparently been dissolved out, they look like groups of minute spherical vesicles, the entire group about 0.024 mm., and the individual vesicles about 0.004 mm. in diameter. They are probably stores of reserve material (thesocytes), but it is noteworthy that they seem usually to be attached rather to the inner surfaces of the subdermal cavities than actually embedded in the tissues. More or less similar structures have frequently been described in the genus *Phlæodictyon*.

Register Nos., Locality, &c.—XIX. 8, 9; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

FAMILY DESMACIDONIDÆ.

SUB-FAMILY ESPERELLINÆ.

SECTION *Isodictyæ*.

Genus ISODICTYA, Bowerbank [1864].

Esperellinæ with oxeote megascleres and palmate isochelæ.

In establishing his genus *Isodictya*, Bowerbank named two type-species, *Isodictya palmata* and *I. Normani*. These are very different sponges, the latter is evidently an *Esperiopsis* and the former, being mentioned first, must clearly be regarded as the real type-species of the genus *Isodictya*. Gray [1867] only made matters worse by employing the generic name *Isodictya* twice over in different senses. Ehlers [1870], also recognising that Bowerbank's genus was too comprehensive, proposed the name *Homæodictya* for a section thereof, but unfortunately he actually applied the new name to Bowerbank's type-species, viz. *I. palmata* (= the *Spongia digitata* of Esper according to Ehlers).

In this respect Ehlers' unfortunate example was followed by Ridley and Dendy [1887], who proposed to restrict *Homæodictya* to species with the peculiarly shaped palmate isochelæ characteristic of *H. palmata*, and to regard it as a subgenus of *Desmacidon*. Lundbeck [1905] also accepted the genus *Homæodictya*, while somewhat extending its scope and separating it from *Desmacidon*. It is quite clear, however, that the name *Homæodictya* should never have been allowed to replace *Isodictya* if we are going to pay due attention to the laws of priority. I therefore revert to Bowerbank's name, although most of the species referred by him to *Isodictya* have had to find refuge elsewhere (e. g. in *Reniera*); and I agree with Lundbeck in associating with *Isodictya palmata* a number of species in which the palmate isochela is of a more ordinary type.

The genus *Desmacidon* may be distinguished from *Isodictya* on the ground that the isochelæ are tridentate and not palmate. I have hitherto used *Desmacidon* to include species with isochelæ of either type, but I now think that this is a mistake, and in any case, if the two genera are to be merged, *Isodictya* would seem to have priority over *Desmacidon*.

46. *Isodictya cavicornuta*, n. sp. (Pl. X, figs. 2 and 3.)

This species is represented by a large number of dry pieces, more or less broken up, all from the same locality. It is quite impossible to say how many originally separate specimens they represent. They are comprised under two numbers, XXXIII. 12 and XXXIII. 13. From amongst these I have picked out a series of the least damaged to represent the range of external form, and labelled them XXXIII. 12. *a-g* and XXXIII. 13. *a*; these may be regarded as co-types.

The form ranges from more or less deeply funnel-shaped, or horn-like (Pl. X, fig. 2), to tubular-cylindrical, slightly curved (fig. 3). Some specimens show clear indications of branching, and it is probable that in the living condition the sponge forms loose colonies of funnel-shaped or cylindrical "individuals" united together basally.

The most perfect funnel-shaped piece (R. N. XXXIII. 12. *b*, fig. 2) is about 120 mm. in height, with a diameter at the base of about 22 mm., and at the mouth, which is very slightly constricted, of about 40 mm. A projection at one side may indicate the attachment of a branch, now broken off. (Unmistakable evidence of branching occurs in R. N. XXXIII. 12. *d*.) The lower, stalk-like portion is almost solid, but it expands quite gradually upwards, and as it does so the central cavity gradually widens out to form a deep funnel, with the wall some 8 or 10 mm. thick in the middle and thinning gradually to the margin. The inner surface is perforated by numerous circular apertures, ranging in diameter up to about 3 mm. The outer surface is also abundantly perforated, but the apertures do not reach so large a size. Another funnel-shaped specimen (R. N. XXXIII. 12. *c*) has a mouth about 60 mm. in diameter.

As an example of a tubular specimen we may take R. N. XXXIII. 12. *g* (fig. 3), which is slightly curved, about 135 mm. in length, with a very uniform diameter of about 25 mm. and a slightly constricted terminal aperture about 12 mm. in diameter, this being also the internal diameter of the tube, the wall being some 6 or 7 mm. thick.

These two extremes are connected by intermediate forms.

The texture of the sponge is coarsely fibro-reticulate, and very friable. There is no dermal membrane remaining on either surface, inside or out. The colour is pale brownish grey.

The skeleton is a close, irregular reticulation of coarse spicular fibre, loose spicule bundles, and isolated spicules, with little or no spongin.

Spicules.—(1) Stout oxea, slightly curved or even angulate, sharply and fairly gradually pointed at each end; very rarely stylote; measuring about 0.65 by 0.032 mm. A number of shorter and much more slender oxea, sometimes toxiform, may also occur; but they appear to be merely young forms of the larger ones, with which they are connected by intermediates.

(2) Palmate isochelæ, about 0.064 mm. in length; of ordinary form, without the inward projection on the inner surface of the palm which characterises such species as *I. palmata*; the palm widening to the free end, which is broadly rounded; the alæ of each side completely separated from one another, about three-sixteenths of the shaft, in the middle, being entirely free from fimbria.

This interesting species is distinguished chiefly by its remarkable external appearance; but the large size of the palmate isochelæ is also noteworthy, while the more ordinary form of this spicule serves to distinguish the species from those which were included by Ridley and Dendy in the genus *Homæodictya*.

Register Nos., Locality, &c.—XXXIII. 12 and 12. a-g, 13 and 13. a; off Three Kings Islands (or off North Cape?), New Zealand.

Section *Guitarreæ*.

47. *Guitarra antarctica*, Hentschel [1914], var. *novæ-zealandiæ*, nov.

This variety is represented by some small fragments removed by Mr. Row from the surface of a specimen of *Jaspis novæ-zealandiæ* (R. N. XXX. 1), and mounted in Canada balsam. It differs from the type chiefly in the absence of the larger placochelæ and the smaller size of the sigmata.

The megascleres are somewhat unequal-ended oxea, measuring about 0.3 by 0.006 mm., densely and irregularly scattered, and in loose fibres and wisps. These spicules are straight or slightly crooked. Both ends are more or less sharply and gradually pointed, but one is usually rather more slender and more gradually pointed than the other.

The placochelæ are of quite ordinary form, but only 0.04 mm. long and rather scarce.

The sigmata are very small and inconspicuous, though numerous. They are very slender, C-shaped, and about 0.01 mm. long.

The type of the species was obtained from deep water in the Antarctic.

Register Nos., Locality, &c.—XXX. 1. h, i; Station 144, near Cape Maria van Diemen, New Zealand, 35-40 fathoms.

Section *Mycaleæ*.

48. *Mycale magellanica* (Ridley).

Esperia magellanica, Ridley [1881]; *Esperia cunninghami*, Carter [1882]; *Esperella magellanica*, Ridley and Dendy [1887]; *Mycale magellanica*, Thiele [1905].

There is a very fine, large specimen (R. N. XXII) of this species in the collection. The external appearance, though more irregular, is essentially similar to that figured

by Ridley. There are, as pointed out by Thiele, three chief sizes of palmate anisochelæ. Ridley probably took the smaller ones for young forms of the larger, a mistake very common at the time when he wrote. I have seen only very poor rosettes, but Thiele mentions them. The unusually stout, fusiform raphides, occurring usually in bundles, form a very characteristic feature of the species. Each individual raphis measures about 0.06 by 0.002 mm., and tapers to a fine point at each end. There are no sigmata.* Masses of light brown, coarsely granular cells, in and beneath the dermal membrane, are very conspicuous.

A second specimen (R. N. XLVIII. 1), also of columnar form, and from the same locality, agrees very closely with the above. It also contains no sigmata.

Register Nos., Locality, &c.—XXII; XLVIII. 1; N. of Cape Horn, April 13th, 1913, Lat. 52° 23' S., Long. 63° 50' W., 125 fathoms.

49. *Mycale lilliei*, n. sp.

Sponge somewhat flattened, tongue-shaped or lobate, apparently attached by one end in life, as indicated by the inclusion of coarse sand in the base. The interior is cavernous, with a number of openings to the exterior, of which some are undoubtedly vents, but these vents are not easy to distinguish owing to the damaged condition of the surface. There seem to be typically a few large vents situated on the edges or summits of the more or less flattened lobes and leading out of large oscular canals. The surface is rather uneven, often mammillated, and normally covered with a thick, easily separable, dermal membrane that frequently has a blistered appearance. There are no pore cracks. The texture is very soft and spongy; compressible, resilient, internally coarsely fibrous. The largest specimen measures about 123 mm. in height by 89 mm. in greatest breadth and 58 mm. in greatest thickness. Several others are of nearly the same size, sometimes more compressed; other much smaller ones are perhaps fragmentary. The colour in spirit is pale yellowish grey.

The main skeleton is very coarsely fibro-reticulate; the main fibres spreading out into brushes of megascleres beneath the surface to support the dermal membrane. The principal fibres, in the interior of the sponge, are compact and very stout. Numerous separate megascleres are scattered in the meshes of the reticulation. The dermal skeleton is an irregular reticulation of loose bundles of megascleres lying tangentially. There is no recognisable spongin in any part of the skeleton.

The following account of the spiculation is taken from R. N. XX. 3, which may be regarded as the type of the species. It is a typical, tongue-shaped, compressed specimen, 130 mm. in height by 65 mm. in breadth and 33 mm. in thickness, with surface projections ranging from low and blister-like to acutely conulose.

Spicules:—(1) Subtylostyli, of one size only; straight or nearly so; with very

* I have actually seen one, but it may be foreign.

feebly developed, oval heads, and rather abruptly sharp-pointed apices; size about 0.5 by 0.014 mm. Occasionally polytylote (abnormal?).

(2) Palmate anisochelæ of the first size; about 0.065 mm. in length. Perfectly typical, with only slightly curved shaft and broad palms; the large and small palms both ending very broadly and almost squarely. Frequently in very beautiful rosettes beneath the dermal membrane.

(3) Palmate anisochelæ of the second size; about 0.04 mm. long. Very similar to (2), but perhaps differing in the presence of a slight projection in the middle of the free edge of the small palm, though I think this sometimes occurs in (2) also.

(4) Palmate anisochelæ of the third size; about 0.024 mm. long. Closely resembling (2) and (3).

None of the chelæ have terminally projecting spurs at the small end.

(5) Large and fairly stout sigmata, more or less contort, of quite ordinary form. Size about 0.16 mm. from bend to bend, by 0.005 mm. in diameter in middle of shaft. The two ends rather sharply incurved and finely pointed, but not drawn out. Very abundant.

(6) Small sigmata, very similar to (5) but only about 0.048 mm. from bend to bend. Much less numerous.

(7) Short, fusiform raphides, or perhaps better, microxea; about 0.04 mm. long by 0.002 mm. thick in the middle; gradually and sharply pointed at each end; occurring singly or in small bundles (trichodragmata). Extremely rare in this specimen.

There can be no doubt that this species is closely related to *Mycale magellanica*, from which it differs chiefly in the presence of sigmata. The raphides (microxea) are unusually stout and in this respect agree with those of *Mycale magellanica*, and I know of no points of distinction as regards the remainder of the spiculation. Moreover, the number of sigmata present in *M. lilliei* varies enormously in different specimens, and apparently in inverse ratio to the number of raphides. Thus, while R. N. XX. 3 has a great many sigmata and hardly any raphides, R. N. XX. 1 has very few large sigmata, abundant but very slender small sigmata, and very abundant trichodragmata (composed of the unusually stout microxea); R. N. XX. 8, again, has very few large sigmata, a few very slender small sigmata, and abundant trichodragmata.

I am not aware that sigmata have ever been recorded for *M. magellanica*, but I have found one, which may of course be foreign, in my preparations of the "Terra Nova" specimen.

So far as regards the spiculation, then, there seems to be no really sharp distinction between the two species in question; but the uncompressed, massive, or columnar form of *M. magellanica* appears to be characteristic and it is perhaps

as well to keep the two distinct for the present. Probably *M. magellanica* has been derived from *M. lilliei* by loss of sigmata and a slight change of habit.

Register Nos., Locality, &c.—XX. 1-8; N. of Cape Horn, 125 fathoms. April 13th, 1913.

50. *Mycale novæ-zealandiæ*, n. sp. (Pl. V, fig. 3; Pl. 13, figs. 6-13.)

The single specimen in the collection (Pl. V, fig. 3) is pear-shaped, and has evidently been attached by the narrow end. The height is 84 mm. and the maximum breadth 44 mm. The surface is greatly corrugated, apparently as the result of contraction, and very minutely hispid. The vents are small, about 1 mm. in diameter, with very slightly prominent margins; fairly numerous on the broadly rounded upper part of the sponge. The inhalant pores are presumably in the floors of ramifying pore cracks. The cracks themselves are easily recognisable here and there, with prominent margins, but the marginal brushes of styli are not nearly so well defined as in *M. murrayi* [Ridley and Dendy, 1887], and the actual pores are not recognisable. The texture is rather spongy and compressible; internally coarsely fibrous, owing to the strongly developed spicular fibre of the main skeleton, which has been exposed by stripping of the superficial tissues in the lower part of the sponge (fig. 3). The colour (in spirit) is blackish grey, as though stained with osmic acid.

The main skeleton is composed of stout but rather ill-defined bundles of styli, radiating from the interior of the sponge, where they form an irregular reticulation, to the surface, where they end in well-developed dermal brushes projecting through the dermal membrane. There is a strongly developed subdermal reticulation of very loose, coarse, spicular fibre, lying a very short way beneath the dermal membrane, but separated from it by a distinct interval. There is no recognisable spongin.

Spicules:—(1) Long styli (Pl. XIII, fig. 13); straight, subfusiform; evenly rounded off at the narrow base or with very feebly developed, oval heads; gradually and finely pointed at the apex, measuring up to about 1.12 by 0.024 mm. Characteristic of the main skeleton.

(2) Short styli (fig. 12); straight or slightly curved; similar to (1), but much shorter; say about 0.5 by 0.016 mm. Characteristic of the dermal brushes. Of course intermediates between (1) and (2) occur abundantly.

(3) Large palmate anisochelæ (figs. 11 *a* and 11 *b*); very similar to those of *Mycale placoides* as figured by Lundbeck, but differing in that the fluke or palm at the large end projects from the shaft at a much wider angle, giving a characteristically short and wide-spreading appearance to the large end. These spicules measure about 0.088 mm. in length; they are very abundant, forming magnificent rosettes scattered beneath the surface and in the deeper parts of the interior.

(4) Intermediate palmate anisochelæ (figs. 10 *a* and 10 *b*); of more ordinary form; not forming rosettes; few in number; about 0.036 mm. long.

(5) Small palmate anisochelæ (figs. 9 *a* and 9 *b*); of ordinary form; not forming rosettes; very abundant throughout the sponge, but especially in the dermal membrane, where they occur in myriads; about 0.024 mm. long.

These three categories of anisochelæ appear to be sharply marked off from one another, there being but little variation of size or form within each.

(6) Large, stout sigmata (fig. 7); more or less contort; usually about 0.06 mm. from bend to bend, occasionally up to 0.08 mm. Very abundant throughout the interior.

(7) Small, slender sigmata (fig. 6); more or less contort; usually about 0.016 mm. from bend to bend; very abundant.

These two categories of sigmata are also pretty sharply marked off from one another, though intermediates are not wanting.

(8) Trichodragmata (fig. 8); perfectly typical, oblong bundles, measuring about 0.08 by 0.016 mm., separating into very slender, hair-like raphides in boiled out preparations; abundant in the more superficial parts of the interior.

This species evidently comes very near to *Mycale* (*Esperia*) *placoides*, Carter [1876], as re-described by Lundbeck [1905]. This is a characteristic North Atlantic species, as also is the closely related *Mycale lingua* (Bk.). They appear to be represented in Australian seas by *Mycale* (*Esperella*) *murrayi*, Ridley and Dendy [1887], and it is very interesting to find another closely related form in New Zealand waters. The New Zealand species, perhaps, comes nearer to *M. placoides* than to either of the others, but is distinguished by the shape of the large isochelæ and the presence of the larger sigmata.

The presence of the pore cracks is a characteristic feature of all these species and may possibly be found to serve as a means of generic distinction.

Register No., Locality, &c., XXIV; Station 90, near Three Kings Islands, 100 fathoms.

51. *Esperiopsis edwardii* (Bowerbank).

Isodictya Edwardii, Bowerbank [1866]; ? *Isodictya paupera*, Bowerbank [1866]; ? *Isodictya gracilis*, Bowerbank [1866]; *Amphilectus gracilis*, Vosmaer [1880]; *Amphilectus Edwardi*, Ridley [1883]; *Esperiopsis Edwardii*, var. *americana*, Ridley and Dendy [1887]; *Esperiopsis Edwardii*, Thiele [1905]; *Esperiopsis Edwardii*, Hentschel [1914].

There are a number of fragments of this species in the collection, all from the same locality; varying from small, flat pieces to elongated, flattened, or slender, cylindrical branches, with marginal rows of vents. One piece, at least, encrusts the stem of a hydroid colony, and it is not impossible that several of the fragments have been torn off from the same. The colour in spirit is light or dark grey, but two of the pieces have evidently been stained with osmic acid. The texture is very soft and fragile, without any axial condensation of the reticulate spicular skeleton.

The spiculation is perfectly typical, consisting of slightly curved styli, measuring

about 0.3 by 0.012 mm., and palmate isochelæ about 0.028 mm. long. Numerous foreign microscleres are present, including a very few toxa, but I do not think any of these can be regarded as belonging to the sponge. Very little spongin is present.

Previously known Distribution.—British Seas (Bowerbank, Ridley); Patagonia (Ridley and Dendy, Thiele); Kerguelen (Hentschel).

Register Nos., Locality, &c.—XIX. 4, 6, 12, 13, 14; XLVII. 1; LV. 10; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

52. *Esperiopsis macrosigma*, Stephens [1916, 1921], var. *novæ-zealandiæ*, nov. (Pl. XIII, figs. 14–20).

The specimen forms a thin brown crust on a block of black basalt, in company with many other organisms.

Spicules:—(1) Rather slender subtylostyli (Pl. XIII, fig. 14); approximately straight; gradually and sharply pointed; measuring about 0.425 by 0.0065 mm.

(2) Palmate isochelæ of the first category (figs. 15*a* and 15*b*); up to about 0.08 mm. long; closely resembling those of the type, but with a much shorter interval between the alæ of the two opposite ends, which tend to become confluent. Shaft nearly straight.

(3) Palmate isochelæ of the second category (figs. 16*a* and 16*b*); about 0.044 mm. long; with strongly curved shaft which sometimes seems to be connected by a thin membrane with each of the palms (in side view), an appearance which is almost certainly deceptive and due to inward curvature of the alæ.

(4) Palmate isochelæ of the third category (figs. 17*a* and 17*b*); about 0.016 mm. long; with rather strongly curved shaft.

(5) Giant sigmata (fig. 18); about 0.34 mm. from bend to bend; C-shaped, not contort.

(6) Small, slender sigmata (fig. 19); about 0.048 mm. long; more or less contort.

Intermediates occur, as might be expected, both amongst the chelæ and the sigmata.

The type of this species was obtained in deep water off the coast of Ireland, and it is extremely interesting to find a variety of it in deep water off the coast of New Zealand.

Register No., Locality, &c.—XXXV. *j*; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

53. *Esperiopsis megachela*, n. sp. (Pl. XIII, figs. 21–25).

This species is represented by a fairly thick but very friable crust (dry) of a pale brown colour, attached to the same block of basalt as the specimen of *Esperiopsis macrosigma*, var. *novæ-zealandiæ*. There is a distinct dermal membrane, with a dermal skeleton composed of a reticulation of more or less separate styli, supported on loose bundles of styli coming up from the deeper parts of the sponge. The

isochelæ are enormously abundant, both in the dermal membrane and in the deeper parts.

Spicules:—(1) Styli (Pl. XIII, fig. 21); straight or nearly so; evenly rounded off at the base, bluntly pointed at the apex; measuring about 0.76 by 0.016 mm. A few much more slender forms may occur mingled in the same skeletal bundles with the above.

(2) Palmate isochelæ of the first category (figs. 25 *a* and 25 *b*); up to 0.14 mm. in length and varying but little in size; the palm varying a good deal in width, but widest at the free end, where it is almost squarely truncated; alæ broad and slightly turned out at the free angles, leaving nearly one-third of the straight shaft quite free in the middle.

(3) Palmate isochelæ of the second category (figs. 23 *a* and 23 *b*); these spicules are quite different in form from the above; the shaft is more or less curved; the palm is much narrowed towards its free end, which is incurved; the alæ are also incurved, especially at the free angles, and the free, median portion of the shaft is a good deal shorter. They vary much in size, from about 0.04 to 0.1 mm. I at first thought that they could be separated into two categories, but this is not so.

(4) Palmate isochelæ of the third category (figs. 24 *a* and 24 *b*); only about 0.02 mm. in length; with rather strongly curved shaft and triangular palms broadest at the free ends.

This is an extremely interesting case, in which the three categories of isochelæ are quite sharply differentiated from one another by peculiarities of form. All are very numerous.

(5) Fairly stout, C- and S-shaped sigmata of ordinary form, with short, incurved ends (fig. 22); measuring about 0.064 mm. from bend to bend, very uniform in size; abundant.

(6) Smaller, flagelliform sigmata; curled almost into a circle and measuring about 0.024 mm. in maximum diameter from bend to bend. One or both ends are usually sharply recurved to form a short, sharp hook. These spicules are scarce and may perhaps be foreign, derived from a specimen of *Gellius flagellifer* growing on the same stone.

This very beautiful species appears to be sharply distinguished by the peculiar form of the isochelæ of the second category. Two other species, *E. decora*, Topsent [1904] and *E. flagellum* Lundbeck [1905], have been described as possessing flagelliform sigmata, but they are quite distinct from ours.

Register No., Locality, &c.—XXXV. *b*; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

Genus ARTEMISINA, Vosmaer [1885].

Esperellinæ of various habit, with a reticulate skeleton of spicular fibre, or spicule bundles, composed of styli and more or less spongin-cement, and often with

dermal or subdermal brushes of more slender styli. Microscleres small, palmate isochelæ and toxa, to which sigmata may be added.

It seems doubtful whether this genus is sufficiently distinct from *Esperiopsis* to deserve recognition, but as it has been accepted by Lundbeck, Topsent and Hentschel, and as a fair number of species have been described which conform to the above diagnosis, I propose to retain it as a matter of convenience.

54. *Artemisina jovis*, n. sp. (Pl. XII, fig. 6.)

This fine species is represented in the collection by a single specimen (Pl. XII, fig. 6). It is stipitate, much compressed, flabellate, with a slight tendency to divide into flattened digitations at the margin. The stalk is about 60 mm. long and 13 mm. in diameter; subcylindrical. The lamina is about 235 mm. in length (height) by about 110 mm. in greatest breadth and 6 or 8 mm. in thickness.

The two surfaces are sharply differentiated as inhalant and exhalant respectively. The former is quite smooth, though slightly undulating, and covered with a thin, subglabrous (in spirit) dermal membrane, minutely reticulate under a pocket-lens, and no doubt perforated in life by the inhalant pores. The latter is similar in appearance, except for the presence of numerous conspicuous compound vents scattered over it, each consisting of a small group of apertures in the floor of a shallow depression, about 4 mm. in diameter, which sometimes (perhaps always in life) has a thin, prominent margin. The exhalant surface is somewhat convex and a good deal abraded; the inhalant surface is correspondingly concave and much less damaged. The texture of the lamina is firm but compressible, and rather friable. The colour in spirit is greenish grey, the green tint being due to staining by the copper tank in which the specimen was preserved.

The main skeleton is an irregular, sub-isodictyal reticulation of stout styli, in which the spicules are mostly arranged in loose bundles and fibres of varying thickness, held together by a moderate amount of spongin. There is a special dermal or subdermal skeleton consisting of radiate brushes of much more slender styli supporting the dermal membrane, with a few similar styli scattered tangentially in the dermal membrane itself.

Spicules:—(1) Stout styli of the main skeleton; usually rather strongly curved; broadly rounded off at the base, sharply and fairly gradually pointed at the apex; measuring about 0.39 by 0.024 mm.

(2) Styli or subtylostyli of the subdermal brushes; straighter and more slender; with smoothly rounded base and fairly gradually sharp-pointed apex; measuring about 0.3 by 0.012 mm.

(3) Small palmate isochelæ; about 0.012 mm. long; enormously abundant, but very inconspicuous on account of their slenderness.

(4) Toxa; resembling hair-pins with reflexed ends and with the central angle

opened out to varying extents; moderately stout, and with markedly roughened ends; each limb measures about 0.1 mm. in length by 0.002 mm. in thickness.

This species is characterised especially by its very distinctive external form and large size as compared with other species of the genus. There is nothing peculiar about the spiculation.

Register No., Locality, &c.—XXXII. 7; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

55. *Artemisina elegantula*, n. sp.

This remarkable species is represented by a single small specimen, which, fortunately, was well preserved. The sponge consists of a short stalk, gradually expanding upwards into a turbinate body, obliquely truncated above to form a slightly convex upper surface with an approximately circular margin, below which a shallow groove runs round the sponge. Nearly in the middle of the upper surface is the single, rather small vent, surrounded by a thin, membranous collar (containing megascleres). The sides and top of the sponge-body are alike covered by a thin, transparent, probably pore-bearing, dermal membrane, through which can be seen with a lens the underlying reticulation of tissue. The interior of the sponge is somewhat cavernous; the texture is soft and resilient; the colour in spirit is pale yellowish grey. The total height of the specimen is 17 mm.; the diameter of the upper surface 7 mm.

The main skeleton is a sub-isodictyal reticulation of styli in loose bundles, held together at the nodes by a very small quantity of spongin. Over the lateral surface of the sponge there is a dermal skeleton, composed of a loose, irregular reticulation of single styli lying horizontally. On the upper surface the arrangement is quite different, the dermal membrane being supported on radiating brushes of styli which are much smaller than those of the general skeleton, and being devoid of the larger styli which occur lying horizontally, as above described, over the lateral surface.

Spicules:—(1) Fairly stout, slightly curved styli or subtylostyli; narrowing slightly towards the base, gradually and sharply pointed at the apex; measuring about 0.39 by 0.016 mm.

(2) Smaller styli of the subdermal brushes beneath the upper surface; straight or nearly so; narrowing slightly towards the base, which may be faintly subtylote; sharply and fairly gradually pointed at the apex; measuring about 0.25 by 0.009 mm.

(3) Minute palmate isochelæ, ranging in length from 0.016 mm. down to 0.004 mm. The palms are triangular in front view. These spicules occur in enormous numbers, both in the dermal membrane and in the interior of the sponge.

(4) Large sigmata; slightly contort, fairly stout, measuring about 0.1 mm. from bend to bend. Rather scarce. A very few small sigmata also occur.

(5) Toxa; very strongly curved in the middle, like the curve of a hair-pin, then

very widely spreading, with slightly reflexed, minutely spined ends; measuring, say, about 0.2 mm. in a straight line from end to end by 0.0027 mm. in diameter near the middle. Rather scarce; a few short, smooth toxa also occur.

The sponge contains a certain number of foreign spicules, and it is difficult to be quite certain that the sigmata and toxa really belong to it, but I have little doubt they do, especially the toxa.

This very interesting species appears to be closely related to Topsent's *Esperiopsis columnata* [1892] from the North Atlantic.

Register No., Locality, &c.—XLVII. 9; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

56. *Desmacella vestibularis* (Wilson).

Tylodesma vestibularis, Wilson [1904].

This species occurs extensively encrusting specimens of four species of Stellettidæ, viz. *Stelletta columna*, *S. crater*, *Ancorina stalagmoides* and *Asteropus simplex*, as described in connection with those species. The crust ranges from about 1.5 to 3.5 mm. in thickness, and is penetrated either by the outer ends of the megascleres of the Stellettid or, in the case of *Asteropus simplex*, by an invasion of the general skeleton. The vents are small and scattered, and rather slit-like, and appear, in some cases at any rate, to serve also as exhalant apertures for the Stellettid.

The main skeleton consists of tylostyli, for the most part loosely and irregularly scattered, but collecting together in radial bundles towards the surface, which is protected by a thick pile of radiate spicule brushes.

Spicules:—(1) Tylostyli; usually slightly curved near the base; with well-developed spherical heads; gradually and sharply pointed at the apex; varying greatly in size, from about 0.14 by 0.006 to about 0.63 by 0.012 mm.

(2) Sigmata; simple and contort, varying from about 0.01 to 0.044 mm. from bend to bend.

I think there can be no doubt that this species is identical with the sponge described by Wilson under the name *Tylodesma vestibularis* from a depth of 53 fathoms amongst the Galapagos Islands, on the opposite side of the Pacific Ocean. A number of encrusting or so-called parasitic species of *Desmacella* have, however, been described, and I am by no means sure that Wilson's species may not be identical with some one or other of those previously known. Evidently this thinly encrusting type of *Desmacella* is very widely distributed. I have referred on previous pages to the possibility of the existence of a true commensalism between the *Desmacella* and the sponge on which it is growing. It is obvious that there must be some mutual accommodation between the canal-systems of the two species, but probably the association is by no means obligatory.

Previously known Distribution.—Galapagos Islands (Wilson).

Register Nos., Locality, &c.—Growing on *Stelletta crater*, R. N. XXXII. 2, 15,

16, Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms, and R. N. L. 9, Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms; and on *Stelletta columna*, R. N. XXXII. 4, Station 96, as above; and on *Ancorina stalagmoides*, R. N. XXXIII. 1, 6, off Three Kings Islands, N. of New Zealand; and on *Asteropus simplex*, R. N. XXXII. 11, Station 96.

57. *Biemna novæ-zealandiæ*, n. sp. (Pl. XIV, figs. 1–4.)

This species is represented by a rather thin, white crust, on what looks like a shell fragment partially embedded in a dry specimen of *Ancorina stalagmoides* (R. N. XXXIII. 1). The main skeleton has a rectangularly reticulate appearance under a pocket-lens, where the surface has been removed, with stouter primary spicular fibres and slender secondaries. The dermal skeleton is too much injured for description, but there are indications of a stellate arrangement of spicules.

Spicules:—(1) Styli (Pl. XIV, fig. 1); stout, slightly curved, especially towards the base, which is evenly and broadly rounded; measuring up to about 1.07 by 0.032 mm., but often much slenderer.

(2) Large sigmata (fig. 2); C-shaped or slightly contort; with short, sharp, incurved extremities; measuring from about 0.056 to about 0.14 mm. from bend to bend and about 0.004 mm. thick; sometimes in sigmodragmata.

(3) Small sigmata (fig. 4); C-shaped, very slender, about 0.02 mm. from bend to bend, or less.

(4) Microxea (fig. 3); straight, fusiform, gradually and finely pointed at each end; measuring about 0.096 by 0.003 mm.; scattered singly or in dragmata.

(5) Microxea; very much smaller than (4) but of much the same form; about 0.02 mm. long; comparatively few, scattered and in dragmata.

(6) Slender raphides; hair-like; about 0.12 mm. long, or perhaps more; scattered and in dragmata.

The larger sigmata and microxea are enormously abundant.

The species is evidently nearly related to *Biemna trirhaphis*, Thiele [1903 B] (= *Desmacella peachi*, var. *trirhaphis*, Topsent [1897]) and to *Biemna megalosigma*, Hentschel [1912], but it differs in details of spiculation.

Register No., Locality, &c.—XXXIII. 1. a; off Three Kings Islands (or off North Cape?), New Zealand.

58. *Biemna* sp.

A second and quite distinct species of *Biemna* is represented by some small fragments removed by Mr. Row from the block of black basalt (R. N. XXXV) and mounted in balsam. It differs from *B. novæ-zealandiæ* chiefly in the absence of microxea and the more strongly curved form of the larger C-shaped sigmata. The trichodragmata of hair-like raphides are more numerous. It is evidently closely

related to *Biemna chilensis*, Thiele [1905] and *B. macrorhaphis*, Hentschel [1914], but is too fragmentary for specific identification.

Register No., Locality, &c.—XXXV. e, x; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

SUB-FAMILY ECTYONINÆ.

SECTION *Iophoneæ*.

Genus IOPHON, Gray [1867], *emend.*

Sponge soft and crumbling, usually dark coloured in spirit. Main skeleton a reticulation of loose spicule fibre or of single spicules, usually acanthostyles but sometimes smooth; echinated by accessory acanthostyles. Dermal skeleton a reticulation of secondary diacts (tylota, &c.). Microscleres palmate anisochelæ (with the small end usually spurred) and bipocilla.

The type of Gray's genus *Iophon* is Bowerbank's *Halichondria scandens*, which is clearly shown by the description and illustrations of that author to be a species with echinating acanthostyles. Ridley and Dendy, in their "Challenger" Report [1887], failed to distinguish such species from those without echinating spicules. Topsent [1891, 1893] pointed out the desirability of such distinction, but unfortunately proposed his genus *Pocillon* with a type-species (*Isodictya implicita*, Bwk. = *I. hydmanni*, *vide* Stephens [1912]) which has echinating acanthostyles, reserving *Iophon* for species without echinating (accessory) acanthostyles. In this respect he has been followed by Lundbeck [1905].

Nothing could be much clearer than that *Pocillon* is a synonym of *Iophon* and must be abandoned in favour of the latter. The group of species without echinating spicules is thus left without a generic name, and to rectify this omission I propose the genus *Iophonopsis*, with *I. nigricans*, the second species of Gray's genus *Iophon*, as the type.

59. *Iophon lævistylus*, n. sp. (Pl. X, fig. 1, a.)

This species is represented by a small sponge (Pl. X, fig. 1, a) attached to the type-specimen of *Clathria scotti* (R. N. LII). It appears exactly like the terminal portion of one of the branches of the latter, except for its darker brown colour and smoother surface. It is oval in transverse section and measured, before cutting, about 7 mm. in length by 4 mm. in longer transverse diameter. The texture is rather firm and fairly tough.

The main skeleton is a sub-isodictyal reticulation of smooth styli, with irregularly triangular meshes, rather sparsely echinated by acanthostyles. The sides of the meshes are pluri- or multi-spicular, and of one spicule's length. There is a dermal skeleton of tylota, irregularly scattered in the dermal membrane, where they tend to form a network. Spongin is not conspicuous, but I think there must be a little at the nodes of the main skeleton.

Spicules :—(1) Smooth styli; slightly curved towards the base, which is slightly narrowed and faintly subtylote; gradually sharp-pointed at the apex; size about 0.32 by 0.012 mm.

(2) Acanthostyli; straight, tapering gradually from base to finely pointed apex; spines small, sharp, curved, abundant at the base and diminishing in numbers towards the smooth apex; size about 0.136 by 0.012 mm. (at base, including spines).

(3) Tylota; slightly curved, tapering towards each end, with small, slightly spined heads; size about 0.264 by 0.008 mm.

(4) Palmate anisochelæ of the usual *Iophon* type, with small end spurred; ranging up to about 0.028 mm. in length. Very numerous.

(5) Bipocilla; of quite ordinary form but only about 0.008 mm. in length. Very numerous.

So far as I am aware this is the only species of *Iophon* as yet known with perfectly smooth styli for principal spicules. It brings out very sharply the distinction between the echinating spicules and those of the main skeleton, which was ignored in the "Challenger" Report on the Monaxonida.

Register No., Locality, &c.—LII. a; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

Genus IOPHONOPSIS, n. gen.

Sponge soft and crumbling, usually dark coloured in spirit. Main skeleton a reticulation of loose spicule fibre or of single spicules, usually acanthostyles but sometimes smooth (?), not echinated by accessory acanthostyles. Dermal skeleton a reticulation of secondary diacts (tylota, &c.). Microscleres palmate anisochelæ (with the small end usually spurred) and bipocilla.

I regard Bowerbank's *Halichondria nigricans* as the type-species of this genus and *H. pattersoni* as another species. In the latter the characteristic bipocilla evidently tend to disappear, and they are not mentioned by Bowerbank.

60. *Iophonopsis* sp.

This species is represented by some fragments of rather dark brown colour, very soft and crumbling texture, and a characteristic honeycombed appearance. The largest measures about 30 by 17 by 12 mm. and looks like part of a lobose specimen, with a rounded margin bearing a row of three vents, of which the largest is about 4 mm. in diameter, each the opening of a cylindrical oscular tube. The substance of the sponge is made up of a meshwork of trabeculæ with rounded canals between them, the ends of these canals, at the surface, being covered by the thin, translucent, finely reticulate dermal membrane.

The main skeleton is a sub-isodictyal reticulation of acanthostyles, with triangular meshes whose sides are made up each of from one to about four spicules. There is no fibre, no recognisable spongin, and no echinating spicules. The dermal

skeleton is very feebly developed, consisting of slender tylota, scattered or in loose wisps and fibres.

Spicules:—(1) Acanthostyli; very slightly curved; abundantly spined but more so towards the base and apex than in the middle; the spines are small, sharp, conical; the apex is short, conical, sharp-pointed and smooth; size about 0.02 by 0.016 mm., including spines.

(2) Secondary diacts of the dermal skeleton; long and slender, nearly straight; usually tylote, with irregularly spined ends; size about 0.2 by 0.005 mm.

(3) A very few minute, palmate anisoschelæ have been observed, about 0.016 mm. long, but so small and rare that no satisfactory account can be given of them.

(4) A very few minute bipocilla, about 0.008 mm. long, have also been seen, apparently in a vestigial condition.

This species comes very near to *I. pattersoni*, and may be merely a variety thereof, with both chelæ and bipocilla vestigial. At any rate it does not seem desirable to propose a new specific name until more material is forthcoming.

Register No., Locality, &c.—L. 2; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

SECTION *Clathriæ*.

61. *Bubaris oxeata*, n. sp. (Pl. XIV, figs. 20 and 21.)

This species is represented by two or three thin crusts attached to the block of black basalt (R. N. XXXV) so often referred to, the type (R. N. XXXV. *f*) being about 21 mm. in maximum diameter. There are abundant remnants of a thin dermal membrane, of a dark brown colour, supported on the ends of the projecting styli. The soft tissues of the interior are also dark brown.

The skeleton consists of a basal crust of short, interlacing oxea, for the most part disposed horizontally, in which are inserted the bases of very numerous, rather close-set styli of various sizes, which project from the basal crust more or less perpendicularly.

Spicules:—(1) Oxea (Pl. XIV, fig. 21) of the basal crust; more or less bent or angulated, symmetrically or asymmetrically; quite smooth; rather abruptly pointed at each end. Size variable, say about 0.27 by 0.012 mm.

(2) Smooth, stout styli (fig. 20), varying greatly in size, say from 0.289 by 0.0127 to 1.037 by 0.034 mm., or perhaps more; often more or less bent near the broadly rounded base, especially in the smaller forms, otherwise very straight and tapering gradually to the usually sharply-pointed apex.

This species is evidently very closely related to Topsent's *Hymenhabdia oxytrunca* [1904], but in that species the basal spicules are almost always stylote, and only exceptionally oxeote. Topsent considers them as being derived from oxea,

but I am inclined to think that the oxeote condition here shown is secondary and derived from the stylote.

Register Nos., Locality, &c.—XXXV. *f, h, u*; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

62. *Bubaris elegans*, n. sp. (Pl. X, fig. 5; Pl. XIV, figs. 22-24.)

The single specimen (Pl. X, fig. 5) consists of a cylindrical stalk, attached below by a slightly expanded base to a fragment of calcareous débris, and dichotomising above in two places, so that there are three terminal branches. The branches are slightly swollen but drawn out apically into conical points. The surface of the sponge has a slightly but characteristically woolly appearance, due to the slight projection of the ends of the radial skeleton columns, but this diminishes towards the stem, which is nearly smooth. There are no recognisable vents or pores. The entire sponge has a very stiff, erect appearance. The total height is 42 mm.; length of stem 14 mm., diameter 2 mm.; length of terminal branches about 12 mm., diameter 3 mm. The colour in spirit is white, the texture stiff and tough, but flexible and elastic.

The skeleton consists in the first place of a dense central axis. In the branches this occupies up to about one-third of the total diameter. In the stem, which I have purposely avoided cutting, it probably occupies much more. In this axis the spicules are so closely packed that it is very difficult to make out their exact form, but they seem to be a mixture of the types described below, with long, straight styli lying lengthwise in the middle and shorter bent styli and oxea towards the surface, variously orientated. From the central axis thus constituted come off almost at right angles short, stout, densely plumose columns or brushes of spicules, the ends of the terminal spicules projecting beyond the surface, but now mostly broken short. These columns again consist of long, straight styli and comparatively short, bent spicules.

Spicules :—(1) Shorter styli and oxea (figs. 23 and 24); more or less bent, gradually sharp-pointed at the one end and ranging from broadly rounded to gradually sharp-pointed at the other, as shown in the figures; size about 0.27 by 0.012 mm., sometimes rather less.

(2) Long styli (Pl. XIV, fig. 22); straight or slightly bent, characteristically narrowed at the base, gradually and sharply-pointed at the apex; size about 0.55 by 0.015 mm.

The different types are connected by intermediate forms and sizes.

This species has a good deal in common with Topsent's *Bubaris sosia* [1904], especially as regards external form, but differs widely in the character of the axial spicules, which in *B. sosia* are vermicular strongyla. It agrees with my *B. oxeata* (from the same locality as *B. elegans*) in the general features of the spiculation, but the long styli of *B. oxeata* attain a much larger size and do not exhibit the narrowing

at the base so characteristic of *B. elegans*. *B. oxeata* is an encrusting species and, though evidently specifically distinct from *B. elegans*, seems to stand in much the same relation to the latter as *B. vermiculata* to *Axinella erecta*. The spiculation of *Bubaris elegans* is more Axinellid than that of *Axinella erecta*, and the species seems to afford an easy transition between the two genera.

Register No., Locality, &c.—XLI; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

63. *Bubaris ornata*, n. sp. (Pl. XIV, figs. 25–27.)

The single specimen forms a thin crust of a pale brownish colour and about 7 mm. in breadth, upon the block of black basalt (R. N. XXXV). It lies close to the large crust of *Bubaris vermiculata*, from which it is indistinguishable in external appearance.

The skeleton consists of a dense basal mass of felted acanthostrongyla, from which springs a dense forest of styli and acanthostyli with outwardly directed apices.

Spicules:—(1) Acanthostrongyla (Pl. XIV, fig. 27); abundantly but minutely spined; more or less curved or angulated, the bend usually occurring about the middle; often slightly tylote; varying a good deal in size and proportions, e. g. 0.068 by 0.01 mm., 0.136 by 0.008 mm., 0.124 by 0.0067 mm.

(2) Acanthostyli (fig. 26); usually more or less sharply bent near the broadly and evenly rounded base, tapering gradually to the finely pointed apex; spines minute but abundant, commonly absent from the apical portion; size variable, say about 0.172 by 0.01 mm.

(3) Smooth styli (fig. 25); nearly straight, with broadly rounded base and tapering gradually to the finely pointed apex; size about 0.372 by 0.014 mm. (possibly much longer in some cases).

(2) and (3) are connected by intermediate forms.

The acanthostrongyla of this interesting species suggest a relationship with the genus *Plocamia*, but I have found no microscleres.

Register No., Locality, &c.—XXXV. o; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

64. *Bubaris vermiculata* (Bowerbank).

Hymeraphia vermiculata, Bowerbank [1866, 1874]; *Bubaris vermicularis*, Gray [1867];
Hymeraphia vermiculata, Carter [1876]; *Bubaris vermiculata*, Thiele [1903 A]; *Bubaris vermiculata*, Topsent [1891, 1904]; *Bubaris vermiculata*, Stephens [1921].

This well-known and widely distributed species is represented in the collection by a thin but very extensive crust, up to about 80 mm. in breadth, growing upon the block of black basalt, R. N. XXXV; and by one or more smaller crusts, associated with it on the same stone. I have compared the spiculation with

"Porcupine" specimens of the encrusting form in Mr. Carter's cabinet and find no difference except that the vermiform spicules of the basal layer are much more robust in the New Zealand example. Topsent, however, has shown how much these vary in size in specimens from the Azores. Over considerable portions of the large crust the hispidating styli have either never developed or been rubbed off, so that the crust consists only of the vermiform spicules densely interwoven into a coherent mass.

Previously known Distribution.—North Atlantic, British Seas, Azores, &c. (Bowerbank, Carter, Topsent, Stephens). Var. *erecta* also from Gulf of Manaar (Carter) and South Atlantic and Southern Ocean (Ridley and Dendy).

Register No., Locality, &c.—XXXV. a, p; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

65. *Clathria scotti*, n. sp. (Pl. X, fig. 1; Pl. XIV, figs. 5–8.)

There are four specimens of this sponge in the collection, all from the same locality and all closely resembling one another in appearance. The largest and most perfect (Pl. X, fig. 1) may be regarded as the type. It has a well-developed, stout main stalk which divides and subdivides into irregular branches, which anastomose with one another at wide intervals and tend to lie, in very straggling fashion, in one plane. The branches are rather slender, somewhat flattened, and ragged in outline, and where a number join together they form flat, fenestrated, rugose expansions. The unbranched main stem is about 45 mm. in height by 8 mm. in diameter; the branches average about 5 mm. in diameter, and the total height of the specimen is about 210 mm. The colour in spirit is light brown and the texture compressible, tough and elastic, with harder stem.

The skeleton is a very irregular reticulation of horny fibre, cored by the stout, smooth styli and abundantly echinated by the acanthostyles. Some of the first-mentioned spicules project in sparse brushes from the surface of the sponge, where there are also sparse, irregular brushes of slender tylostyles.

Spicules:—(1) Stout styli (Pl. XIV, fig. 5); entirely smooth, slightly curved, especially towards the base, which is evenly rounded off or subtylote; gradually and sharply pointed at the apex; size about 0.527 by 0.025 mm.

(2) Acanthostyles (fig. 7); short, straight, tapering gradually from base to sharply pointed apex; thickly covered almost to the apex with small, conical spines, which are thorn-like and curved, those on base and shaft pointing in opposite directions (towards one another); size about 0.1 by 0.016 mm. (including spines), without much variation.

(3) Slender, straight (or nearly straight), entirely smooth tylostyli or subtylostyli (fig. 6); usually with rather fully developed, oval heads; gradually and sharply pointed at the apex; measuring up to about 0.36 by 0.006 mm.

(4) Toxa (fig. 8); long, slender, hair-like, with very open angle, so that the two

limbs tend to lie in the same straight line; length up to about 0.5 mm.; often associated in loose bundles.

The soft tissues contain numerous short chains of highly refractive granules, probably Schizophyta.

Of the numerous species of *Clathria* (including *Rhaphidophlus*) already known, this species, perhaps, comes nearest to Whitelegge's [1907] *Rhaphidophlus tenebratus* from New South Wales, from which it differs chiefly in the absence of the isochelæ; but Whitelegge's figured specimen is a very poor one. I have ventured to name the species after the distinguished explorer whose name will ever be associated with Antarctic discovery.

Register No., Locality, &c.—LII (four specimens); Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

66. *Clathria terræ-novæ*, n. sp. (Pl. XII, fig. 5; Pl. XIV, figs. 9-13.)

The external form of this sponge (Pl. XII, fig. 5) is very characteristic. From a short, erect stem arises a bushy mass of slender branches, giving off longer or shorter lateral branches, which anastomose with one another pretty freely. The branches are usually sub-angular or slightly flattened, and many of the lateral branches are so short as to appear as mere knobs, giving the main branches a nodose appearance. The freely projecting terminal portions of the branches are rather short, and rounded or bluntly pointed. R. N. V. 2 is the most perfect of the three specimens, in that the stem has not been cut off from the base of attachment, as it has been in R. N. V. 3, which is more bushily branched and altogether more beautiful. The total height of the former specimen is about 160 mm., and the greatest breadth about 90 mm. The main stem is about 24 mm. in height and 7 mm. in diameter, scarcely expanding at the base. The diameter of the branches is about 3 mm. The colour in spirit is light brown; the texture tough, compressible and elastic, with harder stem. The surface is very minutely hispid. Vents and pores are not recognisable externally.

The skeleton consists of ascending, plumose columns of larger and smaller acanthostyles; the main columns lie in or near the middle of the branch and anastomose with one another to some extent, while giving off obliquely ascending secondary columns towards the surface. The main columns contain a very large amount of brown-coloured, laminated spongin, in which the bases of the spicules are more or less deeply implanted. The spongin gradually diminishes in the secondary columns as they approach the surface, where their ends mingle with somewhat sparse dermal brushes of slender tylostyles.

Spicules:—(1) Large, stout, basally spined acanthostyles (Pl. XIV, fig. 9); more or less, but usually only slightly, curved; smooth except at the base, which is thickly covered with small, conical spines; tapering gradually to sharply-pointed apex; measuring up to about 0.6 by 0.024 mm.

(2) Small acanthostyles (fig. 10); slightly curved, tapering gradually to sharply pointed apex; base sometimes subtylote, thickly covered with small, thorn-like spines curved towards the shaft; shaft rather sparsely covered with sharp, thorn-like spines recurved towards the base, more sparsely developed in the neighbourhood of the base and of the apex; size variable, from about 0.12 by 0.017 to about 0.36 by 0.025 mm. (including spines). The larger ones (fig. 10a) may be regarded as constituting a transition between (1) and (2), but the distinction between the two categories remains pretty sharp.

(3) Straight, slender tylostyli (fig. 11); with small heads, which commonly show a faint trace of spination; gradually and sharply pointed at the apex; size variable, up to about 0.4 by 0.008 mm.

(4) Toxa (fig. 12); short and rather stout; angle very various; often very contort; often with slightly spined or roughened apices; length, say, about 0.08 mm.

(5) Palmate isochelæ (fig. 13); of the usual *Clathria* type, but very minute and slender, and easily overlooked owing to their sporadic distribution; length about 0.008 mm.

This is one of those species which in spiculation and skeleton arrangement make a near approach to the genus *Microciona*, but its mode of growth is that of a typical *Clathria*.

Register No., Locality, &c.—V. 1-3; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

67. *Raspailia topsenti*, n. sp. (Pl. XII, fig. 4; Pl. XIV, figs. 14-16.)

The specimen (R. N. II. 1, Pl. XII, fig. 4) which I regard as the type of this species is arborescent; copiously and subdichotomously ramified, with rather short, subcylindrical branches anastomosing with one another pretty frequently, the whole branch-system tending to expand in one plane and arising from a short, stout, subcylindrical stem. The total height of the specimen is about 176 mm., the maximum breadth about the same; the unbranched stem measures about 35 by 10 mm.; the terminal branches average about 45 by 5 mm. and end bluntly, with hardly any taper. There are no recognisable vents. The surface is granular and very minutely hispid.

Stem and branches alike consist of a stout, horny-looking axis, resembling that of a *Gorgonia*, and of a dark brown colour in the older parts, surrounded by a layer of soft tissue of a pale greyish colour, which can be readily scraped off, leaving the axis bare.

The axis, in longitudinal or transverse sections, appears at first sight to be composed of an utterly confused, dense interlacement of stout styli; but closer examination shows that it is made up, in part at any rate, of stout longitudinal strands of horny fibre abundantly cored with styli. From this axis close-set spicular fibres, or columns of stout styli, curve upwards and outwards to the surface, where

they terminate in feebly developed tufts of similar styli, associated with which are a few, evidently vestigial, brushes of very slender styli or raphides. The outwardly curving spicular columns are not very well defined, and exhibit a slightly plumose character owing to the want of parallelism amongst many of the component spicules. They contain little if any spongin, and are connected with one another by transverse bundles of stout styli, or by single spicules. They are abundantly echinated by the small acanthostyles so characteristic of the genus, which also occur, though less abundantly, in the central axis.

Spicules :—(1) Stout styli (Pl. XIV, fig. 14); more or less curved or bent; entirely smooth; evenly and broadly rounded off at the base; sharply and more or less gradually pointed at the apex; size up to about 0.44 by 0.02 mm.

(2) Slender styli or raphides of the dermal brushes (fig. 15); smooth, straight, often of hair-like dimensions, about 0.16 by 0.0013 mm.

(3) Small acanthosubtylostyles (fig. 16); bent near the base like a hockey-stick; tapering very gradually to the apex; the proximal third, or thereabouts, smooth, the distal two-thirds minutely spined, right up to the apex; size about 0.1 by 0.008 mm.

This species probably falls within the limits of Topsent's genus *Raspaxilla* [1913 B], which that author, as I think unnecessarily, separates from *Raspailia*, largely on account of the character and arrangement of the acanthostyles. It is especially interesting because of the vestigial condition of the dermal brushes of slender styli, which seem to be entirely absent in the closely allied species, *R. inæqualis*, described below.

In addition to the type-specimen described above, there are in the collection two other much less perfect specimens with rather short branches and vestigial brushes of slender dermal spicules. One of these (R. N. II. 3) has been almost entirely denuded of the soft tissues and reduced to a hard, stiff, elastic stem with branches coming off in one plane only, so that it makes a close approach to the external appearance of *R. inæqualis*, though the branches, so far as can now be ascertained, are all short. Neither of these specimens exhibits any anastomosis of the branches, but I think they may both be regarded as belonging to the species described above.

Register Nos., Locality, &c.—II. 1-3; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

68. *Raspailia inæqualis*, n. sp. (Pl. XII, fig. 1; Pl. XIV, figs. 17-19.)

There is a single very fine specimen of this remarkable sponge (Pl. XII, fig. 1). The subcylindrical stem, slightly expanded below in a base of attachment, is about 72 mm. high by 8 mm. in diameter. The branching is almost regularly dichotomous, and the branches, whose proximal portions are very distinctly flattened, are spread out all in the same plane, entirely without anastomosis. The terminal branches vary greatly in length, some being quite short while others are very long and slender. Thus one of two branches formed by the same bifurcation measures only about

35 mm. in length, while the other measures no less than 305 mm., becoming cylindrical and quite slender distally. The main branches measure about 8 mm. in breadth by 5 mm. in thickness, and the slender, cylindrical, terminal portions of the elongated branches about 3.5 mm. in diameter, tapering to blunt points. The total height of the specimen is about 460 mm. The hard, elastic axis is covered with a rather thin layer of soft tissue having a somewhat velvet-like texture, with very minutely hispid, granular-looking surface. The colour in spirit is greyish. There are no recognisable vents.

The solid axis occupies about two-thirds of the longer diameter, and about one-third of the shorter diameter of the flattened branches. At first sight the spicules appear to lie in it without order, pointing in all directions; but closer examination shows that there is really a dense network of horny fibre, mostly longitudinal, in which the individual fibres are cored by smooth, slender styli, and echinated to a slight extent by acanthostyles, though the spination of these spicules is here so slight as to make it difficult to recognise them in the confused mass. From this central axis numerous close-set spicular columns radiate almost at right angles to the surface of the sponge, where they terminate in well-developed brushes of stout styli. The axes of these columns are made up of similar or more slender styli, and they are echinated in a plumose fashion by the acanthostyles. The columns also branch occasionally, and are irregularly connected with one another by transverse spicules or spicule-bundles. The bases of the columns may be deeply embedded in the solid axis, which evidently extends in between them as thickening of the branch progresses.

Spicules:—(1) Large, stout styli (Pl. XIV, fig. 17); more or less curved or bent; entirely smooth; broadly and evenly rounded off at the base; tapering gradually to a sharply or bluntly pointed apex; size about 0.37 by 0.017 mm. (may be rather longer and slenderer, e.g. 0.476 by 0.014 mm.).

(2) Smooth styli (fig. 18); similar to the above, but smaller, and especially more slender; measuring, say, about 0.22 by 0.0053 mm., but very variable; characteristic of the interior of the sponge. A few oxea occur amongst them.

(3) Acanthostyles, or subtylostyles (fig. 19); more or less bent towards the base; tapering very gradually to the sharply-pointed apex; the proximal third, or thereabouts, smooth, the distal two-thirds very minutely spined right up to the apex; measuring, say, about 0.132 by 0.008 mm. These spicules seem sometimes entirely to lose their spination and pass into (2).

I at first thought that this species must be regarded as a mere variety of *Raspailia topsenti*, the single specimen coming from the same station as the specimens of the latter, and closely resembling them in most respects. In distinguishing the two I lay particular stress upon the complete absence in *R. inæqualis* of the vestigial dermal tufts of very slender styli which characterise *R. topsenti*. In this respect *R. inæqualis* agrees with Hallmann's genus *Echinaxia* [1917 B], which, together with *Raspaxilla*, I should include in *Raspailia*. Other features by which the two New

Zealand species may perhaps be distinguished from one another are the great elongation of some of the branches in *R. inæqualis* and the much smaller size, and especially more slender character, of the majority of the smooth styli.

Register No., Locality, &c.—II. 4; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

69. *Rhabderemia coralloides*, n. sp. (Pl. XII, fig. 3; Pl. XV, figs. 1-4.)

There are three pieces of this sponge in the collection, which may all have belonged to the same specimen. The largest (Pl. XII, fig. 3) is a mass of irregular, subcylindrical, anastomosing branches, resembling a Madrepore. The entire mass is about 120 mm. in maximum diameter. The individual branches are about 12 mm. in diameter; they anastomose with one another at short intervals, the terminal portions ending bluntly and not projecting far. The surface of the sponge is granular from the slight projection of the ends of the primary lines of the skeleton. It is also characteristically marked by shallow, branching grooves, about 1 mm. in width. These grooves rarely anastomose, but their branches converge and meet at points where, in life, vents must have been situated. They are still covered with a thin, translucent dermal membrane, and are doubtless superficial exhalant canals. Numerous small openings occur in their floors. The texture of the sponge is very firm and compact; scarcely compressible, but rather friable. The colour in spirit is pale greyish yellow.

The skeleton is a very compact reticulation of spicular fibre, or, better, of spicule-bundles, or even single spicules, in which the side of the mesh is of only one spicule's length. In the interior the meshes are usually triangular, but more externally there is a well-marked tendency to form quadrangular meshes with stouter primary skeletal lines radiating to the surface, where their ends give rise to the small papillæ or granules above mentioned. There is no special dermal skeleton, the thin dermal membrane, which covers the general surface of the sponge as well as the superficial exhalant canals, containing only microscleres. There is no visible spongin.

Spicules:—(1) Acanthostyles (rhabdostyles) (Pl. XV, fig. 1); stout; straight, except towards the base, which is abruptly bent to one side and broadly rounded off without enlargement; apex sharply and fairly gradually pointed. The proximal third, or thereabouts, of the spicule is smooth, the distal two-thirds are covered with small, sharp spines. Young, slender examples (fig. 1 a) are completely smooth, the spines only appearing as the spicule approaches its full size, which is exactly the opposite of what Topsent [1896] describes for his *Rhabderemia spinosa*. Fully grown examples measure about 0.34 by 0.034 mm., including the spines.

(2) Microstyles (fig. 2); very small and slender; usually slightly curved towards the base; tapering very gradually to the finely-pointed apex; perhaps very slightly

roughened; size about 0.04 by 0.002 mm.; enormously abundant in the interior of the sponge, scarce in the dermal membrane.

(3) *Microxea* (fig. 4); with a more or less developed kink in the middle (the "thraustoxea" of Topsent); smooth and fairly stout; sharply pointed at each end; about 0.032 mm. in length (from apex to apex) by 0.0026 mm. in thickness in the middle. These occur at or near the surface, but they are comparatively scarce and seem to pass by intermediate forms and sizes into

(4) *Sigmata* (fig. 3); very much contorted, often twisted into the form of calipers; slender; greatest length in a straight line only about 0.008 mm.

This is by far the most robust species of *Rhabderemia* as yet described, the others being mostly thinly encrusting forms. Whitelegge's *Sigmaxinella mammillata*, however, for which Hallmann has proposed the genus *Rhabdosigma*, is a robust form evidently closely related to *Rhabderemia* [*vide* Hallmann, 1917 A].

The New Zealand species described above combines the spicular characters of several of the others in an interesting way. Thus it has the "thraustoxea" of *R. guernei*, the type of the genus [Topsent, 1892], and the spiny rhabdostyles of *R. spinosa* [Topsent, 1896], and altogether an unusually complete spiculation.

Register No., Locality, &c.—XIII; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

SECTION *Hymedesmiæ*.

70. *Hymedesmia lundbecki*, n. sp. (Pl. XIV, figs. 28–30 c.)

The single specimen (dry) forms a dark brown crust (lighter on the surface) attached chiefly to an encrusting Polyzoon growing on the block of black basalt, R. N. XXXV. The maximum diameter of the crust is about 16 mm., the thickness about 1 mm. The surface is almost smooth, not hispid but finely granular. There are no recognisable vents.

The skeleton consists chiefly of very stout but short columns of densely packed strongyla, arranged almost vertically and supporting the dermal membrane. There are very few acanthotylostyles and it is impossible to make out their arrangement. The dermal membrane is densely packed with the large isochelæ, which also occur scattered in the subjacent tissues.

Spicules:—(1) Acanthotylostyles (Pl. XIV, fig. 28); rather irregular in form; straight or nearly so; with well-developed, subspherical heads and sharp or blunt apices; spination very irregular, confined to the head and adjacent part of the shaft. These spicules have been measured from 0.25 to 0.47 by 0.012 mm. They are apparently not differentiated into two distinct size-categories.

(2) Strongyla (fig. 29); straight or slightly curved, more or less distinctly polytylote; bluntly rounded off at each end; usually somewhat narrower at one end than at the other; typical size about 0.6 by 0.012 mm.

(3) Tridentate isochelæ (figs. 30 a–30 c); large and stout, with very strongly

curved shaft and very short, semicircular teeth. Length (in a straight line) 0.06 mm.; thickness of shaft in side view 0.008 mm.

This species belongs to the group with very strongly curved isochelæ and with strongyla, and is closely related to *H. koehleri*, *H. lacera*, *H. curvichela*, and *H. similis* as described by Lundbeck [1910], and to *H. helgæ*, Stephens [1916, 1921]. It is, however, distinguished by details of spiculation which can be readily made out by comparison with the published descriptions and figures of the above-mentioned species. Amongst these details the small size of the acanthotylostyles in comparison with the strongyla, together with their rarity and irregularity, are perhaps the most noteworthy. I have much pleasure in naming the species after Dr. Will. Lundbeck, who has contributed more than any one else towards our knowledge of the large and interesting genus *Hymedesmia*, and has given [1910] a most useful key to the then-known species, about seventy in number.

Register No., Locality, &c.—XXXV. c; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

SECTION *Myxilleæ*.

71. *Anchinoë fristedti*, n. sp. (Pl. XV, figs. 5–8.)

The single specimen is an irregular mass of anastomosing trabeculæ. The surface is very uneven, covered with small conuli except in places where the thin, smooth, translucent dermal membrane stretches uninterrupted over a considerable extent. Vents? Texture soft and resilient. Colour now quite black, evidently stained with osmic acid. The specimen measures about 46 by 30 by 20 mm.

The skeleton is by no means typical. It consists primarily of plumose columns of acanthostyles (large and small), but instead of being cored by smooth diacts these columns either have no special axis at all or are based upon foreign matter, chiefly *Gorgonia* spicules, of which the sponge contains a large quantity. In some places it looks as if the acanthostyles were merely echinating a network of foreign matter, in others true plumose columns are present. The dermal membrane contains many of the smaller acanthostyles lying tangentially, along with a profusion of isochelæ, with loose, subdermal wisps and strands of slender tornota (or subtylota).

Spicules —(1) Large acanthostyles (Pl. XV, fig. 5); slightly bent towards the base, which is evenly rounded off and abundantly spined, the spines rapidly dying away towards the apex, so that by far the greater part of the spicule is almost or quite smooth; tapering gradually towards the apex, which is sharply pointed. Size about 0.43 by 0.025 mm. (at base, including spines).

(2) Small acanthostyles (fig. 6); straight, entirely and richly spined, except for the extreme apex, which is gradually and sharply pointed; widest at the base; size about 0.084 by 0.016 mm. including spines.

These two types of acanthostyles are sharply distinguishable, though intermediate forms are not altogether wanting.

(3) *Tornota* (or *subtylota*) (fig. 7); straight, slender, entirely smooth; slightly asymmetrical, being rather thicker at one end than at the other; size about 0.216 by 0.004 mm.

(4) Tridentate *isochelæ* (*chelæ arcuatae*) (fig. 8); of quite ordinary form and about 0.024 mm. long.

A very few *sigmata* have been observed, which are very likely foreign.

Register No., Locality, &c.—XIX. 7; Station 90, near Three Kings Islands, 100 fathoms.

72. *Anchinoë novæ-zealandiæ*, n. sp. (Pl. XII, fig. 2; Pl. XV, figs. 9–11.)

The single specimen (Pl. XII, fig. 2) is erect, flabellate, with a short, thick stalk, expanding nodosely below. The lamina is slightly proliferous, with slight indications of a clathrous character. The two surfaces are essentially similar, marked by shallow, meandering grooves separated by rows of low conuli usually united to form ridges, the whole covered by a rather thick, translucent, subglabrous dermal membrane. Pores and vents inconspicuous; a few small, round apertures in the dermal membrane on both sides may represent the latter. Texture compressible and elastic, tough and fibrous. Colour in life "bright post-office red," now (in spirit after formalin) light brownish grey with a very slight pinkish tinge. Height 142 mm.; maximum breadth 94 mm.; thickness about 10 mm.

The main skeleton consists of stout, sinuous, plumose columns of spicules, with much spongin, branching and curving outwards towards the surface. These columns lie pretty close together, and are connected here and there by anastomoses. Each consists of a compact, multispicular, axial core of oxea, surrounded by a very thick coating of spongin. The total diameter of the fibre, excluding the projecting apices of the echinating acanthostyles, is about 0.085 mm. (sometimes more). The echinating spicules are very abundant, they usually project from the fibre nearly at right angles and their bases are deeply embedded in the spongin, usually right up against the spicular core. A good many loose megascleres occur scattered in the ground-substance between the fibres, and, at the surface of the sponge, numerous loose brushes of oxea lie more or less at right angles beneath the dermal membrane, with their apices often projecting slightly through it. In the dermal membrane itself numerous acanthostyles are scattered tangentially, so as to form an almost continuous, but thin, crust.

Spicules:—(1) Acanthostyles (Pl. XV, fig. 10); usually slightly curved, abundantly spined except over the sharply-pointed apex; spines small, sharp; measuring up to about 0.15 by 0.014 mm. (inclusive of spines), but usually a good deal smaller; not divisible into distinct categories.

(2) Oxea (*tornota*) (fig. 9); straight, rather slender, hastately pointed at each end; commonly more abruptly pointed and rather broader at one end than at the other. Size about 0.176 by 0.005 mm.

(3) Tridentate isochelæ (chelæ arcuatæ) (fig. 11); small and rather slender; about 0.016 mm. in length; rather scarce.

Topsent [1913 A] and Stephens [1921] having both agreed to revive Gray's genus *Anchinoë* [1867] it seems almost necessary to follow their example, otherwise I should have referred the present species to Carter's genus *Plumohalichondria*, of which it is a very typical example. The species is evidently very closely related to my *Plumohalichondria clathrodes* from the Indian Ocean [1921]. It seems to differ chiefly in the absence of the larger chelæ and may not be worthy of a distinct specific name.

Register No., Locality, &c.—I; off North Cape, New Zealand, sandy bottom, 30–14 fathoms, August 2nd, 1911.

73. *Myxilla novæ-zealandiæ*, n. sp. (Plate X, fig. 6; Pl. XV, figs. 12–15 b.)

Sponge (Pl. X, fig. 6) rather thinly lamellar, very irregular; fenestrate and canaliculate; with very uneven surfaces proliferating into irregular ridges, and with numerous round holes of various sizes, some of which are vents. The fenestrations may be closed by a thin, transparent membrane, which also forms the outer walls of canals which run just beneath the surface and open by circular vents. There are two good-sized fragments from Station 96, which may be parts of the same specimen. There are no recognisable points of attachment and no evidence as to whether the sponge grew erect or procumbent. Each piece measures about 70 by 60 mm., with a very variable thickness, from almost nothing to about 14 mm. There are no well-defined pore-areas and the pores themselves are unrecognisable. The colour in spirit is pale yellowish grey, the texture rather firm and elastic, but somewhat friable.

The main skeleton is a sub-isodictyal reticulation of stout, smooth styli, with irregular meshes of one spicule's length and little or no spongin. There is no well-developed dermal skeleton, but the dermal membrane contains scattered styli like those of the main skeleton and is supported on very loose brushes of slender strongyla.

Spicules:—(1) Stout, smooth styli (Pl. XV, fig. 12), more or less curved; evenly rounded off or very slightly swollen at the base, sometimes slightly polytylote, gradually and fairly sharply pointed at the apex, measuring about 0.47 by 0.02 mm.

(2) Slender strongyla (figs. 13 and 13 a); straight, very slightly spined at the extremities, one of which may be subtylote; measuring about 0.24 by 0.008 mm.

(3) Isancoræ spatuliferæ (fig. 14), with three or four long, narrow teeth at each end, very sharply recurved, and not very strongly curved shaft. These spicules vary in length, from about 0.02 to about 0.076 mm., with numerous intermediates.

(4) Minute, slender isochelæ (figs. 15 a and 15 b), in side view resembling C-shaped sigmata with slightly thickened ends, but really with very small teeth, probably three at each end; length from bend to bend about 0.01 mm.

This species is evidently nearly related to *Myxilla spongiosa*, Ridley and Dendy, obtained by the "Challenger" Expedition from the east coast of South America. The original description of that species mentions only one kind of isochelæ (isancoræ spatuliferæ), but a re-examination of the type-slide shows that both large and small occur and both are numerous, the large measuring about 0.05 mm. and the small about 0.02 mm. in length, with few, if any, intermediates. (At the time when the "Challenger" Report was written the smaller forms of chelæ were commonly regarded as young forms of the larger, which of course they cannot be.) I have seen none but tridentate forms, however, nor have I found any of the minute C-shaped chelæ. Moreover, there are abundant sigmata in *M. spongiosa*, and the smooth styli are much longer, so that there can be no question of specific identity.

Topsent [1901, 1913] has described, under the name *Lissodendoryx (Myxilla) spongiosa*, var. *asigmata*, an Antarctic form without sigmata, but with only one kind of chela (isancora), so that it, again, cannot be identical with our species.

Lundbeck [1905] has described three species of *Myxilla* with smooth styli, isancoræ spatuliferæ and no sigmata, viz. *M. pedunculata*, *M. diversiancorata*, and *M. pluridentata*, and in the two latter of these the isancoræ have more than three teeth, the number varying from five to seven or eight. These, again, are obviously nearly related to the New Zealand species described above, but still distinct, and none of them seem to possess the very small C-shaped chelæ.

Other species with smooth styli, but with chelæ arcuatæ instead of ancoræ, are included by Lundbeck (*loc. cit.*) in the genus *Lissodendoryx*, which appears to be a synonym of *Hamigera*, Gray, a genus which I have elsewhere [1921] made use of in a wider sense.

Register No., Locality, &c.—XVIII. 2. *a, b*; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

Genus PHORIOSPONGIA, Marshall [1880].

Myxilleæ in which the proper skeleton is almost completely replaced by sand. Megascleres and microscleres greatly reduced, or even absent.

Messrs. George and Wilson [1919] have proposed to include the genera *Chondropsis* (Carter), Dendy [1895], and *Psammochela*, Dendy [1916 A], in Marshall's Phoriospongia. So far as *Chondropsis* is concerned I am very much inclined to agree with them, though I think *Psammochela* may be conveniently kept apart for the present. When I first revived the genus *Chondropsis* [1895] I pointed out that I had very good evidence of its Ectyonine origin. I must again put forward this view, which has since been strongly supported by the discovery of *Myxilla arenaria*, Dendy [1905], with a highly arenaceous skeleton and reduced megascleres. *Myxilla arenaria*, *Psammochela* and *Phoriospongia* seem to form a natural regression series, but as a similar series of events has probably taken place also in other cases (e. g. in the Collosclerophoreæ, Dendy [1921]) it is impossible to include all the arenaceous

Desmacidonidæ with reduced skeleton even in one and the same section. The genera above referred to may be, provisionally at any rate, included in the Myxilleæ.

74. *Phoriospongia kirkii* (Carter).

Chondropsis Kirkii, Dendy [1916 A].

(For further synonyms and literature *vide* Dendy, *loc. cit.*)

There is in the collection a single very fine specimen (broken into two pieces) of this common Australian species. It forms a large but low, spreading mass of thick, crest-like, proliferous lamellæ, with numerous, large, sphinctrate vents, chiefly on the ridges and other elevated portions. The surface is minutely conulose and also very minutely reticulate or porous. The texture is rather soft and compressible, but resilient. The colour in spirit is yellowish grey.

The main skeleton is a subrectangularly, wide-meshed network of intensely arenaceous fibre, the primary lines being very stout and the secondaries more slender. The dermal skeleton is a polygonally, close-meshed network of similar but more slender fibre, or a layer of sand interrupted by the numerous, usually close-set, small pore-areas, each of which contains perhaps only a single pore.

The spicules are scattered irregularly in the interior between the fibres, the megascleres being straight strongyla, very slender in the deeper parts of the sponge but more robust towards the surface. The microscleres are very slender, small sigmata. Both kinds of spicule are very abundant.

There is a thick but ill-defined, mainly collenchymatous ectosome, more or less granular and with a small amount of fibrous tissue. It is interrupted very frequently by large, irregular, subdermal cavities, which extend into the choanosome and have each a thin roof penetrated by numerous dermal pores. The canal-system is largely lacunar, but with wide oscular tubes having many annular diaphragms. The flagellate chambers are about 0.024 mm. in diameter, subspherical and apparently eurypylous, though the condition of the material makes it difficult to be certain as to the latter point.

This is one of the commonest species of sponge in Port Phillip, and I have recorded thirty-nine specimens in Mr. J. Bracebridge Wilson's collection. It is interesting to find it, with no noteworthy difference, in New Zealand waters.

Previously known Distribution.—Australian Seas (Carter, Lendenfeld, Dendy); Indian Ocean (Okhamandal) (Dendy).

Register No., Locality, &c.—XXXI; Station 134, near Spirits Bay, North Cape, New Zealand, 11–20 fathoms.

SECTION *Crelleæ*.

Genus CRELLOMYXILLA, n. gen.

The main skeleton is an isodictyal or sub-isodictyal reticulation of acanthostyles, without special echinating spicules and without distinct fibres. The dermal skeleton

is a felt-work of (smaller) acanthostyles lying tangentially in the dermal membrane and more or less supported by brushes of subdermal tornotoxea (or other secondarily diact spicules?). The microscleres are tridentate isochelæ, to which sigmata may be added.

This genus is intermediate between the sections Myxilleæ and Crelleæ of the Ectyoninæ, which I endeavoured to distinguish in my Report on the "Sealark" Sigmatotetragonida. It is identical with the genus *Myxilla* except for the invasion of the dermal membrane by spiny megascleres, which is the most characteristic feature of the Crelleæ, and it throws considerable light on the origin of the latter group. I include it amongst the Crelleæ because of the character of the dermal skeleton, though as regards the main skeleton it retains the most primitive condition of the Myxilleæ, from which the other genera of Crelleæ have all more or less widely diverged.

75. *Crellomyxilla intermedia*, n. sp. (Pl. XV, figs. 16-21).

This species is represented in the collection by three good-sized pieces (R. N. LV. 5) and three small fragments, all from the same locality and very possibly parts of the same specimen. The sponge consists of elongated, subcylindrical branches about 7 mm. in diameter, some of which are still attached to a main body of compressed, flabellate form, the whole very irregular. Two of the branches are fused together for a considerable distance where they have come into contact with one another side by side. The longest branch, now detached, measures about 75 mm. The surface is uneven, slightly grooved and granular, with a distinct, subglabrous dermal membrane where not rubbed. Vents apparently small and scattered. Pores in irregular, ill-defined groups, not definite pore-areas. Texture firm, compact but friable. The colour of the smaller fragments (in spirit) is white; the three larger pieces have evidently been stained black with osmic acid.

The main skeleton is a compact, sub-isodictyal reticulation of acanthostyles, with triangular meshes whose sides are formed either by single spicules or by bundles of two or three. No echinating spicules can be found and there is no recognisable spongin. The dermal skeleton is a very dense felt-work of tangentially disposed acanthostyles, for the most part much smaller than those of the main skeleton, partly supported on feebly developed subdermal brushes of tornotoxea.

Spicules:—(1) Acanthostyli of the main skeleton (Pl. XV, fig. 16); usually slightly curved, abundantly and uniformly covered with small, sharp spines, except for the short, smooth, sharp-pointed apex. The base is not tylote and is rather more richly spined than the shaft, the spines tending to be recurved. Size about 0.22 by 0.017 mm. including spines.

(2) Acanthostyli of the dermal skeleton (fig. 18); similar to the above but more strongly curved and measuring only about 0.1 by 0.012 mm., including spines. These

spicules are sometimes distinctly narrowed towards the base, thus showing a tendency to become oxeote.

(3) *Tornotoxea* (fig. 17); slightly crooked, perfectly smooth, sharply and abruptly pointed at each end, size about 0.21 by 0.007 mm.

(4) Tridentate isochelæ (*isancoræ spatuliferæ*) (fig. 19); of ordinary form, about 0.028 mm. in length. Not very numerous.

(5) Small tridentate isochelæ (*isancoræ spatuliferæ*) (fig. 20); about 0.016 mm. in length, but variable. Very abundant.

(6) *Sigmata* (fig. 21); of ordinary form, rather slender, more or less contort, measuring about 0.036 mm. from bend to bend. Very abundant.

Register Nos., Locality, &c.—XLVII. 3, 16, 19; LV. 5; all from Station 90; near Three Kings Islands, New Zealand, 100 fathoms.

SECTION *Tedaniaæ*.

76. *Tedania crista-galli*, n. sp. (Pl. XII, fig. 8).

The single very fine specimen (Pl. XII, fig. 8) is a laterally compressed, massively lobose sponge, in which the main lobe gives off strong lateral spurs or buttresses; the whole sessile on a broad base. The upper part of the sponge forms a branching crest or ridge, bearing vents, some of which are open and of moderate size, while the majority appear to be closed and inconspicuous. The surface is strongly conulose and the conuli frequently form vertical ridges, between which is stretched a thin, subglabrous dermal membrane. Under a pocket lens the surface exhibits, between the conuli, a minutely reticulate appearance. The greatest length of the specimen is about 170 mm.; the maximum height about 100 mm.; the thickness of the principal lobe up to about 40 mm. The texture, in spirit, is very soft and compressible but fairly compact. The colour, both internally and externally, is chocolate-brown, which has deeply tinged the spirit in which the specimen is preserved.

The ectosome is about 0.35 mm. thick; not sharply marked off from the choanosome. It is fibrous and contains also granular pigment cells. In the meshes of the dermal reticulation it gives place to a thin, pore-bearing membrane, overlying extensive subdermal cavities from which comparatively narrow inhalant canals originate. The choanosome is collenchymatous, with a good deal of granular pigment. The collenchyma is very extensively developed between the flagellate chambers, which are spherical, about 0.04 mm. in diameter, and either eurypylous or with very short aphodal canaliculi.

The skeleton is not reticulate but consists mainly of very loose wisps of long, slender styli radiating from the interior of the sponge to the surface, where they terminate in the conuli. There are no well-defined skeletal fibres but here and there adjacent and parallel spicules are united together by spongin, which, though fairly abundant, is by no means conspicuous. At the surface occur a few sparsely scattered

brushes of small tornota or tornotoxea, especially associated with the ends of the spicule tracts of the main skeleton; otherwise there is no dermal skeleton at all.

Spicules:—(1) Very long, slender styli and tylostyli of the main skeleton, usually slightly curved or bent, rarely pointed at the base; size when full grown about 1.36 by 0.013 mm., but usually more slender and measured up to 1.7 mm. in length.

(2) Tornota or tornotoxea of the surface tufts; slender, usually slightly curved and hastately pointed at one or both ends, but rather narrower and more gradually pointed at the distal end; size about 0.32 by 0.004 mm.

(3) Rhaphides; nearly straight or slightly curved, gradually and finely pointed at each end; measuring about 0.4 by 0.003 mm.; not very abundant.

Numerous, very slender, hair-like spicules, much longer than (3), also occur, which are evidently young forms of the styli and tylostyli.

This is a very remarkable and well-characterised species, easily to be recognised by its external form, its colour, its skeleton arrangement and the great length and slenderness of the main skeletal spicules. In its skeletal characters it makes a near approach to the genus *Acanthella*.

Register No., Locality, &c.—XXXIV; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

Genus TEDANIOPSIS, n. gen.

The main skeleton is a reticulation of spicular fibre composed of stout diacts (strongyla, tylota) held together by spongin. There is also a dermal (or subdermal) skeleton of slender diacts (tornota, tylota, strongyla) in radially arranged brushes. Tylorhaphides may be present in addition to simple rhaphides.

It is quite possible that the turbinate form and the occurrence of two distinct growth stages, widely differing from one another, may also be generic characters. The type species is *Tedaniopsis turbinata*, n. sp., in which these two growth stages can be clearly demonstrated. The only other species known to me that can be quite safely referred to the same genus is Hentschel's *Oceanapia kirkpatricki* [1914] (*vide infra*). Kirkpatrick's *Oceanapia tantula* [1908] is probably a third. The description and figures of the very small specimens by which it is represented strongly suggest the first stage of a *Tedaniopsis*, and the spiculation agrees very well except for the absence of tylorhaphides. Whether or not the presence or absence of these remarkable spicules should be regarded as a ground for generic distinction it is hard to say. Probably not, for tylorhaphides occur in several Tedaniine genera. Topsent [1908] has described and figured them for *Tedania charcoti*; Hallmann [1914] makes them a characteristic feature of his genus *Hemitedania*, and I have myself [1921] described and figured them for *Tedanione wilsoni*.

It should be pointed out that the term "tylorhaphides" is here introduced for the first time for the curious pipette-like spicules in question.

The genus *Tedaniopsis* differs from *Tedanione* [Wilson 1894] in the presence of the main skeleton reticulation of stout strongyla or tylota, reminiscent of *Plocamia*. Wilson speaks of "stout skeletogenous oxeas" in *Tedanione fætida*, but his figures show only very slender spicules and I suppose these are regarded as stout only in contrast with the raphides. His figure of the dermal membrane (Pl. XXIII, fig. 100), "strengthened by numerous oxeas of full size," is conclusive on this point. It is extremely doubtful whether Hallmann's *Hemitedania* [1914] is anything more than a synonym of *Tedanione*.

77. *Tedaniopsis turbinata*, n. sp. (Pl. XI, figs. 2-3; Pl. XIV, figs. 31-35).

The type specimen (R. N. XII, Pl. XI, figs. 2, 2 *a*), is a rather large, stipitate sponge of turbinate form, the upturned base of the cone being excavated to form a shallow cup with broadly rounded margin, while the down-turned apex is continuous with the stalk. The outer surface is marked by slight longitudinal ridges, radiating to the margin of the cup at wide intervals. The total height of the specimen is about 190 mm. and the maximum transverse diameter about 140 mm. The stalk is irregularly cylindrical, about 72 mm. in length and 18 mm. in diameter. The depth of the cup in the middle is about 25 mm. On the inner surface are scattered numerous small openings, with slightly prominent margins. These are evidently sphinctrate vents, whose size depends upon their state of contraction. The sphincter lies a little within the outer margin and may be open or closed. The diameter of these vents is usually about 1 mm. They are much more numerous on the inner surface of the cup than on the outside.* Both inner and outer surfaces are covered with a thin dermal membrane, firmly adherent to the underlying tissues. The upper part of the stalk, however, is expanded obliquely and there is a sharp line of junction between the expanded portion and the general body of the sponge (much sharper on the side opposite than on that represented in the drawing). Below this line the ordinary dermal membrane is replaced by a strongly developed cuticle, formed by a layer of (apparently) spongin spread over the dermal skeleton, the nature of which is quite different here from what it is above the line of demarcation. The texture of the body of the sponge is very soft open and friable, so that it has been a good deal damaged. The stalk, on the other hand, is hard and compact. The colour, in spirit, is pale greyish yellow.

In addition to this specimen there are in the collection three others, which differ widely from the type in certain respects, while agreeing pretty closely with one another. It appears to me fairly certain that these are merely young individuals in which the upper and larger part of the sponge has not yet been developed. They

* In drawing the figure of the external form it was necessary to make a considerable amount of restoration, and the artist has somewhat exaggerated the number of vents on the outer surface.

correspond to that portion of the type specimen which lies below what I have called the line of demarcation, and it is noteworthy that their outer surfaces have the same strongly cuticularised appearance.

Two of these small specimens (R. N. XIV. 1. *a* and *b*) have evidently been treated with osmic acid and thereby stained black superficially. They agree closely with one another. The larger of the two has the form of an elongated cone, about 51 mm. in height, tapering gradually from the deeply concave, up-turned, oblique base to the narrow attachment at the lower end, and with the long axis somewhat curved; horn-like. A remarkable feature of both is the presence of a sharply prominent rim separating the dermal membrane of the concave upper surface from that of the general surface. Indeed the two portions of the dermal membrane are actually discontinuous along this rim, with a narrow groove between them. I strongly suspect that this is a natural, pore-bearing groove, rendered necessary by the development of the layer of spongin over the outer surface. I have been unable to determine the presence of vents. Both specimens are remarkably cavernous, right down to the place where they have been broken off from their attachment, and the firm but thin rind or outer layer contrasts strikingly with the more or less pulpy interior, much as in *Phlaodictyon* and *Oceanapia*.

The third of these supposedly young specimens (R. N. XXVIII) differs from the other two in that the concave upper surface has become divided into three by an incipient process of branching (Pl. XI, fig. 3). From each of these three surfaces the dermal membrane has been completely, or almost completely, removed, exposing the cavernous interior. The colour is pale yellowish grey. This specimen measures about 41 mm. in height by 28 mm. in maximum transverse diameter.

My reasons for regarding these three small specimens as specifically identical with the type are as follows. (1) The spiculation is identical. (2) The external form agrees closely with that of the type *below the line of demarcation*, and there is the same cuticularization by a superficial layer of spongin. (3) All the specimens came from the same locality. If this view is correct it would appear that the sponge has two post-larval stages of growth sharply marked off from one another and differing in important particulars. The second stage is superposed upon the first one and forms the great bulk of the fully grown sponge. The part of the body formed in the first stage becomes partly solidified by excessive development of the skeleton to form the hard, compact stalk of the adult.

In spite of the attempts made to fix two of the small specimens with osmic acid, the condition of the material is not such as to permit of any very satisfactory account of the canal-system and histology.

In the fully grown sponge there is no pore-groove round the margin of the upper surface and the inhalant pores are presumably scattered through the thin dermal membrane which covers the surface generally. They can, however, be no longer recognised, being apparently all closed. Beneath the dermal membrane is a rather

thin, collenchymatous ectosome, for the most part by no means sharply distinguished from the choanosome, and penetrated here and there by very irregular subdermal cavities. The choanosome is very gelatinous, but at the same time coarsely granular in appearance, the deeply staining granules being apparently for the most part nuclei. The wider exhalant (and inhalant?) canals are interrupted at frequent intervals by thin, membranous diaphragms. The flagellate chambers are scattered irregularly in the gelatinous ground-substance, but large areas, where the ground-substance is less granular, appear to be quite free from them. They are approximately spherical, only about 0.02 mm. in diameter, and evidently eurypylous, though the actual openings are hardly to be distinguished in my sections.

The main skeleton is a very irregular, open network of spicular fibre, the fibres being composed of loose bundles of stout, curved tylota held together by a small amount of spongin. This network permeates the body of the sponge and undergoes great condensation, especially in the form of close-set, stout, longitudinal spicule tracts, in the stalk. Loose, radially arranged brushes of straight, slender diacts occur on the surface and may be regarded as constituting a dermal skeleton. Their ends commonly project slightly beyond the dermal membrane. A concentration of this skeleton around the vents constitutes a special oscular skeleton, forming a fringe round the margin of the vent and continued inwards for some distance in the wall of the exhalant canal. The interior of the body (and of the stalk) also contains great numbers of the very characteristic, slender, pipette-like raphides, mostly arranged in loose bundles. These spicules also occur lying horizontally in the dermal membrane. The smaller raphides, without the bulbous swelling, occur scattered throughout.

In the young specimens referred to above (except on the upper surface), and in that part of the full-grown sponge that lies below the line of demarcation, the dermal brushes of slender diacts are not present, their place being taken by a dense, irregular reticulation of the stout tylota, covered by the cuticular layer of spongin.

Spicules:—(1) Tylota (Pl. XIV, fig. 31); stout, more or less curved; with well-developed, oval heads; size about 0.5 by 0.025 mm. These spicules form the main skeleton reticulation.

(2) Slender diacts (fig. 32); straight or nearly so; variously ended, often slightly tylote or subhastate (tornote) and with a very few feebly developed terminal spines. Size about 0.34 by 0.006 mm. These spicules form the dermal brushes.

(3) Tylorhaphides (pipette-spicules) (figs. 34 and 35); long and slender, slightly curved or very nearly straight; slightly roughened all over; with a distinct, bulbous dilatation near one end, which is symmetrically but rather abruptly pointed, while the other end is very gradually and finely pointed. Size about 0.6 by 0.004 mm., with the bulb 0.008 mm. in diameter and 0.04 mm. from the nearest extremity of the spicule. These spicules occur singly and in bundles.

(4) Smaller raphides (fig. 33); nearly straight; without bulb; slightly roughened all over; tapering more gradually at one end than at the other;

sharply pointed at each end; about 0.18 by 0.002 mm. Scattered singly (and in bundles?).

The above account of the spiculation is taken from the type specimen (R. N. XII) but the young specimens exhibit no difference in this respect.

There can be no doubt that this species is closely related to Hentschel's *Oceanapia* (*Tedaniopsis*) *kirkpatricki* [1914] from the Antarctic. The two species may, however, be readily distinguished by the fact that the stout amphistrongyla of *T. kirkpatricki* are replaced in the New Zealand species by tylota. Hentschel only had very small specimens, more or less similar in form to the young specimens of *T. turbinata*; probably they represented merely the first stage of growth.

Register Nos., Locality, &c.—R. N. XII; XIV. 1. *a* and *b*; XXVIII; LV. 1. *c*, 9 (fragments); all from Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

SECTION *Cælosphæreæ*.

Genus PYLODERMA, Kirkpatrick [1908.]

Sponge with parchment-like, easily separable dermal membrane. Oscula on conical projections on the upper part, inhalant pores in more or less raised pore-areas over the general surface. Megascleres slender oxea, arranged tangentially so as to form a feltwork in the dermal membrane and scattered or collected into fibres in the interior. Microscleres sometimes present in the form of tridentate isochelæ, sometimes absent.

This genus was founded by Kirkpatrick [1908] for the reception of Ridley and Dendy's *Halichondria latrunculioides* [1887]. Hentschel [1914] included this species in *Inflatella* and abandoned the genus *Pylooderma*. The discovery of a remarkable new species by the "Terra Nova" Expedition, closely resembling *Pylooderma latrunculioides* in all features except the presence of isochelæ, seems to justify the retention of Kirkpatrick's genus and at the same time throws a flood of light upon its true relationship. It does not, as Ridley and Dendy, followed by Kirkpatrick, supposed, belong to the *Renierinæ*, but to the *Cælosphæreæ*, the mistake having arisen owing to the accident that the first species discovered happened to be lipochelous.

78. *Pylooderma demonstrans*, n. sp. (Pl. IX, fig. 4; Pl. XV, figs. 22–23*b*).

There are two specimens in the collection, which may be regarded as co-types. Both are much shrunken and corrugated as a result of the action of the spirit in which they are preserved, one is, in addition, a good deal damaged. The more perfect specimen (R. N. IX. *a*, Pl. IX, fig. 4) is obconical in form and has been torn off below from a narrow attachment. In life the broad upper surface was probably more or less flattened, but it is now greatly puckered, as are also the sides. The illustration gives but a poor idea of what must have been the natural appearance

of the sponge. The entire surface is covered, at fairly regular intervals, with prominent papillæ (or short fistulæ), those on the upper surface being clearly differentiated from those on the sides. The former are about 3 mm. in height by 1 mm. in diameter and each carries a small vent at the summit; the latter are only about 2 mm. in height and 1 mm. in diameter and have flattened tops which are obviously pore-areas. The height of the specimen is about 36 mm., the diameter across the top about 22 mm., the intervals between the papillæ about 4 mm. The colour in spirit is pale greyish yellow.

The choanosome is coarsely fibrous and evidently does not part readily from the thin, parchment-like ectosome, so that in contracting it has drawn the latter with it and thrown it into puckers.

The skeleton of the choanosome consists partly of very coarse, very irregularly arranged, spicular fibres, not very well defined, and partly of scattered megascleres and microscleres. That of the ectosome is a dense feltwork of tangentially placed oxea, not more than two or three spicules thick, exactly like that figured by Ridley and Dendy [1887] for "*Halichondria*" *latrunculioides*. The pore-areas are rendered very slightly hispid by the projection of the ends of longitudinally placed bundles of oxea; the projecting ends of longitudinally disposed oxea may also form a very slight fringe around the vents, but this is only sometimes visible.

Spicules:—(1) Oxea (Pl. XV, fig. 22); long, slender, nearly straight, gradually and sharply pointed at each end; size about 0.5 by 0.012 mm.

(2) Tridentate isochelæ (chelæ arcuatæ) (figs. 23*a*, 23*b*); robust, with stout, strongly curved, laterally compressed shaft and short teeth; length about 0.028 mm.; scattered very abundantly through the choanosome, especially in the walls of the canals, also sometimes on the surface of the sponge, outside the ectosomal skeleton.

Register Nos., Locality, &c.—IX. *a* and *b*; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

79. *Amphiastrella kirkpatricki*, n. sp. (Pl. IX, fig. 2; Pl. XV, figs. 28–31).

This very remarkable species is represented by one perfect specimen (Pl. IX, fig. 2), and the upper half of another. The perfect sponge (R. N. LIV. *a*) consists of a bladder-like body, vertically elongated to an oval form, attached to a stone by a flat, slightly constricted base, without root-like processes. From the central body are given off a number of elongated fistulæ. The largest of these, occupying the apex of the sponge, is elongatedly conical (now compressed by shrinkage) and terminates in a small vent at the narrow apex, without enlargement. Five others are similar in general form but shorter, and terminate each in a small, hemispherical, knob-like pore-area. A few others are still shorter and appear as if in different stages of growth. Owing to its thin, bladder-like character, the wall of the sponge has to some extent collapsed inwards. The height of the body is 32 mm., the

transverse diameter 24 mm. The length of the oscular fistula is 25 mm., of the fully developed poral fistulæ about 12 mm. The colour (in spirit) is now black, but this is evidently due to the action of osmic acid.

The imperfect specimen (R. N. LIV. c) resembles the type very closely, with a single, large, terminal, oscular tube and a number of poral fistulæ of exactly the same character as described above.

The ectosome of both body and fistulæ is thin and parchment-like, only about 0.25 mm. in thickness. The choanosome has shrunk away from it and now forms an amorphous mass of pulp, not nearly filling the interior of the sponge. This interior is traversed by a few stout, compact spicular fibres, about 0.34 mm. in diameter, forming a very coarse network with enormously wide meshes, the ends of some of the fibres being attached to the inner surface of the ectosome. In addition to these fibres the choanosome contains numerous scattered megascleres. The skeleton of the ectosome is a dense feltwork of tangentially arranged megascleres, in several layers.

Spicules:—(1) Tylota (Pl. XV, fig. 28), with slightly developed oval heads, ranging to strongylote (fig. 29); rather crooked; measuring about 0.8 by 0.02 mm.

(2) Birotulate isochelæ (amphidiscs) (figs. 30 and 31); with up to about ten slender, sharp-pointed, sharply recurved teeth at each end. These spicules are about 0.032 mm. in length. They are scattered in great abundance throughout the choanosome.

The only species of the genus *Amphiastrella* hitherto described is *A. birotulifera* from near Port Phillip Heads, Victoria [*vide* Dendy 1896], which has a closely similar spiculation but differs much in external features. The New Zealand species described above is, except for the presence of the microscleres, a typical *Inflatella* and closely resembles my *Inflatella spherica* from the same locality, and perhaps still more closely *Inflatella (Joyeuxia) belli* Kirkpatrick [1908] from the Antarctic, suggesting the possible derivation of the genus *Inflatella* from *Amphiastrella* by loss of amphidiscs, just as *Pyloderma latrunculioides* may have been derived from some such form as *P. demonstrans* by loss of tridentate isochelæ. It may be necessary at some future time to include the genus *Amphiastrella* in *Inflatella*, which has priority, but I think such a step would be premature at present.

Register Nos., Locality, &c.—LIV. a and c; Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

Genus INFLATELLA, Schmidt [1875].

Sponge bladder-like, with parchment-like dermal membrane and pulpy choanosome. Oscula and pores on elongated projections. Dermal skeleton of tangentially disposed megascleres. Internal skeleton feebly developed. Megascleres strongylote to oxeote. Microscleres absent.

For further information as to this genus I would refer more particularly to Lundbeck [1910] and Hentschel [1914].

80. *Inflatella spherica*, n. sp. (Pl. IX, fig. 3).

The single specimen (Pl. IX, fig. 3) is almost perfectly spherical, attached to a stone by a very short, broad peduncle, extending into flattened, root-like processes. From these processes come off a number of slender, almost filiform branches, which project freely in various directions, but are not very conspicuous. From the spherical body come off, at fairly regular intervals, fifteen rather slender and rather short fistulæ, most of which appear to be poral and the remainder oscular. It is not easy to distinguish between the two in their present state of contraction, but the oscular fistulæ are typically longer, tapering towards the extremity, where the small vent is placed, while the poral fistulæ are shorter, often slightly enlarged at the end, where there is a cup-shaped depression which I take to be the pore-area. The thin, parchment-like rind has partially collapsed into the hollow interior, while the choanosome has contracted into a pulpy mass. The colour (in spirit) is now black (brown internally), but this is evidently due to the action of osmic acid. The diameter of the body of the sponge is about 21 mm. The longest oscular fistula is about 9 mm. in length, a typical poral fistula about 4 mm.

The rind or ectosome is only about 0.25 mm. thick. Its skeleton consists of a close interlacement or feltwork of long slender oxea, in two or three layers. The skeleton of the choanosome is feebly developed and consists of similar oxea, mostly in loose wisps.

Spicules:—Oxea only; long, slender, slightly curved, gradually and sharply pointed at each end, *Halichondria*-like; measuring about 0.85 by 0.02 mm.

Except for its *Halichondria*-like spicules, in the possession of which it agrees with *Pyloderma*, this species is a very typical *Inflatella*, perhaps most nearly related to Hentschel's *Inflatella fistulosa* [1914] from the Antarctic, in which the megascleres are tornote. It also bears a considerable external resemblance to *Amphistrella kirkpatricki*, found with it and described above.

Register No., Locality, &c.—LIV. b, Station 90, near Three Kings Islands, New Zealand, 100 fathoms.

81. *Histodermella australis*, n. sp. (Pl. XV, figs. 24–27).

The single specimen consists of an agglomeration of two (or three?) very irregular, vesicular individuals overgrown by other sponges, &c. (including *Ancorina progressa*, var. *diplococcus*) and closely resembling *Histodermella ingolfi* as described and figured by Lundbeck [1910]. The wall of the sponge is thin but tough and leathery, a good deal folded, and in both individuals a considerable portion of it has been torn away, exposing the spacious internal cavity, now empty, except for a small quantity of choanosomal tissue attached here and there to the wall. From

the central body come off numerous hollow tubes or fistulæ, varying much in dimensions, up to about 13 mm. in length by 4 mm. in diameter; often much more slender and occasionally branched. Most of these fistulæ are more or less widely open at the free end; their cavities are separated by diaphragms from the cavity of the body of the sponge. The body of the larger individual is about 25 mm. in diameter. The colour in spirit is pale grey.

The skeleton of the choanosome consists merely of scattered megascleres with a very few microscleres. That of the wall or rind (ectosome), of both body and fistulæ, is a dense feltwork of tylota, several or many layers thick, with a comparatively few acanthoxea.

Spicules :—(1) Tylota, with well-developed oval heads (Pl. XV, fig. 24), ranging to strongyla with no heads (fig. 25); slightly curved or crooked; varying much in size, up to about 0.7 by 0.02 mm. Those in the interior of the sponge are, on an average, much more slender than those in the rind, and are probably mostly young forms.

(2) Acanthoxea (fig. 26); short, stout, straight or nearly so; thickly covered with short, sharp spines, except at the apices, which are quite smooth and sharply pointed; size about 0.17 by 0.034 mm. (including spines). Occasionally a stylote form is met with (fig. 27).

The acanthoxea occur pretty abundantly just within the thick ectosomal layer of tylota. They are especially abundant, almost to the exclusion of other spicules, in the membranous diaphragm that separates the cavity of the fistula from that of the body of the sponge.

(3) Sigmata; usually slender, C- or S-shaped, measuring up to about 0.068 mm. from bend to bend. Not very numerous or conspicuous, scattered in the choanosome.

I have also seen two small isochelæ in the choanosome, the form of which was difficult to make out. These may perhaps be regarded as vestigial but it is not certain that they belong to the sponge, with which several other species, including an encrusting *Hymedesmia*, are closely associated.

Except for the absence of the isochelæ (chelæ arcuatæ) I do not see how this species can be distinguished from *Histoderma ingolfi*, described by Lundbeck [1910] from deep water off the S.W. of Iceland and since recorded by Stephens [1921] from the North Atlantic. It is extremely interesting to find a New Zealand representative of this very curious genus.

Register No., Locality, &c.—L. 1. d; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

SUB-FAMILY AXINELLINÆ.

SECTION HETEROXYEÆ.

Genus PARAHIGGINSIA, n. gen.

Sponge composed of thin lamellæ which may anastomose with one another. Canal-system like that of *Phakellia*, with inhalant and exhalant surfaces. Main

skeleton an irregular reticulation of stout oxea. No special dermal skeleton. Spicules of two kinds; short, stout oxea and slender acanthoxea (microxea).

This genus is distinguished from *Higginsia* by its *Phakellia*-like habit and canal-system, and by the absence of long, slender megascleres.

82. *Parahigginsia phakellioides*, n. sp. (Pl. XI, fig. 4; Pl. XV, figs. 32 and 33.)

There are two pieces of this sponge in the same jar and from the same locality; it is possible that they are parts of the same specimen. The sponge (Pl. XI, fig. 4) consists of a system of thin, curved lamellæ, branching off from and anastomosing with one another in a very irregular fashion. The larger of the two pieces measures about 140 mm. in height by 80 mm. in breadth; the lamellæ have a fairly uniform thickness of about 2.5 mm. Both surfaces are smooth, and even subglabrous, in spirit. They may be distinguished, with some degree of probability, as being respectively inhalant and exhalant. The former is thickly studded with very small pore-sieves, the latter with minute vents; both pore-sieves and vents are only about 0.25 mm. in diameter. The texture is inflexible, rather hard and brittle; the colour in spirit pale yellowish grey.

The canal-system is extraordinarily like that of *Phakellia* [cf. Dendy, 1921, p. 118]. The lamella is perforated by numerous canals about 0.25 mm. in diameter, extending from the inhalant surface, where they are covered over by the very thin, pore-bearing, dermal membrane, to the exhalant surface, where they open each by one of the small vents. These canals do not always run straight through but may ramify to a considerable extent. They might be interpreted in most sections as inhalant and exhalant canals interdigitating, but I think that, as in *Phakellia*, they really run through from surface to surface. The smaller canals are lacunar. The flagellate chambers are about 0.04 mm. in diameter, subspherical and eurypylous. The ectosome appears to be represented only by the thin dermal membrane. The mesogloea of the choanosome is collenchymatous and sparingly developed.

The main skeleton is a fairly dense reticulation of stout oxea, bundled together for the most part in stout irregular tracts, but with no distinct fibres and apparently no spongin. This reticulation may be specially concentrated beneath the surface, but one cannot say that there is a distinct dermal skeleton.

Spicules:—(1) Oxea (Pl. XV, fig. 32); short, stout, slightly curved, sharply and somewhat abruptly pointed at each end; of very uniform size, about 0.34 by 0.022 mm.

(2) Acanthomicroxea (fig. 33); very slender, more or less curved or bent, sharply pointed at each end, minutely spined. Size about 0.088 by 0.002 mm. Scattered abundantly through the choanosome and in the dermal membrane.

The interior of this sponge is penetrated by a commensal hydroid.

Register No., Locality, &c.—XVII; Station 96, 7 miles E. of North Cape, New Zealand, 70 fathoms.

FAMILY CLAVULIDÆ.

SUB-FAMILY SPIRASTRELLINÆ.

Genus DISCORHABDELLA, n. gen.

Encrusting Spirastrellinæ with radially arranged skeleton. The principal megascleres are large styli or tylostyli, which may be spiny, associated with brushes of smooth tylostyles, and with abbreviated, pseudastrose acanthotylostyles echinating the substratum. Microscleres are present in the form of isochelæ and oxydiscorhabds.

This is a very remarkable genus in more ways than one. The pseudastrose acanthotylostyle (Pl. XV, figs. 35 and 35 *a*) is an extremely interesting spicule, and the interest attaching to it is increased by the fact that a closely similar spicule has been described by Hinde and Holmes [1892, Pl. XII, figs. 1 and 2] from the lower tertiary strata of Oamaru, in the South Island of New Zealand. These authors, however, altogether failed to interpret the true nature of the spicule and assigned it to the genus *Latrunculia*. The same authors (*op. cit.* Pl. VIII, fig. 29) also figure the curiously tuberculated base of a large megasclere which closely resembles the large acanthosubtylostyle of *Discorhabdella*. There is thus good reason to believe that the genus *Discorhabdella* was living in New Zealand waters in early Tertiary times, in association, probably, with many other surviving genera of sponges. The nearest approach to the pseudastrose spicule which I know of amongst existing species is found in Bowerbank's [1866, 1874] *Hymenaphia stellifera*, a not very distantly related, encrusting sponge, for which Gray [1867] proposed the genus *Mesapos*.

A still more remarkable spicule is the oxydiscorhabd, rather like that of the genus *Barbozia* [Dendy, 1921], where it is also associated with chelæ, but of a quite different form from those of *Discorhabdella*. Here again, then, we have clear evidence of the origin of the Spirastrellinæ from Ectyonine ancestors, for in most respects *Discorhabdella* is a typical member of the latter group, evidently closely related to such encrusting genera as *Hymedesmia* and *Hymenaphia*. It may also be related to the Ectyonine genus *Fusifera* [Dendy, 1896] in which the microscleres are toxa and smooth microxea. I am strongly inclined to think that the latter are the precursors of the discorhabd series of spicules, and that they themselves may be homologous with the microxea (rhopides) of such species as *Mycale magellanica* and *M. lilliei*, which, in turn, are clearly derived from the rhopides of ordinary trichodragmata.

83. *Discorhabdella incrustans*, n. sp. (Pl. XV, figs. 34-38.)

The sponge (in spirit) forms a greyish white crust, up to about 1 mm. in thickness and 15 mm. in diameter, on a small angular pebble. The surface, under a lens, appears rather strongly hispid, but no vents or pores could be made out.

The megascleres are all radially arranged with regard to the substratum. The

large acanthosubtylostyles have their bases planted on the substratum while their apices project far beyond the surface of the sponge, causing the conspicuous hispidation thereof. They stand at some distance apart from one another and their inner portions are surrounded by radiate brushes of slender tylostyles, whose apices project beyond the surface but not nearly so far as those of the very much larger acanthosubtylostyles. Between the bases of the latter the substratum is echinated by the very curious pseudastrose acanthotylostyles. The chelæ occur abundantly and chiefly in the dermal membrane, and the oxydiscorhabds throughout the soft tissues.

Spicules:—(1) Large acanthosubtylostyles (Pl. XV, figs. 34–34 c); slightly curved towards the base; tapering very gradually from base to sharply-pointed apex; base tuberculate rather than spined, the remainder of the spicule quite smooth; size up to about 1.7 by 0.05 mm.

(2) Abbreviated, pseudastrose acanthotylostyles (figs. 35 and 35 a); with large, subspherical base covered with short conical spines; very short, smooth shaft, and enlarged, subspherical apex (but much smaller than the base), covered with small conical spines which may be recurved towards the base. Length about 0.052 mm., diameter of base (including spines) about 0.04 mm.

(3) Smooth, slender tylostyles (fig. 36); slightly curved, with distinct oval head; tapering gradually to sharply-pointed apex and also towards the head, forming a neck; quite smooth; size about 0.54 by 0.012 mm.

(4) Isochelæ (isancoræ) (figs. 37 and 37 a); with slightly curved, non-fimbriated shaft and usually four (occasionally three or five) rather long, narrow, sharply-pointed and sharply-recurved teeth at each end. Length about 0.048 mm.

(5) Oxydiscorhabds (fig. 38); with straight, slender shaft, sharply pointed at each end, and a swollen, spiny node placed symmetrically towards each extremity. Between the nodes the shaft also often appears to be slightly spiny. Length about 0.028 mm., diameter of shaft about 0.0013 mm.

As already mentioned, there is reason to believe that the genus *Discorhabdella* is represented in the lower Tertiary deposits of Oamaru. The pseudastrose acanthotylostyle figured by Hinde and Holmes [1892], however, differs in one interesting particular from that of the recent species described above, viz. in the possession of a specially large terminal spine which clearly represents the original apex of the spicule. The disappearance of this apex in the spicule of *Discorhabdella incrustans* seems to represent a further stage in evolution that has been reached since the period of the Oamaru deposits.

Register No., Locality, &c.—XLVI. 3; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

84. *Trachycladus styliifer*, n. sp. (Pl. XII, fig. 7; Pl. XV, figs. 39–42.)

The single specimen (Pl. XII, fig. 7) is stipitate and very irregularly branched.

Stalk and branches cylindrical, about 5 mm. in diameter. Branches rather short and usually tapering to pointed extremities; rarely anastomosing. Surface of branches very minutely conulose, vents not recognizable. Texture tough, flexible, elastic. Colour now (in spirit) black, evidently stained with osmic acid. When spread out the specimen has a maximum height of about 130 mm. and a maximum breadth of about the same. The stalk is about 24 mm. long but has been broken off below.

The skeleton arrangement is quite typical. A condensed axis of long styli, nearly all arranged lengthwise, occupies rather less than one-third of the diameter of the branch, and gives off obliquely ascending, rather loose columns of styli which curve outwards to the surface. There is very little spongin. The spinispiræ are scattered in enormous abundance throughout the interior of the sponge and also form a dense dermal crust.

Spicules:—(1) Styli (Pl. XV, fig. 40); rather slender and usually slightly curved; narrowing slightly to the evenly rounded base and tapering gradually to the rather abruptly pointed apex, which may be blunted (fig. 39). Very uniform in size and shape. Measuring about 0.5 by 0.017 mm.

(2) Spinispiræ (fig. 41); of the usual *Trachycladus* type; with about $1\frac{1}{2}$ complete turns; minutely spined; length in a straight line from end to end about 0.012 mm.; occasionally becoming more or less uncurled.

(3) Microrhabds (fig. 42); typically stout and irregularly oval in outline, sometimes bent, surface more or less uneven, but smooth; size when full grown about 0.02 by 0.008 mm., but numerous more slender forms occur. These spicules are very abundant in the interior of the sponge, but not nearly so numerous as the spinispiræ.

The discovery of this species marks an interesting extension of the geographical range of the genus *Trachycladus*, which has hitherto been found only along the Australian coast, where it is common and widely distributed. The Australian specimens show a good deal of variation in spiculation and Hallmann [1916] has attempted to distinguish between a number of species accordingly. It may be regarded as very doubtful, however, whether they should not all be included in Carter's *Trachycladus lævispirulifer* [1879, 1885-6], the type-species of the genus. In all the Australian specimens hitherto recorded the megascleres are oxeote or strongylote, and styli only occur rarely and exceptionally. In *T. stylifer*, on the other hand, they are practically all stylote and I have not seen a single oxeote, though an occasional but very rare strongylote may be met with. This difference seems to be a sufficient ground for the separation of the New Zealand and Australian species.

As in the Australian specimens the soft tissues of the New Zealand sponge are crowded with short, jointed, algal rods.

Register No., Locality, &c.—LV. 4; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

Genus DOTONELLA, n. gen.

Sponge thinly encrusting; with a deep layer of large and a superficial layer of small spinispiræ; surface hispidated with large tylostyli based upon the substratum.

This very interesting genus is founded upon a species which is evidently closely related to Carter's *Dotona pulchella*, originally described [1880, p. 57] from the Gulf of Manaar and re-described by Topsent [1904] from the Azores. *Dotona*, however, is a boring sponge, and in it the smaller spinispira is represented by a short, rod-like spicule with a bunch of spines at each end and a single whorl of spines in the middle; while the large tylostyles are represented by small, slender styli, chiefly congregated in the small papillæ which occupy the terminal openings of the excavations. The small spinispiræ of *Dotonella* are closely similar to those of *Trachycladus*. The large spinispiræ are much larger and more coarsely spined than the corresponding spicules of *Dotona pulchella*.

Another encrusting sponge in which a relatively large spinispira resembling that of *Dotonella* occurs is Carter's *Rhaphidhistia spectabilis* [1879], but in this case it is associated with an oxeote megasclere. Topsent's *Spiroxya heteroclita* [1900] appears to me to be a second species of *Rhaphidhistia*. It agrees with *Dotonella mirabilis* in having two kinds of spinispiræ, but they are quite different from those of the New Zealand sponge.

Hinde and Holmes [1892, Pl. VII, fig. 38] have figured a fossil spicule from the lower Tertiary deposits of Oamaru, in the South Island of New Zealand, which closely resembles the large spinispira of *Dotonella mirabilis* and is even larger.

85. *Dotonella mirabilis*, n. sp. (Pl. XV, figs. 43-45.)

This remarkable sponge is represented by two very thin, white crusts attached to the block of black basalt so often referred to in this Report. The larger of the two (R. N. XXXV. d) is about 22 mm. in diameter. The surface is generally smooth but with minute, irregularly placed punctations scattered over it, not very thickly. These punctations mark the points of insertion of long tylostyles, which project from the surface in life but which are now all broken off except in certain small concave areas where they have been protected from abrasion and where they give the surface a coarsely hispid character.

The skeleton consists of three distinct parts: (1) next to the substratum, a dense layer of the large spinispiræ; (2) above the latter, at the surface of the sponge, a dense layer of the small spinispiræ; (3) the large hispidating tylostyles, with bases resting on the substratum and shaft penetrating the two layers of spinispiræ to project far beyond the surface.

Spicules:—(1) Tylostyles (Pl. XV, fig. 43); small, slightly curved; tapering gradually from the well-developed spherical head to near the sharply-pointed apex, where the taper becomes more abrupt; length up to about 1 mm., with head 0.024 mm. in diameter and shaft 0.016 mm. in diameter where it joins the head.

(2) Large spinispiræ (fig. 44); consisting of a stout, slightly curved shaft, spined at the two blunt ends and with similar short spines arranged typically on a spiral ridge extending from end to end; size about 0.12 by 0.016 mm. (including spines).

(3) Small spinispiræ (fig. 45); consisting of a stout rod, twisted into a spiral of about $1\frac{1}{2}$ turns and minutely spined on the concave side; length of spicule as a whole about 0.012 mm., thickness of shaft about 0.004 mm.

Register Nos., Locality, &c.—R. N. XXXV. *d, n*; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

SUB-FAMILY SUBERITINÆ.

86. *Suberites carnosus* (Johnston), var. *novæ-zealandiæ*, nov.

(For literature and synonymy *vide* Topsent [1900].)

This widely distributed species is represented by a single small specimen, ovoid in form, about 20 by 10 mm., slightly narrower at one end than at the other. There are no conspicuous vents, but the surface is pitted with numerous small, oval cavities, each of which is typically inhabited by a small amphipod crustacean. Some of the cavities are empty, and some of the empty cavities appear to have healed up and become filled with sponge-tissue. The texture is very compact, but characteristically soft, fleshy and compressible. The colour in spirit is pale yellow.

The arrangement of the skeleton is quite typical, a confused mass of interwoven spicules in the interior passing into a surface-layer of radiate brushes of shorter tylostyles imbedded in the fibrous cortex.

Spicules:—Slender tylostyles; with well-developed heads, which may be very irregular and may be (apparently) shifted to a greater or lesser extent, sometimes very great, towards the middle of the spicule. The proportion of such abnormal spicules is rather large, and their occurrence suggests a possible mode of origin for the remarkable and anomalous centrotylote spicules of *Ficulina ficus*. Sometimes there is a terminal head and an additional, irregular swelling some distance along the shaft. These spicules vary so much in size that it seems almost useless to give individual measurements; perhaps from about 0.136 by 0.003 mm. in the surface-brushes to about 0.42 by 0.005 mm. in the interior gives the range of variation with sufficient accuracy. A direct comparison with a preparation in Mr. Carter's cabinet, purporting to come from Johnstone's type-specimen in the British Museum, gives the impression that the spicules are decidedly smaller and more slender than in the British form, but the difference is by no means great enough to justify specific distinction, and my measurements agree closely enough with those given by Topsent [1900]. More remarkable is the not infrequent occurrence of long, slender oxea, with a centrally or excentrically placed swelling. These are obviously derivatives of the slender tylostyles, and until more is known about their constancy in different specimens they may be regarded as abnormalities. They are very interesting, however, and seem to

throw a new light upon the significance of the long, slender, centrotylote oxea in *Halicnemia patera* [cf. Dendy, 1921].

According to Topsent the ectosome of *Suberites carnosus* is collenchymatous. In the New Zealand specimen it is distinctly fibrous, but this is probably a very variable character, and I can hardly believe that there is no fibrous tissue in the European form.

Register No., Locality, &c.—XLIV; Station 91, S. of Three Kings Islands, New Zealand, 300 fathoms.

87. *Polymastia conigera*, Bowerbank [1874].

There is one small specimen in the collection which agrees very closely with the specimens obtained by the "Sealark" Expedition in the Indian Ocean [Dendy, 1921]. It is more nearly spherical than hemispherical in shape, and has been attached by a broad base. It bears two low, rounded, mammiform projections, of solid appearance and without visible perforations. The diameter of the sponge is about 9 mm. The colour in spirit is pale yellowish grey, darker and more yellow internally; the texture firm and compact throughout.

The cortex is about 0.43 mm. thick, and divided into three zones; externally the very dense surface pile of small, radially arranged tylostyles; internally a densely felted layer of larger tylostyles, lying more or less tangentially. These two layers are of about equal thickness, and between them lies a clearer zone showing a strongly fibrous structure and containing numerous small, radially arranged tylostyles which appear to be passing through to take their place in the surface pile. This middle layer is not distinguishable in the Indian Ocean specimens.

The main skeleton consists of radial bundles of long tylostyles whose ends penetrate the cortex without projecting conspicuously on the surface, though many of the spicules have been broken off just outside the surface pile. Between these main radial bundles are scattered other bundles of tylostyles of various sizes, and lying in all sorts of directions, including small bundles of the surface forms, which evidently develop in the choanosome and pass outwards.

The spicules are so similar to those of the Indian Ocean specimens described by me that it is unnecessary to say more about them. The relationships of the species are discussed in the same place.

Previously known Distribution.—British Seas (Bowerbank); Saya de Malha, Indian Ocean (Dendy).

Register No., Locality, &c.—XXXVII; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

Genus *MICROTYLOSTYLIFER*, n. gen.

Sponge massive, with thin dermal membrane. Skeleton reticulate throughout. Megascleres, large styli with constricted bases; microscleres, microtylostyli, scattered throughout the sponge.

There seems no alternative but to propose a new genus for the curious sponge described below. The spiculation seems to approach most closely that of the genus *Polymastia*, if the microtylostyles may be supposed to represent the small tylostyles of that genus; but the external form and skeleton arrangement are totally different, and the absence of cortex affords another means of distinction.

88. *Microtylostylifer anomalus*, n. sp. (Pl. XV, figs. 46-49.)

This species is represented in the collection by a small, massive fragment, measuring about 15 mm. in diameter. Its consistence is crumb-of-bread-like, but harsh, owing to the large megascleres; the colour in spirit light yellowish grey. The surface, where uninjured, is covered with a thin, transparent, easily separable, dermal membrane, with inhalant pores scattered in the meshes of the reticulate dermal skeleton. Vents were not recognised.

The main skeleton is an irregular reticulation of large styli, single and in loose bundles, without any visible spongin. The dermal skeleton is a similar reticulation of bundles of megascleres and single spicules, but all lying tangentially, and with a greater proportion of the more slender megascleres.

Spicules:—(1) Styli (Pl. XV, fig. 46); stout, more or less curved or bent; much constricted at the evenly rounded base, gradually and sharply pointed at the apex; measuring about 0.76 by 0.027 mm. Numerous shorter and more slender forms (fig. 47) occur, which are presumably young stages.

(2) Microtylostyles (figs. 48 and 49); slender, slightly curved or bent; rather feebly tylote at the base and bluntly pointed at the apex; size very uniform, about 0.064 by 0.0016 mm. These spicules, which may be regarded as microscleres, occur in immense numbers, scattered through the dermal membrane, where they all lie tangentially, and through the interior of the sponge.

A few sigmata, of quite ordinary form, are also found in my preparations, but their relative scarcity and their distribution in the sponge lead me to believe that they are foreign; nor are they the only foreign spicules present.

Register No., Locality, &c.—XLVII. 7; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms.

ORDER EUCERATOSA.

FAMILY DARWINELLIDÆ.

89. *Megalopastas elegans* (Lendenfeld).

Dendrilla elegans, Lendenfeld [1889]; *Megalopastas elegans*, Dendy [1905].

There is a single good specimen of this common Australian species in the collection, which closely resembles some of my material from the neighbourhood of Port Phillip Heads. It is erect, digito-lamellate, and may have been pedunculate, but has been cut off below. The surface is conulose and the ends of the

primary fibres, and even some of the secondaries, project considerably in most parts, owing, apparently, to shrinkage of the soft tissues between them. The thick, opaque-looking dermal membrane is glabrous, and in many places minutely reticulate. The vents vary much in size, and are scattered. The height of the specimen is 132 mm. and the breadth 103 mm. The colour in spirit is dark greenish grey (which appears to be very characteristic of the species), both internally and externally. The colouring matter is, however, soluble in alcohol, and my Victorian material shows that it disappears in course of time. The same material shows that specimens dried with the flesh on are black. The texture in spirit is soft and compressible, but resilient.

The skeleton is a wide-meshed network of stout, heavily "pithed," light or dark coloured horny fibre, of which the primary lines radiate outwards and end (normally) in the surface conuli. The secondaries are very irregular, some running straight across between the primaries and others forming lattice-works, especially in the angles where the primaries diverge from one another.

The external form of this species has been figured by Lendenfeld (loc. cit., Pl. XLIV, fig. 9), and the anatomy by myself (loc. cit., Pl. XV, fig. 4).

Previously known Distribution.—Australian Seas.

Register No., Locality, &c.—IV; Station 134, Spirits Bay, near North Cape, New Zealand, 11–20 fathoms.

FAMILY SPONGELIIDÆ.

90. *Spongelia hirciniformis* (Carter).

Dysidea hirciniformis, Carter [1885–6]; *Spongelia fragilis*, var. *hirciniformis* Lendenfeld [1889].

This species is represented in the collection by two specimens, of which the smaller (R. N. XXIII. *b*) is the more perfect, consisting of a single, long, cylindrical process, rising from a small, irregular mass of the same sponge, which has apparently had no attachment. The basal mass is about 22 mm. in maximum diameter; the process commences with a diameter of 4 mm., gradually increasing to 8 mm. (excluding conuli) and finally tapering away to a sub-acuminate apex; its total length is 120 mm. The larger specimen (R. N. XXIII. *a*) is closely similar in appearance but has been cut off below, so that there is no narrow proximal portion; its total length is now 330 mm. and its maximum diameter (exclusive of conuli) is about 10 mm. Neither specimen shows any sign of branching. The conuli are acute and about 2 mm. in height. The vents are rather small and inconspicuous, scattered between the conuli. The dermal membrane is distinct and glabrous and has a slightly ridged appearance as it is raised up on the conuli. The colour in spirit (after formalin) is pale yellowish grey, the texture, as a whole, is tough, flexible and resilient.

The skeleton consists of an irregular, wide-meshed, axial network from which fibres branch off into the conuli. The axial portion consists of stout, strongly

laminated, dark amber-coloured, horny fibre; the main longitudinal fibres abundantly cored with sand and broken spicules, the connecting fibres much less abundantly cored or quite clear. The peripheral branches subdivide slightly and terminate in the conuli, where they consist almost entirely of broken spicules, the proportion of spongin increasing centripetally; they are only very sparsely united by connecting fibres.

The main longitudinal fibres of the skeleton vary up to 0.34 mm. in diameter.

The flagellate chambers are sac-shaped and eurypylous, and measure up to about 0.12 mm. in longer diameter.

This appears to be merely a robust variety of Carter's Australian species. I have examined a section of the latter from British Museum material and find the axial portion of the skeleton a good deal less strongly developed but the peripheral fibres more abundantly joined by connecting fibres.

Previously known Distribution.—South coast of Australia (Carter).

Register No., Locality, &c.—XXIII. *a, b*; August 2nd, 1911, 30–14 fathoms, off North Cape, New Zealand, sandy bottom.

91. *Spongelia spiculivora*, n. sp.

The best specimen (R. N. XXX. 2) is an irregularly massive, subdigitate sponge, about 54 mm. in length by 20 mm. in maximum diameter, probably repent in growth. The surface is coarsely subconulose, the conuli being low and far apart and sometimes connected by low ridges. There is a thin dermal membrane having a rather coarsely and unevenly reticulate appearance. Vents and pores are not distinguishable. The interior is cavernous. The texture (in spirit) is fairly firm and tough. The colour is white, with a curiously translucent appearance.

The skeleton is an irregular jumble of spicules, chiefly large oxea and triænes, derived from Stellettid sponges, and in such a perfect state of preservation that the sponge itself was at first mistaken for a Stellettid. There is hardly any other foreign matter and the spicules are held together only here and there by very locally and, on the whole, sparsely developed spongin. There is no dermal skeleton.

The distinction between ectosome and choanosome is not obvious. There is an abundantly developed mesogloea in places, especially around the larger canals and cavities. It is collenchymatous, but rather richly fibrillated, and contains numerous small nuclei. The flagellate chambers are crowded together in some parts, more sparingly scattered in others. They are large, sac-shaped and eurypylous; measuring up to about 0.1 mm. in greater diameter.

It is possible that this species may be identical with one or other of the Australian sand-sponges, but these are at present so imperfectly known as to make an identification very hazardous.

Register Nos., Locality, &c.—VII. 1; Station 90, near Three Kings Islands, N. of New Zealand, 100 fathoms; XXX. 2; Station 144, from Cape Maria van Diemen, W. by S., 7 miles, 35–40 fathoms.

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29 APR 1924



Porifera, Part I.—Non-Antarctic Sponges, Pl. I.

PLATE I.

Figs. 1-10.—*Leucettusa tubulosa*, n. sp.

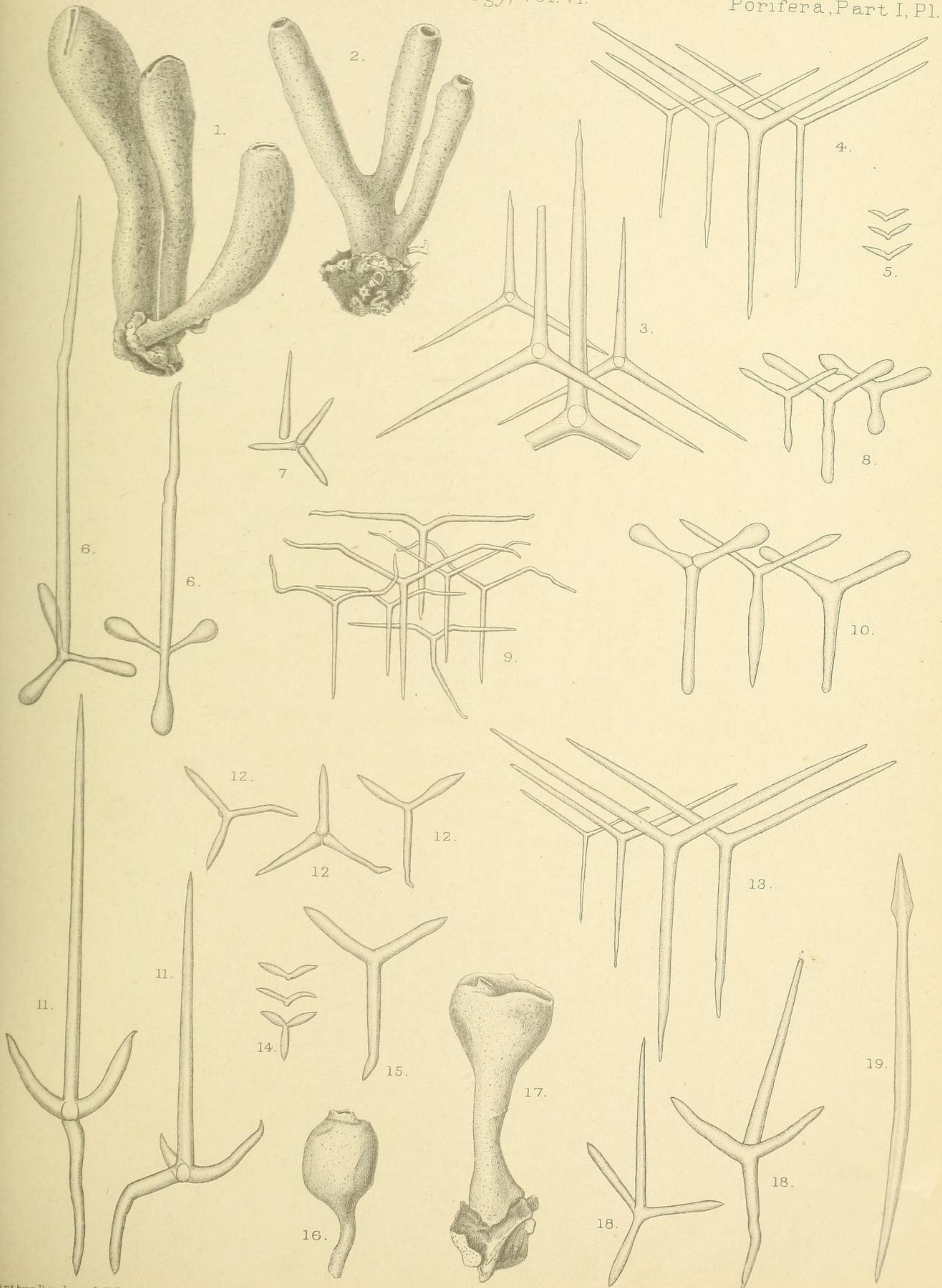
- FIG. 1.—R. N. XIX. 2. External form. Nat. size.
FIG. 2.—R. N. XIX. 3. External form. Nat. size.
FIG. 3.—R. N. XIX. 2. Large quadri radiates. $\times 48$.
FIG. 4.—R. N. XIX. 2. Large tri radiates. $\times 48$.
FIG. 5.—R. N. XIX. 2. Reduced pigmy radiates with only two rays, from interior. $\times 450$.
FIG. 6.—R. N. XIX. 2. Pigmy quadri radiates from near margin of vent. $\times 450$.
FIG. 7.—R. N. XIX. 2. Pigmy quadri radiate from interior, with separating rays. $\times 450$.
FIG. 8.—R. N. XIX. 2. Pigmy tri radiates from interior. $\times 450$.
FIG. 9.—R. N. XIX. 2. Sagittal tri radiates. $\times 48$.
FIG. 10.—R. N. XIX. 2. Pigmy tri radiates from margin of vent. $\times 450$.

Figs. 11-18.—*Leucettusa lancifer*, n. sp.

- FIG. 11.—R. N. XIV. 2. Pigmy quadri radiates from interior. $\times 450$.
FIG. 12.—R. N. XLIII. Pigmy tri radiates from interior. $\times 450$.
FIG. 13.—R. N. XIV. 2. Large tri radiates. $\times 48$.
FIG. 14.—R. N. XIV. 2. Reduced pigmy radiates. $\times 450$.
FIG. 15.—R. N. XIV. 2. Pigmy tri radiate from interior. $\times 450$.
FIG. 16.—R. N. XLIII. External form. Nat. size.
FIG. 17.—R. N. XIV. 2. External form. Nat. size.
FIG. 18.—R. N. XIV. 2. Pigmy quadri radiates from interior. $\times 450$.

FIG. 19.—*Grantessa poculum* (Poléjaeff).

- FIG. 19.—R. N. XIX 1 a. Lance-headed oxeote. $\times 90$.





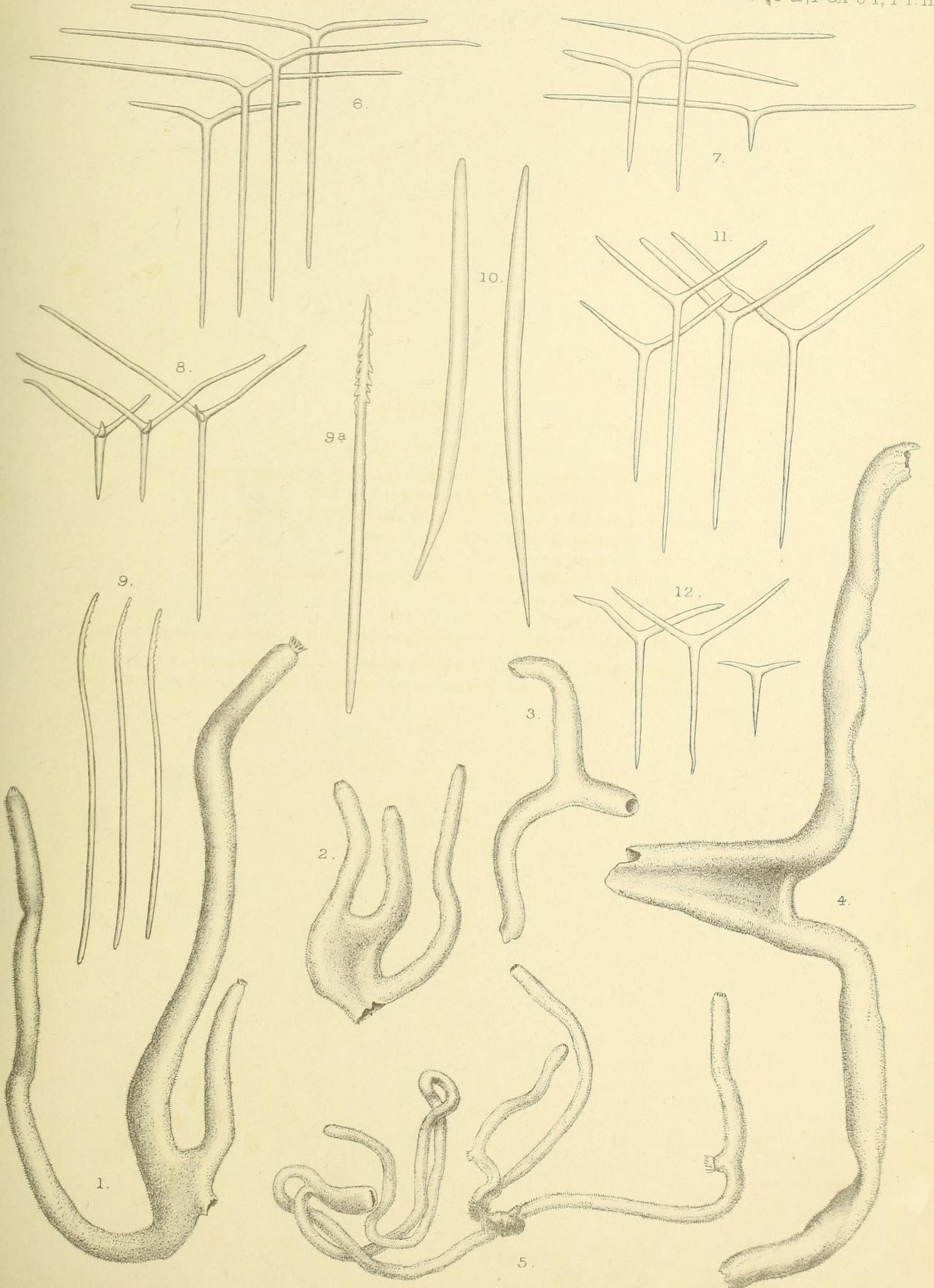
Porifera, Part I.—Non-Antarctic Sponges, Pl. II.

PLATE II.

Grantia ramulosa, n. sp. (R. N. XVI).

- FIGS. 1-5.—Pieces selected to show the range in external form. × 2.
FIG. 6.—Subgastral sagittal triradiates. × 160.
FIG. 7.—Alate triradiates of the oscular skeleton. × 160.
FIG. 8.—Gastral quadriradiates. × 160.
FIG. 9.—Saw-like oxea, side views. × 280.
FIG. 9 a.—Saw-like oxeote (small specimen), front view. × 650.
FIG. 10.—Large oxea. × 160.
FIG. 11.—Dermal triradiates. × 160.
FIG. 12.—Triradiates of chamber layer (drawn from spicules *in situ*). × 160.

The spicules, with the exception of those shown in Fig. 12, were drawn from boiled-out preparations, so that their position in the sponge could only be inferred from their shape.

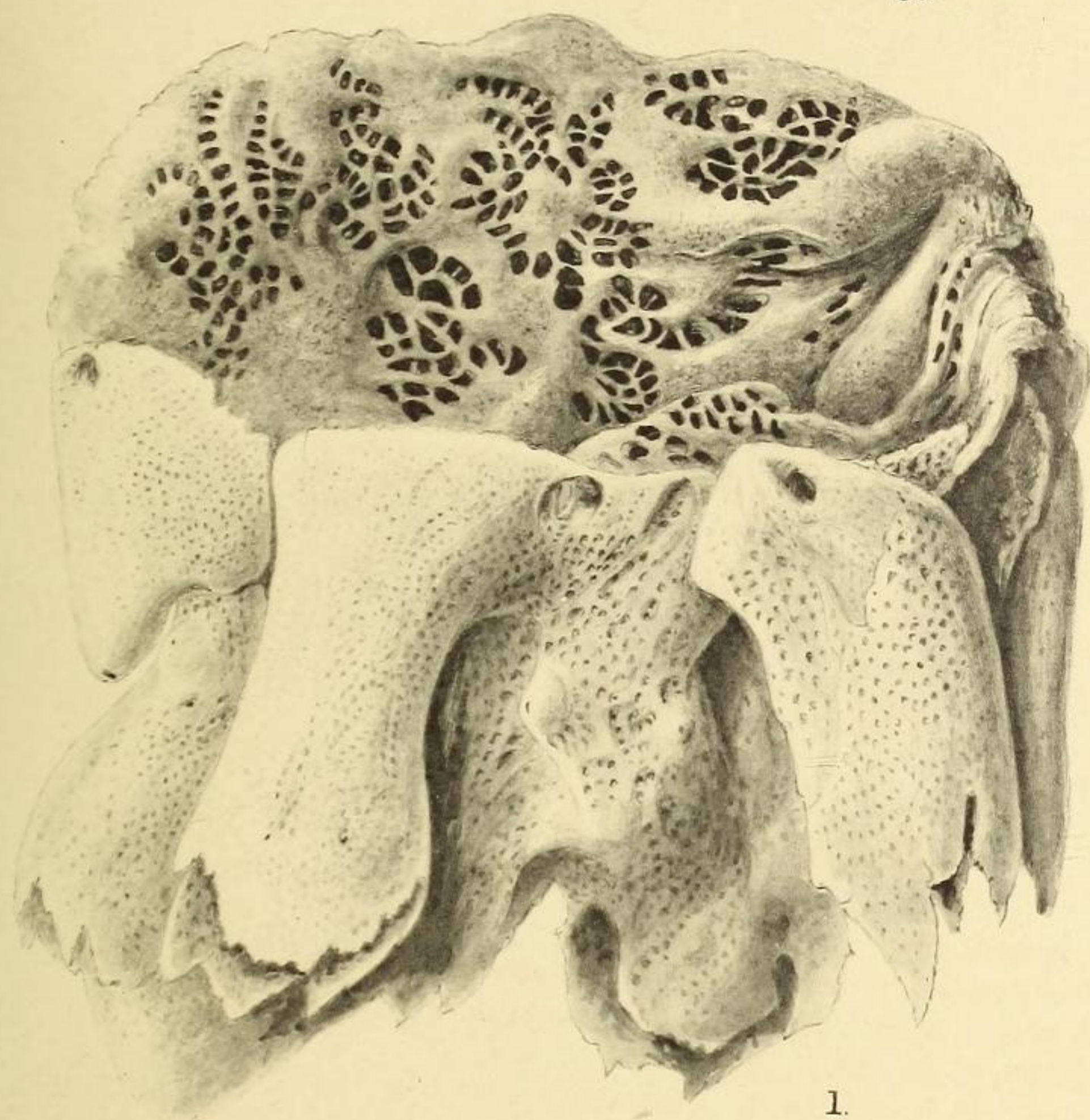




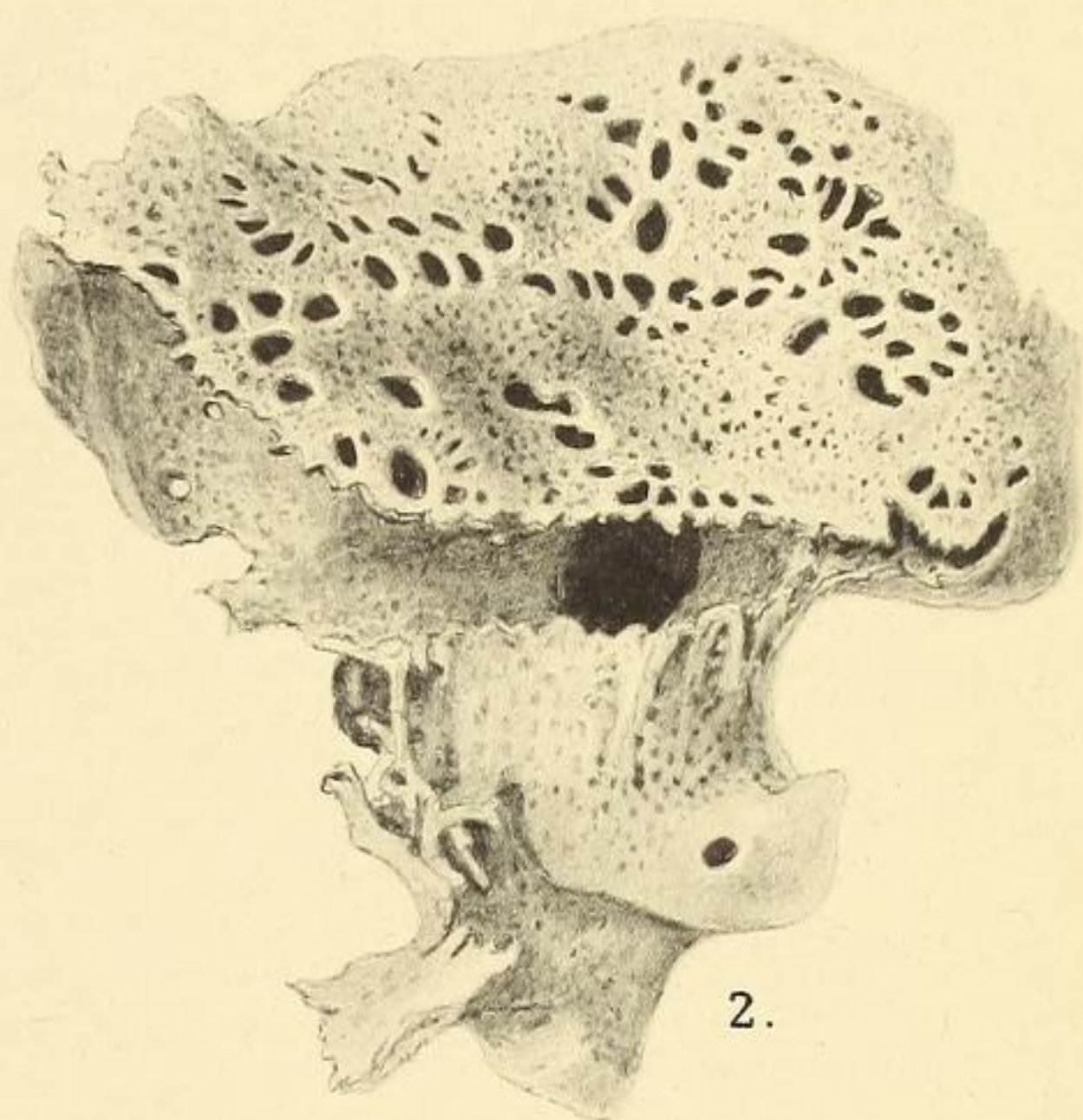
Porifera, Part I.—Non-Antarctic Sponges, Pl. III.

PLATE III.

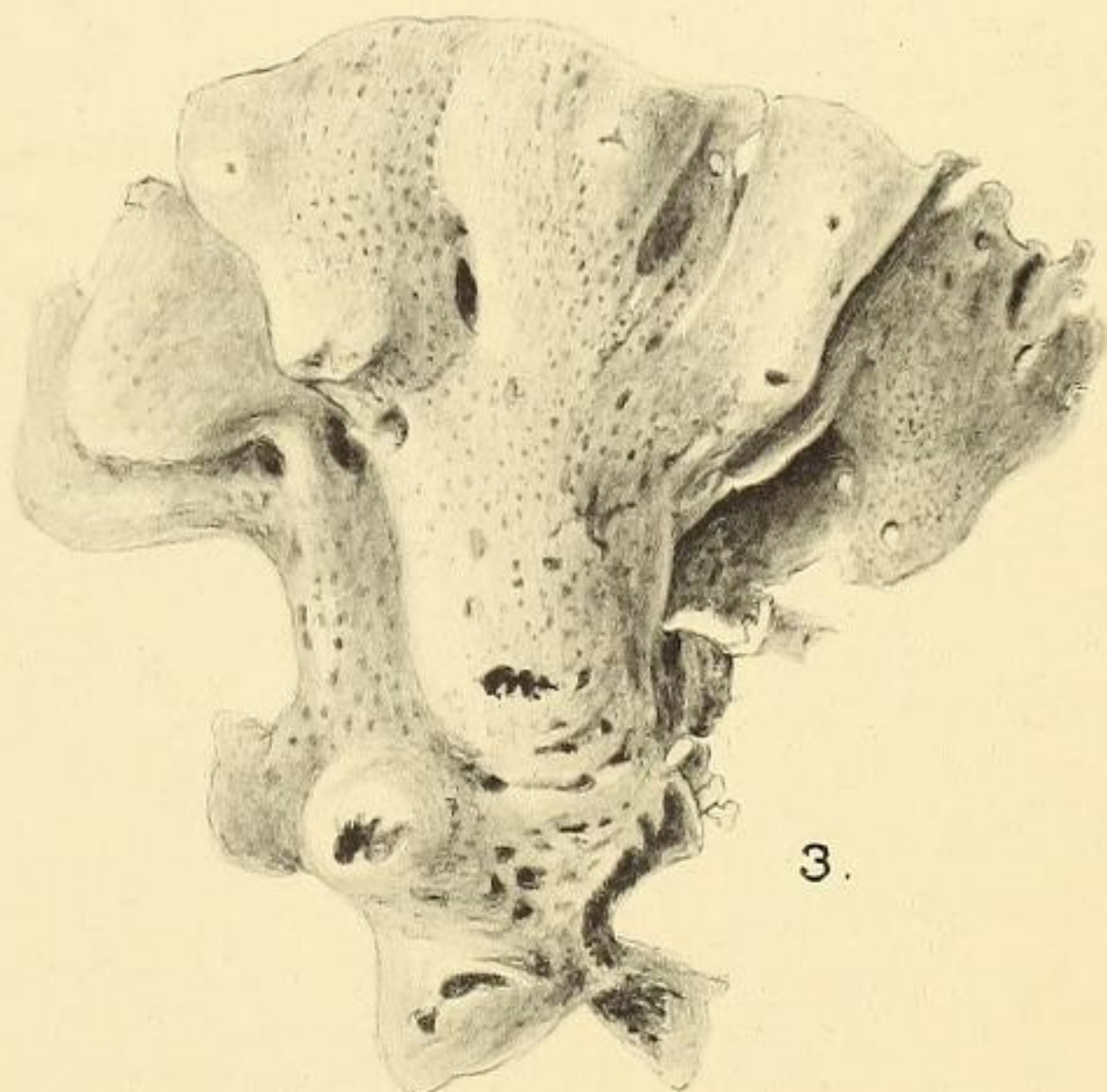
- FIG. 1.—*Symplectella rowi*, n. gen. et sp. R. N. XV. $\times \frac{1}{2}$.
FIG. 2.—*Symplectella rowi*, n. gen. et sp. R. N. XXVI. A younger specimen. Nat. size.
FIG. 3.—*Symplectella rowi*, n. gen. et sp. R. N. XXVI. Another view. Nat. size.
FIG. 4.—*Ancorina stalagmoides*, n. sp. R. N. XXXIII. 1. $\times \frac{2}{3}$.
FIG. 5.—*Rossella ijimai*, n. sp. R. N. XVIII. 1. Nat. size.



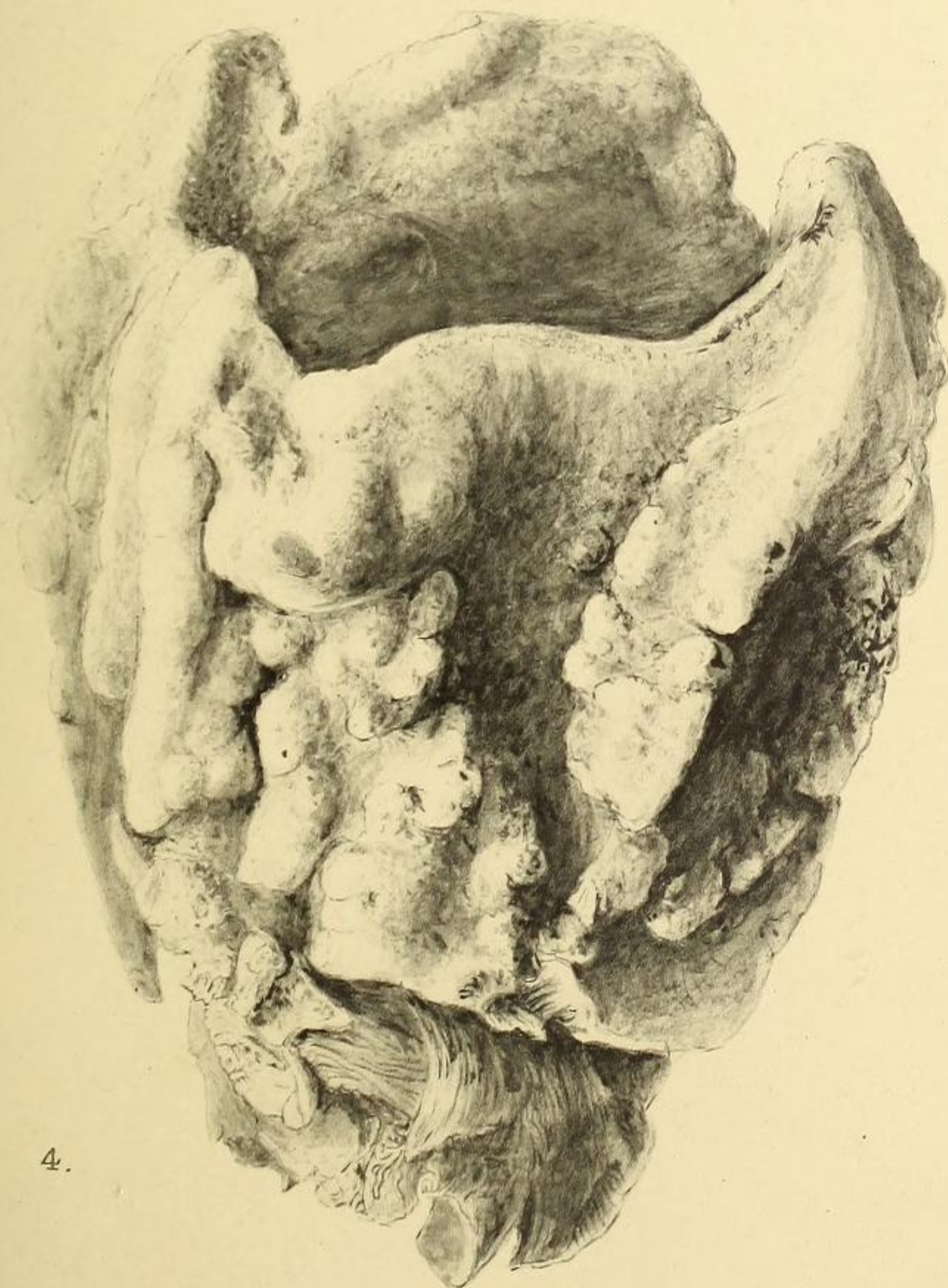
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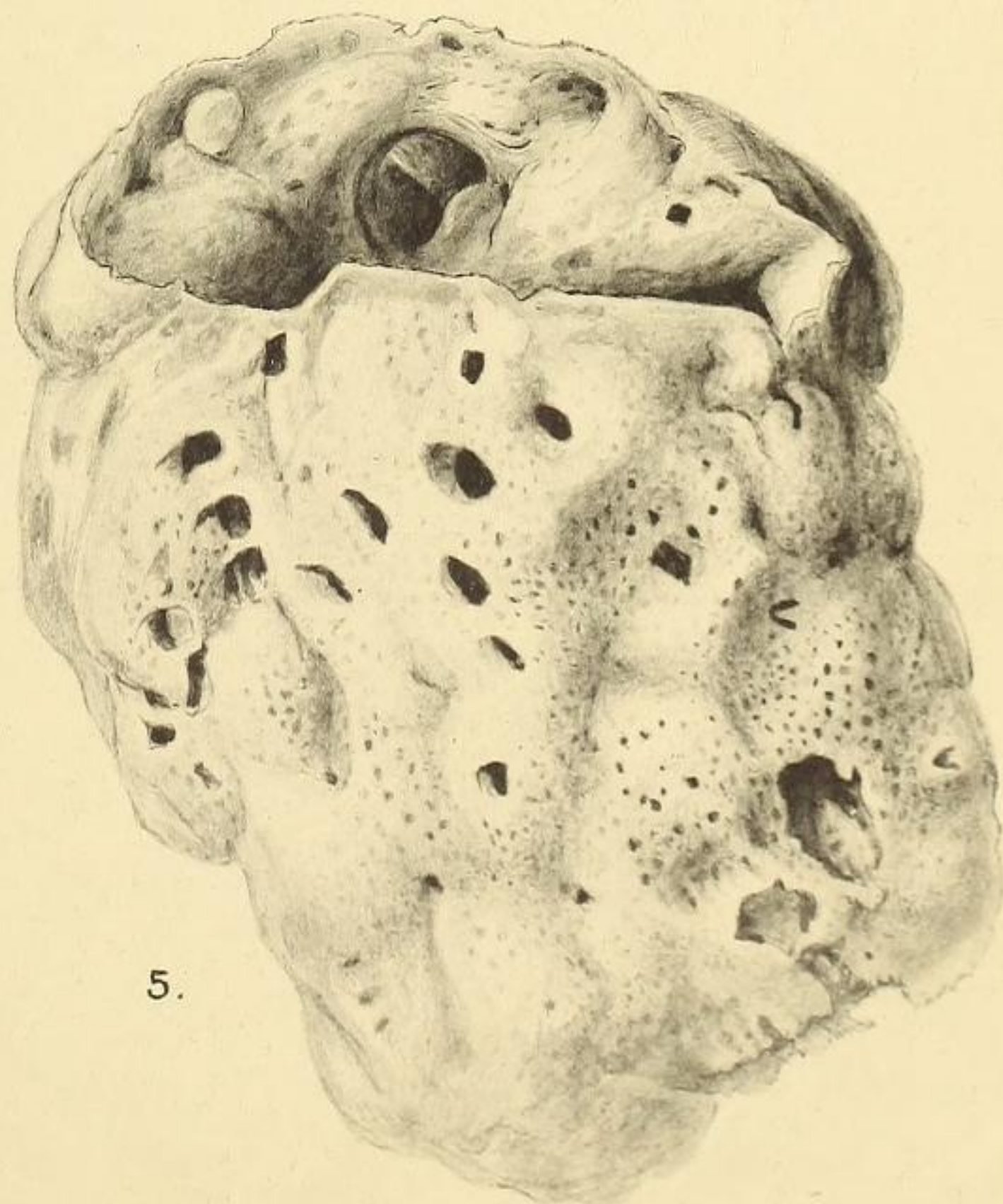
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Porifera, Part I.—Non-Antarctic Sponges. Pl. IV.

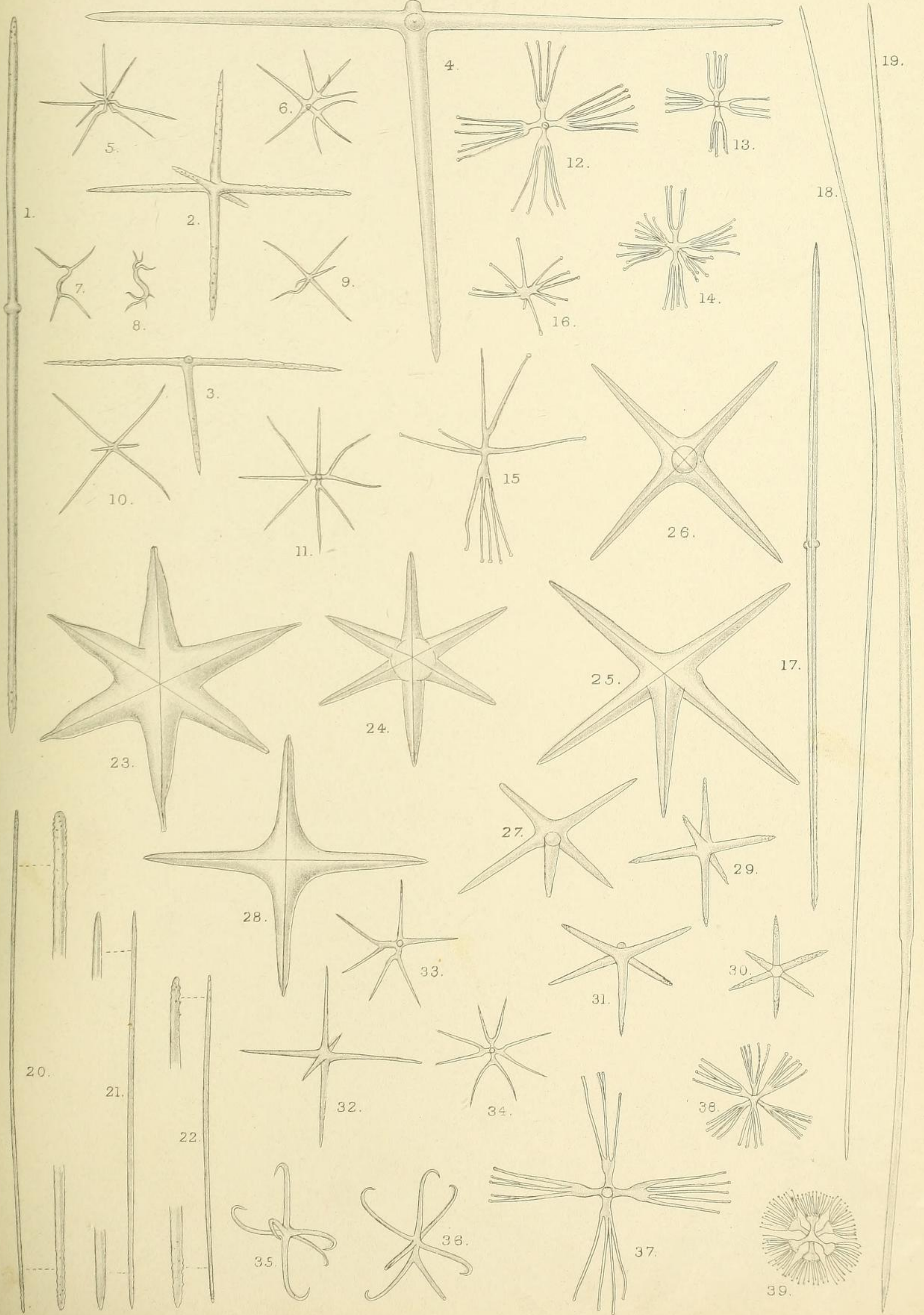
PLATE IV.

FIGS. 1-16.—*Rossella ijimai*, n. sp. (R. N. XVIII. 1).

- FIG. 1.—Small diact. × 280.
FIG. 2.—Gastral hexact (*in situ*). × 280.
FIG. 3.—Gastral pentact (*in situ*). × 280.
FIG. 4.—Pentact. × 280.
FIGS. 5-11.—Oxyhexasters. × 370.
FIGS. 12-15.—Calycocomes. × 370.
FIG. 16.—Irregular discohexaster. × 370.

FIGS. 17-39.—*Symplectella rowi*, n. gen. et sp. (R. N. XV).

- FIG. 17.—Small diact with central inflation. × 160.
FIG. 18.—Slender diact. × 65.
FIG. 19.—Stout diact. × 60.
FIGS. 20-22.—Small diacts. × 65; their ends also drawn separately. × 280.
FIG. 23.—Large hexact, parenchymal type. × 160.
FIG. 24.—Medium-sized hexact, dermal type. × 160.
FIGS. 25-27.—Pentacts. × 160.
FIG. 28.—Stauract. × 160.
FIGS. 29, 30.—Small hexacts with roughened tips. × 160.
FIG. 31.—Small pentact with three roughened tips. × 160.
FIG. 32.—Dermal oxyhexact (oxyhexaster). × 370.
FIGS. 33, 34.—Oxyhexasters. × 370.
FIGS. 35, 36.—Oxyhexasters with curved rays. × 370.
FIG. 37.—Larger calyccome. × 370.
FIG. 38.—Smaller calyccome. × 370.
FIG. 39.—Very minute discohexaster. × 1100.

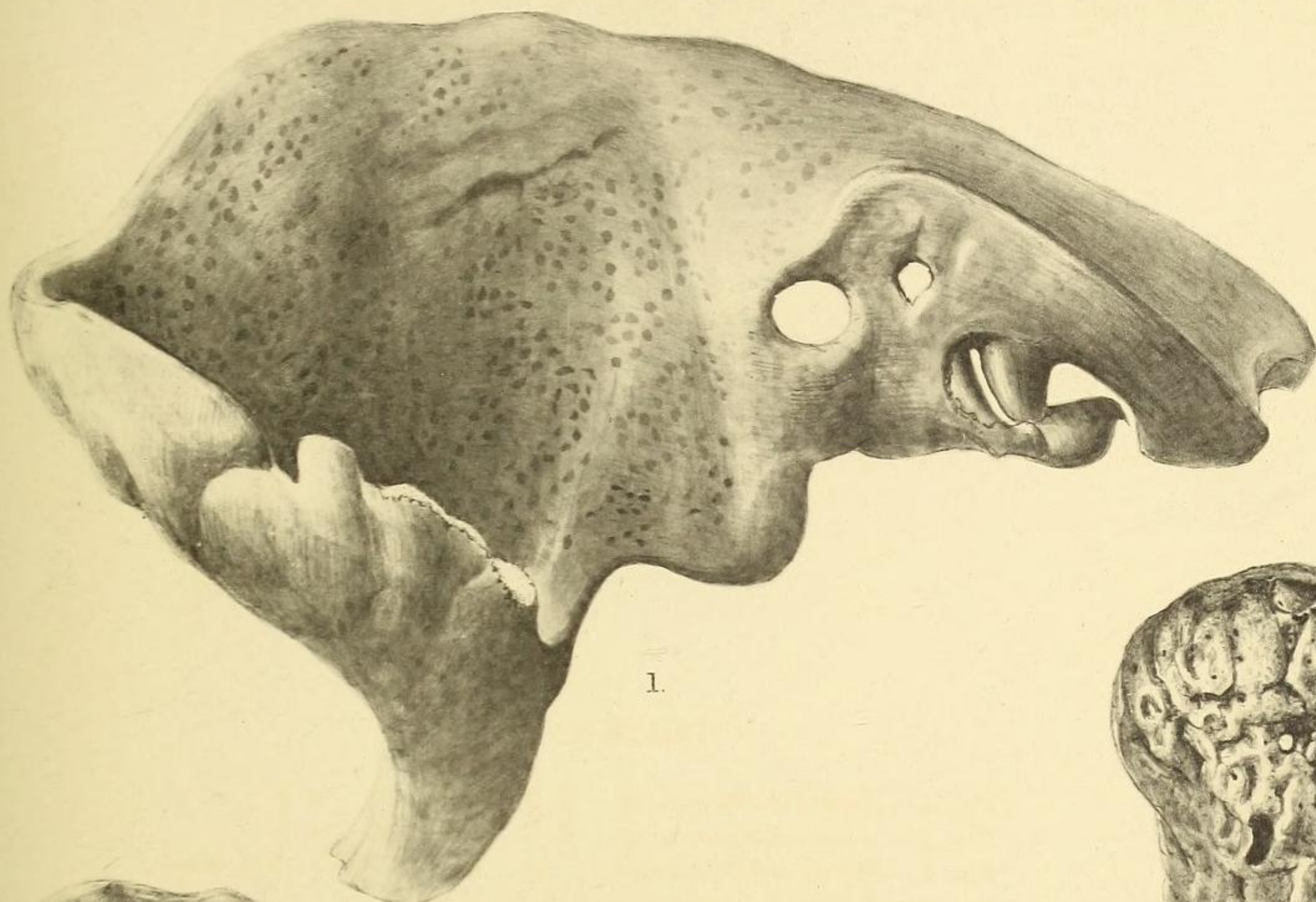




Porifera, Part I.—Non-Antarctic Sponges, Pl. V.

PLATE V.

- FIG. 1.—*Ancorina alata*, n. sp. R. N. XXXII. 6. $\times \frac{2}{3}$.
FIG. 2.—*Ancorina alata*, n. sp. R. N. XXXII. 8. $\times \frac{2}{3}$.
FIG. 3.—*Mycale novæ-zealandiæ*, n. sp. R. N. XXIV. Nat. size.
FIG. 4.—*Stelletta columna*, n. sp. R. N. XXXII. 4. $\times \frac{1}{2}$.
FIG. 5.—*Geodia regina*, n. sp. R. N. XXXII. 3. $\times \frac{2}{3}$.



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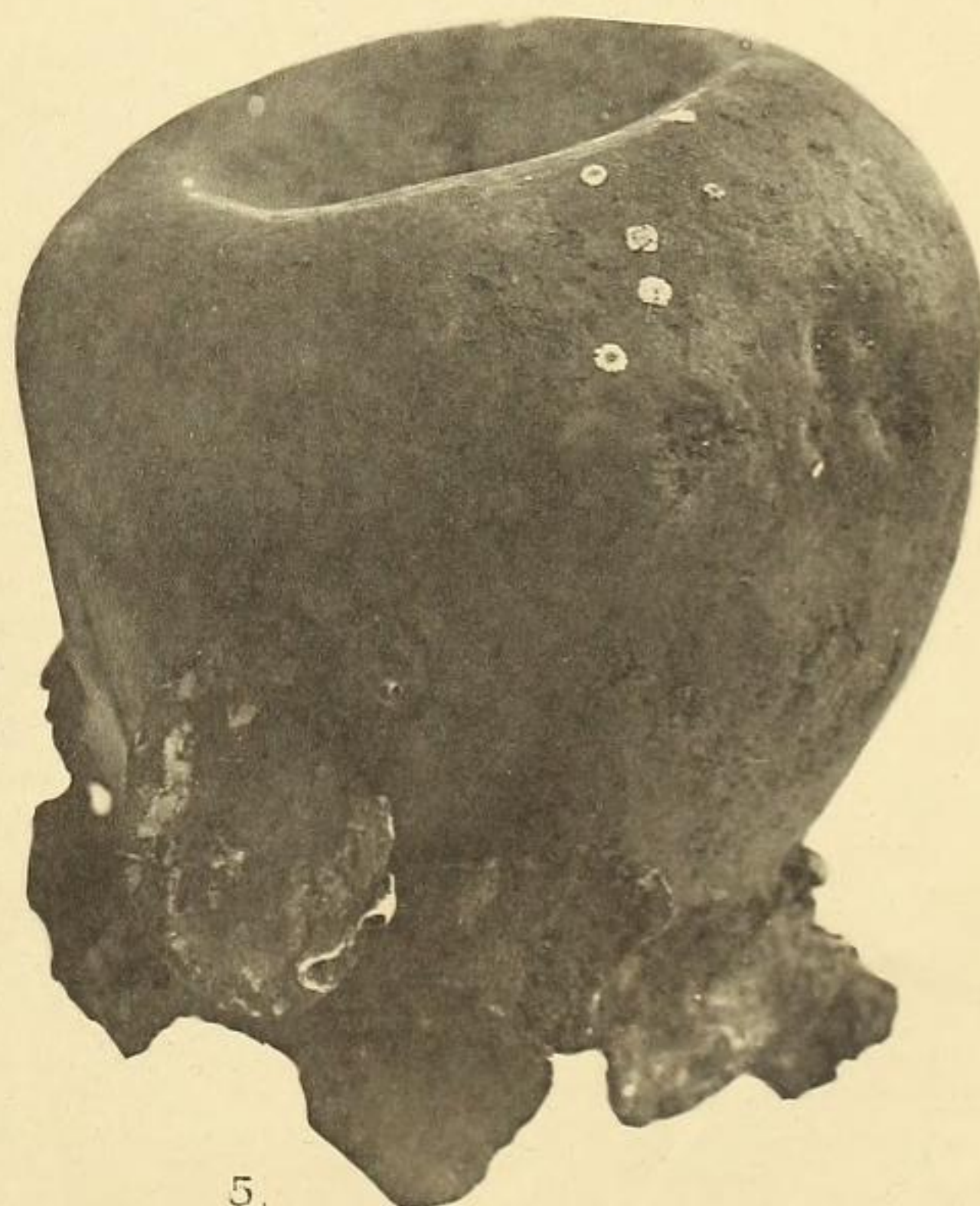
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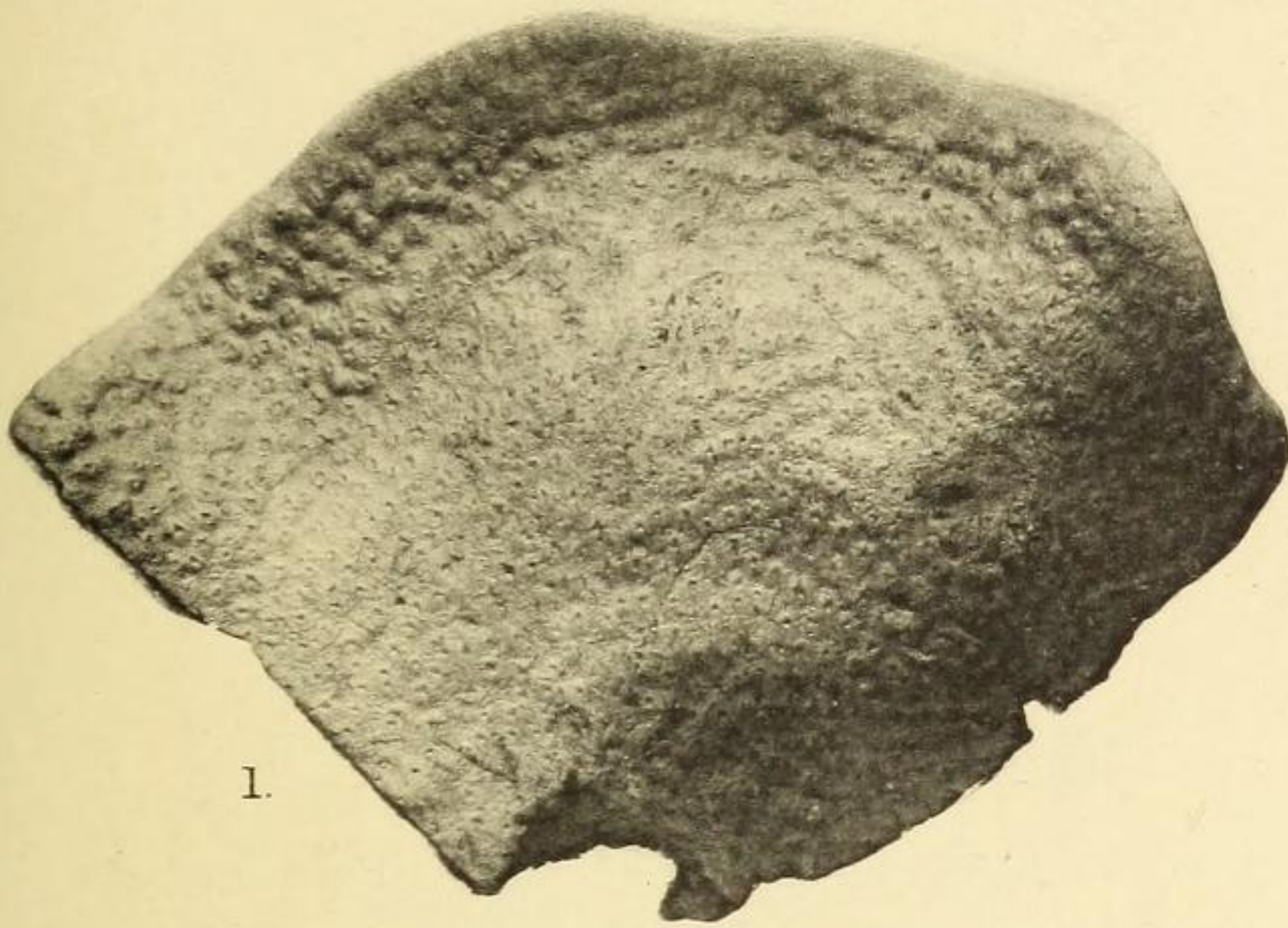
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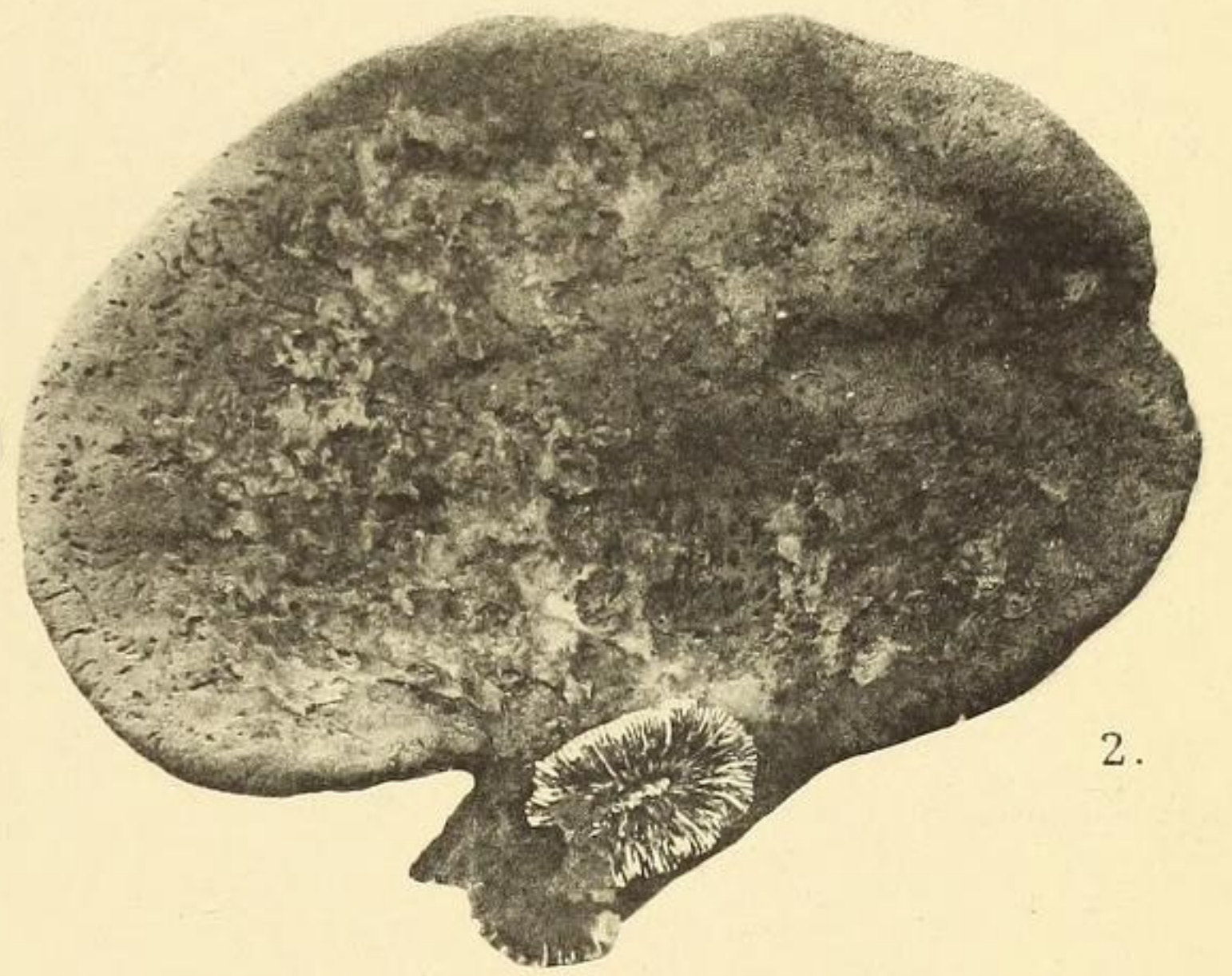
Porifera, Part I.—Non-Antarctic Sponges, Pl. VI.

PLATE VI.

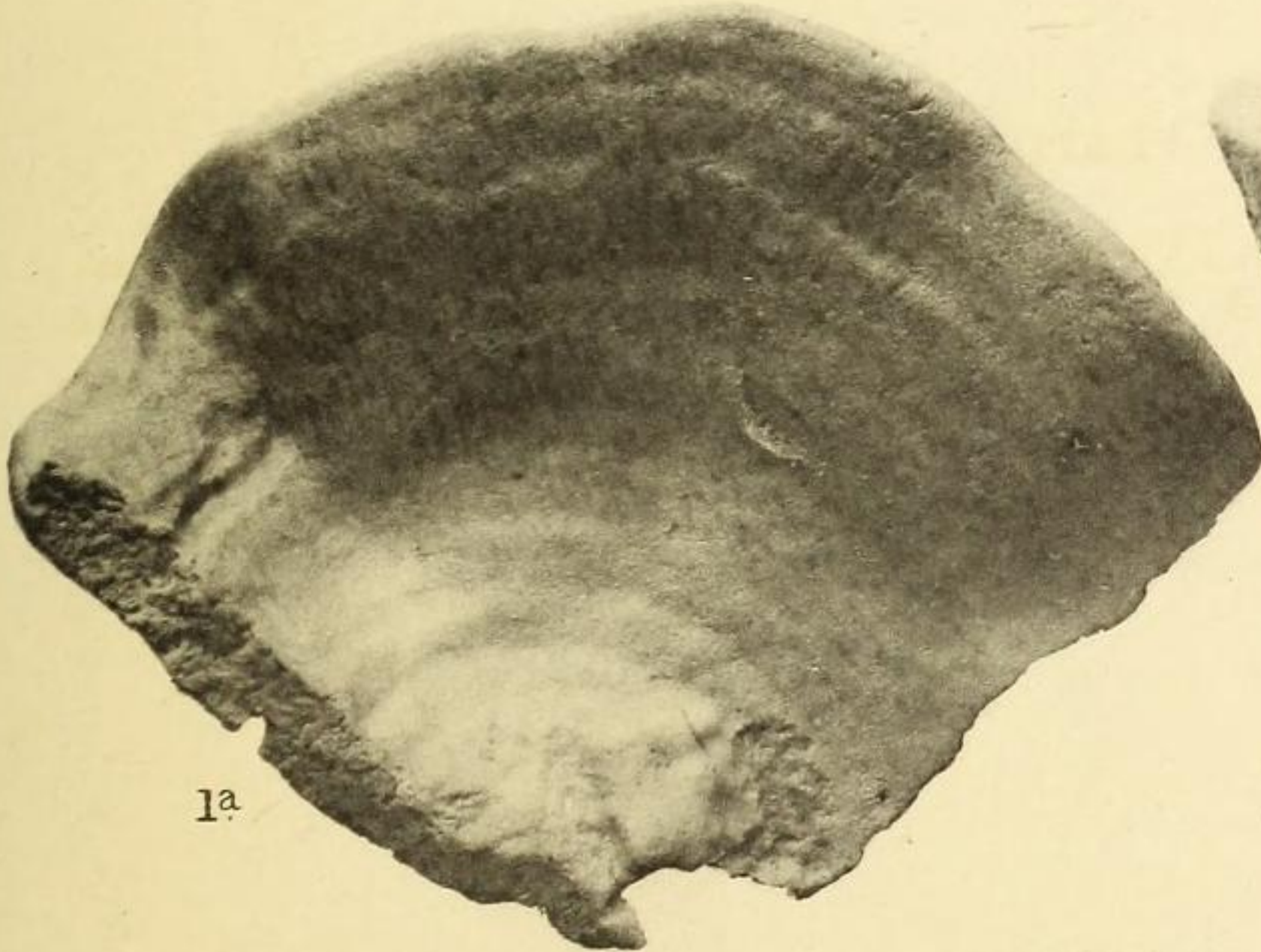
- FIG. 1.—*Aciculites pulchra*, n. sp. R. N. LVI. *b*. Part of specimen. Upper surface. Nat. size.
FIG. 1 *a*.—*Aciculites pulchra*, n. sp. R. N. LVI. *b*. Part of specimen. Lower surface. Nat. size.
FIG. 2.—*Gellius petrocalyx*, n. sp. R. N. XXXII. 1. $\times \frac{2}{3}$.
FIG. 3.—*Gellius petrocalyx*, n. sp. R. N. XXXII. 9. $\times \frac{2}{3}$.
FIG. 4.—*Geodia rex*, n. sp. R. N. XXXIII. 4. $\times \frac{1}{2}$.



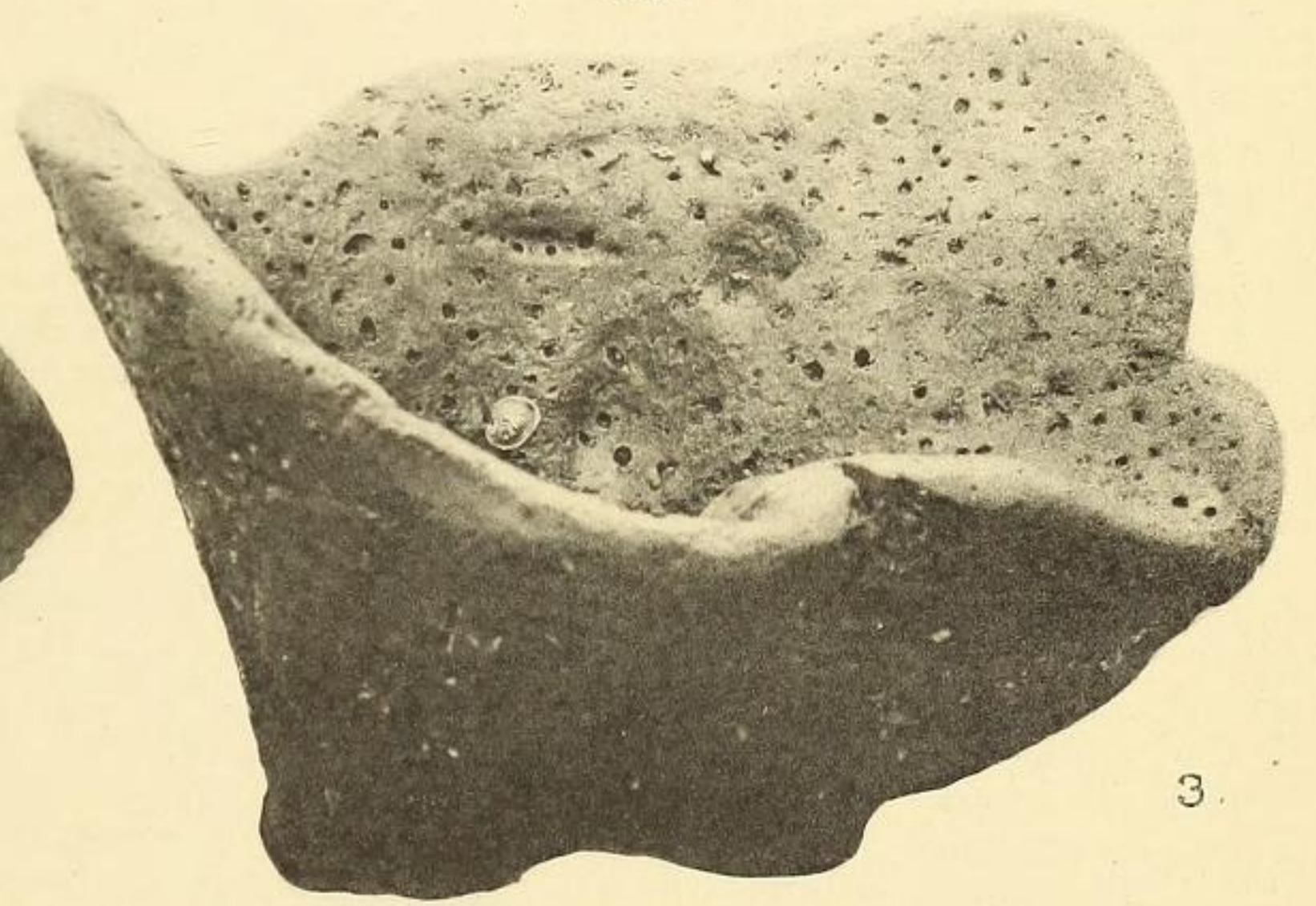
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4.



Porifera, Part I.—Non-Antarctic Sponges, Pl. VII.

PLATE VII.

FIGS. 1-4.—*Stelletta columna*, n. sp. (R. N. XXXII. 4).

- FIG. 1.—Plagiotriæne. × 50.
- FIG. 2.—Oxeote. × 50.
- FIG. 3.—Large oxyspherasters. × 280.
- FIG. 4.—Minute oxyspherasters. × 280.

FIGS. 5-7.—*Stelletta crater*, n. sp. (R. N. XXXII. 15).

- FIG. 5.—Oxeote. × 64.
- FIG. 6.—Triænes. × 64.
- FIG. 6 a.—Triæne with blunted cladi. × 64.
- FIG. 6 b.—Diæne. × 64.
- FIG. 7.—Oxyspherasters. × 440

FIGS. 8-11.—*Stelletta maori*, n. sp. (R. N. L. 10).

- FIG. 8.—Dichotriænes. × 50.
- FIG. 9.—Oxea. × 50.
- FIG. 10.—Oxyasters. × 440
- FIG. 11.—Tylasters. × 440.

FIGS. 12-15.—*Ancorina stalagmoides*, n. sp. (R. N. XXXIII. 1).

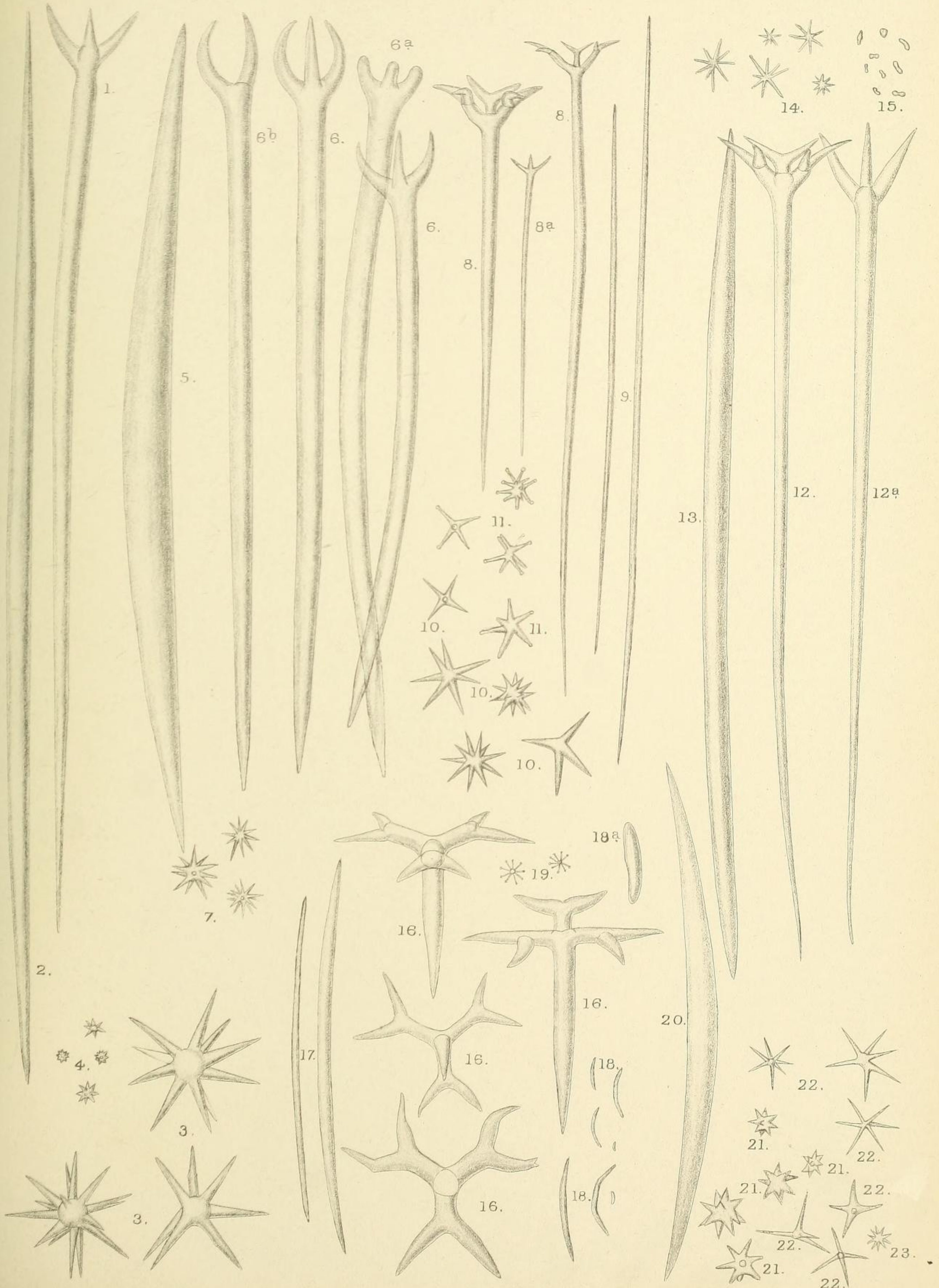
- FIG. 12.—Dichotriæne. × 50.
- FIG. 12 a.—Plagiotriæne. × 50.
- FIG. 13.—Oxeote. × 50.
- FIG. 14.—Oxyasters. × 440.
- FIG. 15.—Microrhabds. × 440.

FIGS. 16-19.—*Penares tylostaster*, n. sp. (R. N. XXVII).

- FIG. 16.—Dichotriænes (various views). × 66.
- FIG. 17.—Oxea. × 66.
- FIG. 18.—Microxea. × 66.
- FIG. 18 a.—Microxeote. × 440.
- FIG. 19.—Tylasters. × 440.

FIGS. 20-23.—*Jaspis novæ-zealandiæ*, n. sp. (R. N. XXX. 1).

- FIG. 20.—Oxeote. × 50.
- FIG. 21.—Spherasters. × 475.
- FIG. 22.—Oxyasters. × 475.
- FIG. 23.—Small spheraster. × 475.





Porifera, Part I.—Non-Antarctic Sponges, Pl. VIII.

PLATE VIII.

FIGS. 1-7.—*Ancorina alata*, n. sp. (R. N. XXXII. 8).

- FIG. 1.—Anatriæne. × 64.
- FIG. 2.—Plagiotriæne. × 64.
- FIG. 3.—Oxeote. × 64.
- FIG. 4.—Style. × 64.
- FIG. 5.—Strongylote. × 64.
- FIG. 6.—Microrhabds. × 440.
- FIG. 7.—Tylasters. × 440.

FIGS. 8-15 b.—*Ancorina novæ-zealandiæ*, n. sp. (R. N. X).

- FIG. 8.—Small oxeote. × 50.
- FIG. 9.—Large oxeote. × 50.
- FIG. 10.—Promesotriæne (Plagiomesotriæne). × 50.
- FIG. 10 a-d.—Variations of the cladome of the promesotriæne. × 94.
- FIG. 11.—Anatriæne. × 50.
- FIG. 12.—Plagiotriæne. × 50.
- FIG. 13.—Tylasters. × 1085.
- FIG. 14.—Tylospherasters. × 1085.
- FIG. 15-15 b.—Microrhabds. × 1085.

FIGS. 16-22.—*Geodia regina*, n. sp. (R. N. XXXII. 3).

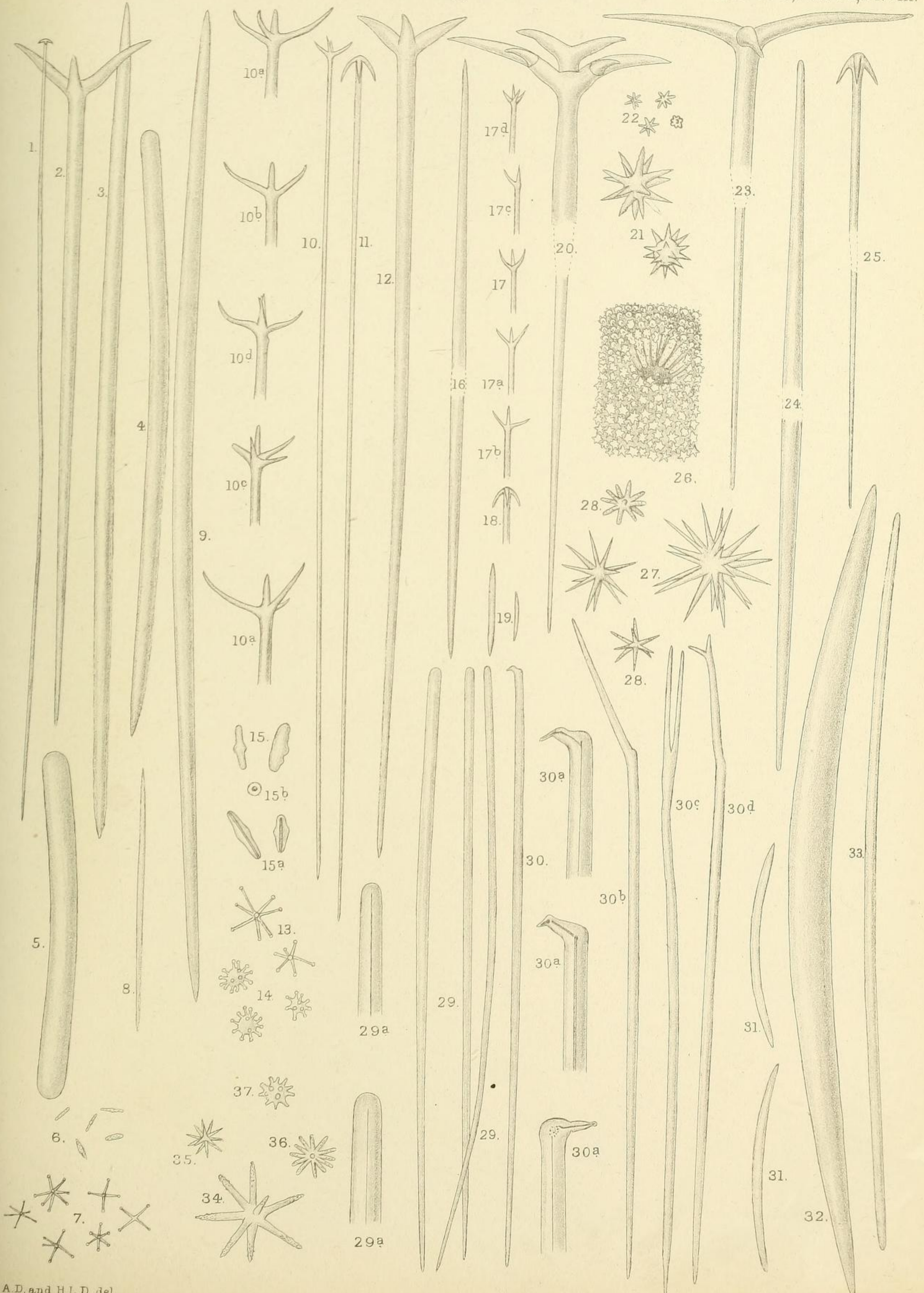
- FIG. 16.—Large oxeote. × 50.
- FIG. 17.—Cladome of protriæne. × 50.
- FIG. 17 a-d.—Variations in the cladome of the protriæne. × 50.
- FIG. 18.—Cladome of anatriæne. × 50.
- FIG. 19.—Cortical oxea. × 50.
- FIG. 20.—Dichotriæne. × 50.
- FIG. 21.—Oxyspherasters. × 470.
- FIG. 22.—Minute spherasters from dermal membrane. × 470.

FIGS. 23-28.—*Geodia rex*, n. sp. (R. N. XXXIII. 8).

- FIG. 23.—Orthotriæne. × 50.
- FIG. 24.—Large oxeote. × 50.
- FIG. 25.—Anatriæne. × 50.
- FIG. 26.—Portion of sterraster, with hilum. × 275.
- FIG. 27.—Larger oxyspherasters. × 1100.
- FIG. 28.—Smaller oxyspherasters. × 1100.

FIGS. 29-37.—*Geodinella vestigifera*, n. sp. (R. N. L. 8).

- FIG. 29.—Styli. × 90.
- FIG. 29 a.—Bases of styli. × 280.
- FIG. 30.—Reduced triæne with vestigial cladus. × 90.
- FIG. 30 a.—Cladomes of reduced triænes. × 280.
- FIG. 30 b-d.—Abnormal spicules. × 90.
- FIG. 31.—Short oxea. × 90.
- FIG. 32.—Stout oxeote. × 90.
- FIG. 33.—Slender oxeote. × 90.
- FIG. 34.—Large oxyaster. × 650.
- FIG. 35.—Small oxyaster. × 650.
- FIG. 36.—Small strongylaster. × 650.
- FIG. 37.—Minute strongylospheraster. × 650.

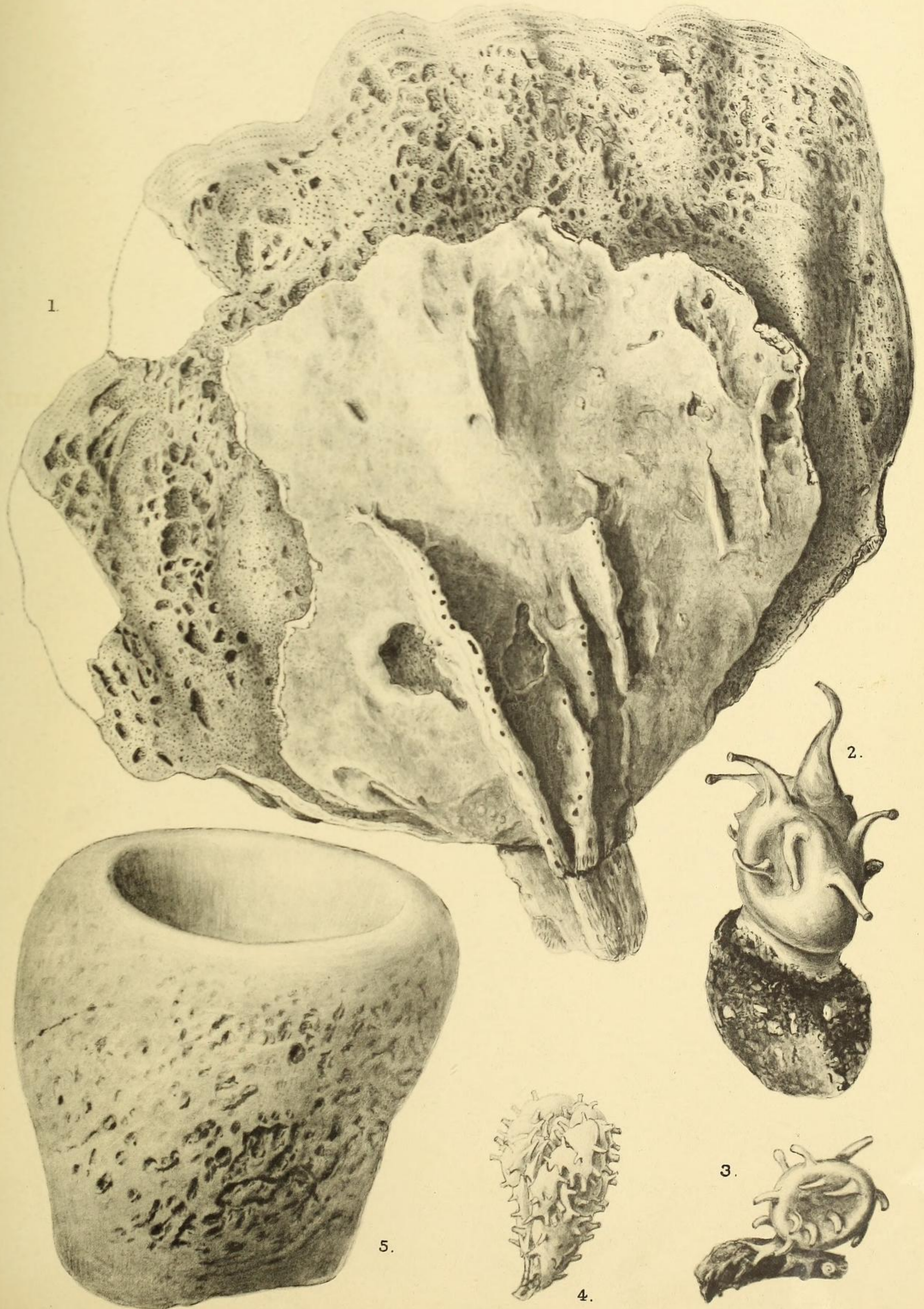




Porifera, Part I.—Non-Antarctic Sponges, Pl. IX.

PLATE IX.

- FIG. 1.—*Gellius imperialis*, n. sp. (Partially restored from dry and broken specimen.) R. N. XXXIII
3, 7, 17. $\times \frac{1}{2}$.
- FIG. 2.—*Amphiastrella kirkpatricki*, n. sp. R. N. LIV. a. Nat. size.
- FIG. 3.—*Inflatella spherica*, n. sp. R. N. LIV. b. Nat. size.
- FIG. 4.—*Pyloderma demonstrans*, n. sp. R. N. IX. a. Nat. size.
- FIG. 5.—*Stelletta crater*, n. sp. R. N. XXXII. 15. $\times \frac{2}{3}$.



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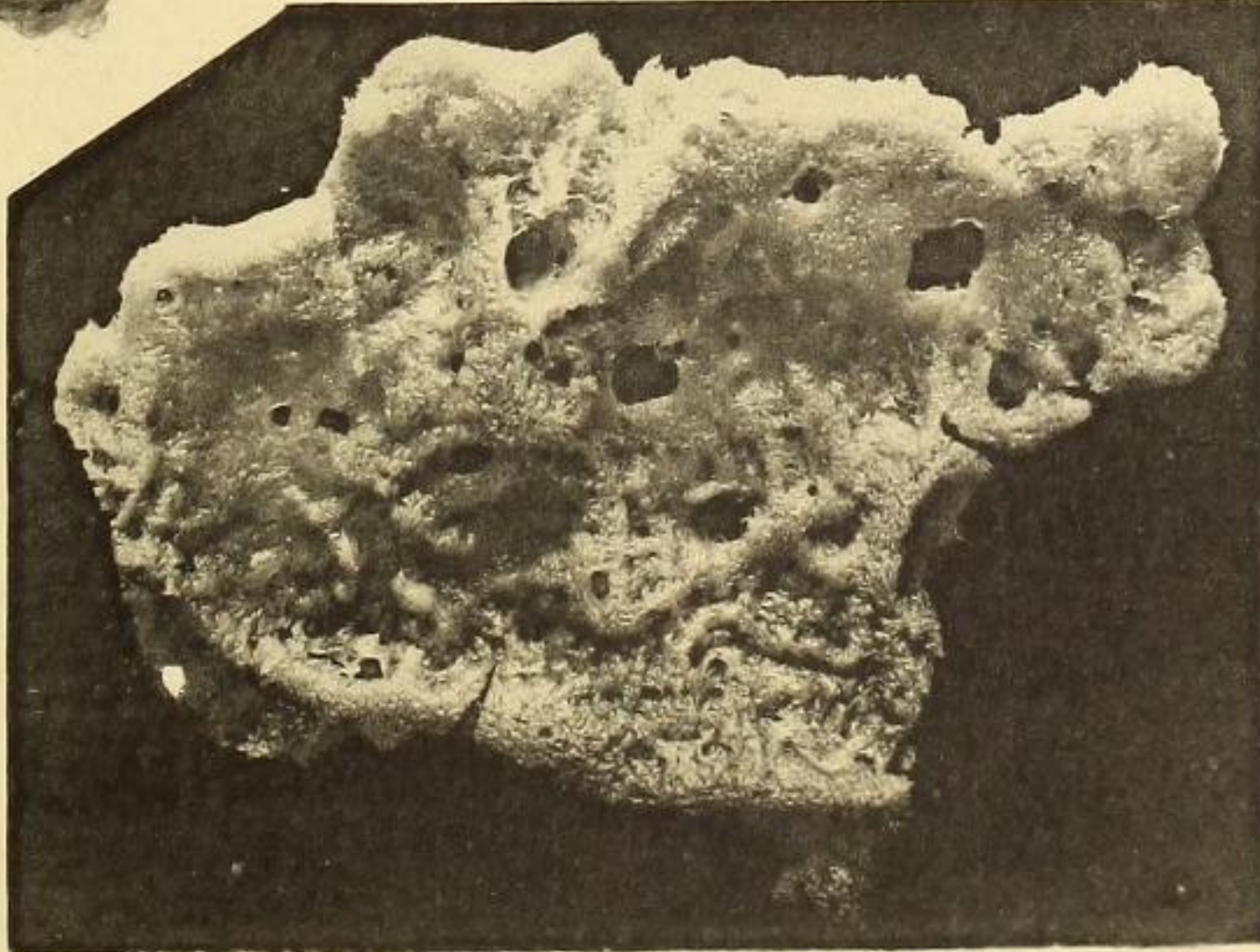
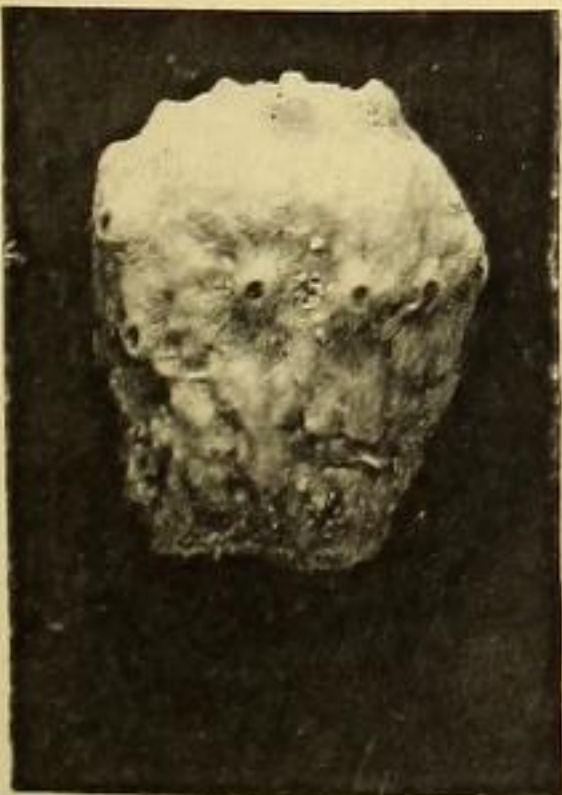
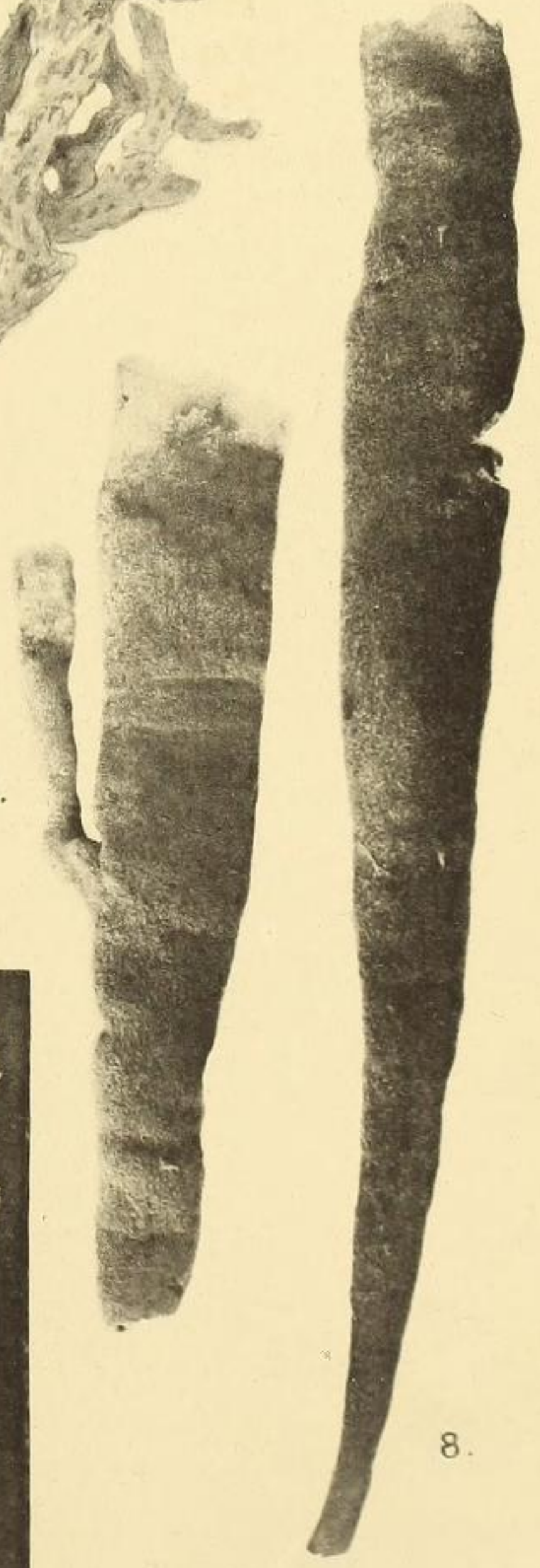
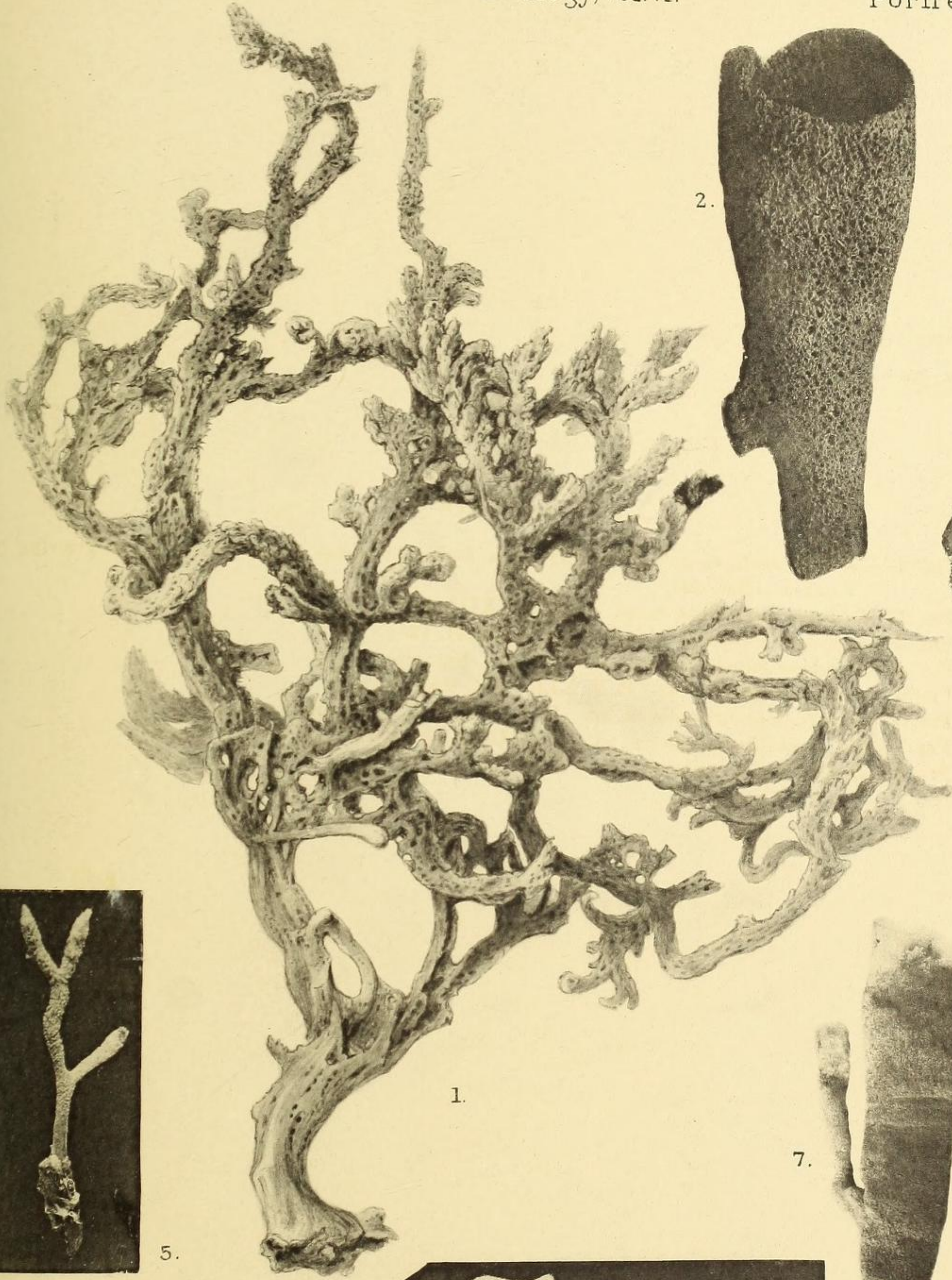
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Porifera, Part I.—Non-Antarctic Sponges, Pl. X.

PLATE X.

- FIG. 1.—*Clathria scotti*, n. sp. R. N. LII, with *Iophon lævistylus*, n. sp. R. N. LII. *a*, growing on it at *a*. Nat. size.
- FIG. 2.—*Isodictya cavicornuta*, n. sp. R. N. XXXIII. 12. *b*. $\times \frac{7}{9}$.
- FIG. 3.—*Isodictya cavicornuta*, n. sp. R. N. XXXIII. 12. *g*. $\times \frac{7}{9}$.
- FIG. 4.—*Cinachyra uteoides*, n. sp. R. N. XLII. Nat. size.
- FIG. 5.—*Bubaris elegans*, n. sp. R. N. XLI. Nat. size.
- FIG. 6.—*Myxilla novæ-zealandiæ*, n. sp. R. N. XVIII. 2. Nat. size.
- FIG. 7.—*Siphonochalina latituba*, n. sp. R. N. LVII. *b*. $\times \frac{1}{3}$.
- FIG. 8.—*Siphonochalina latituba*, n. sp. R. N. III. $\times \frac{1}{3}$.



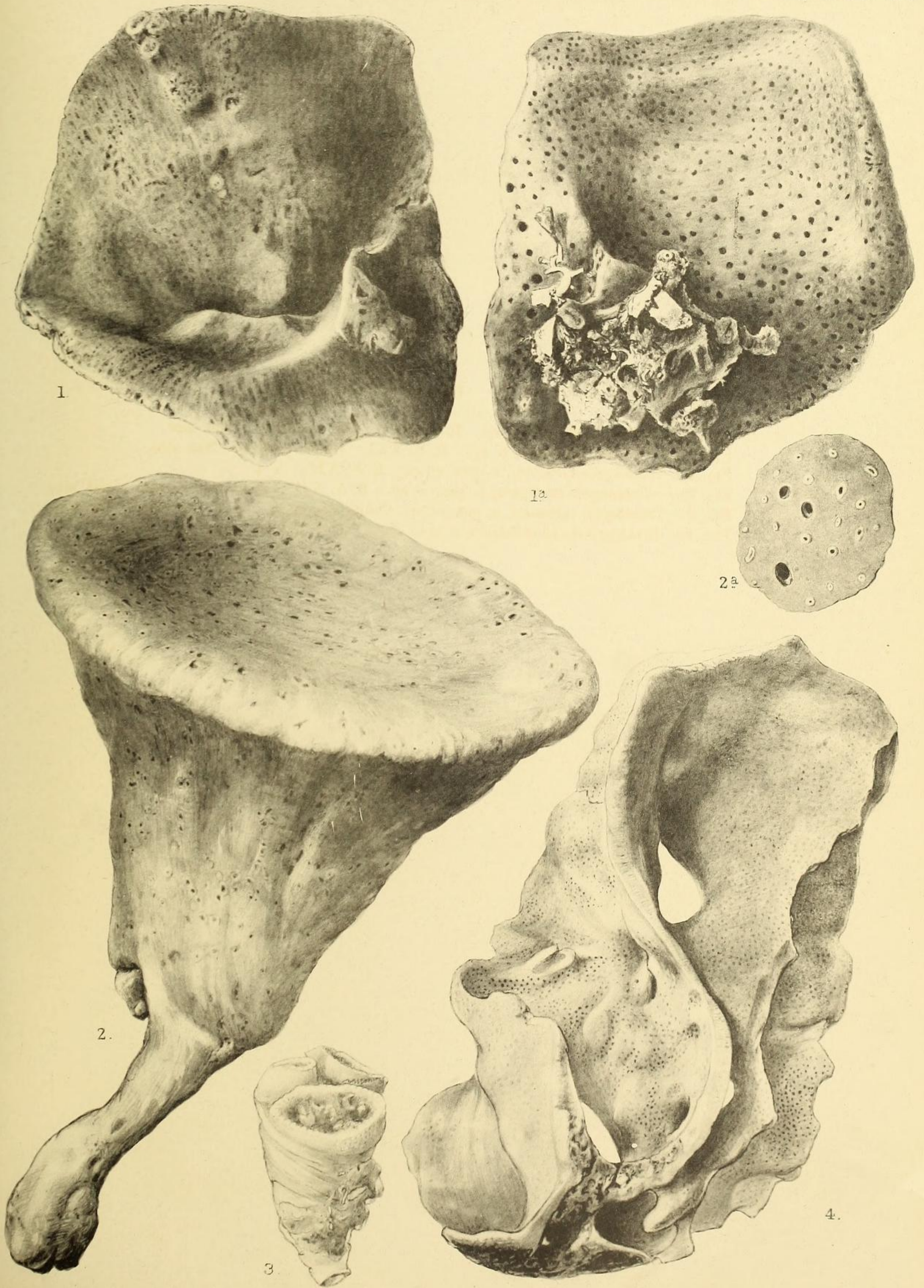
British Museum Library



Porifera, Part I.—Non-Antarctic Sponges, Pl. XI.

PLATE XI.

- FIG. 1.—*Petrosia coralloides*, n. sp. R. N. XXI. Upper surface. Nat. size.
FIG. 1 a.—*Petrosia coralloides*, n. sp. R. N. XXI. Lower surface. Nat. size.
FIG. 2.—*Tedaniopsis turbinata*, n. gen. et sp. R. N. XII. $\times \frac{3}{4}$.
FIG. 2 a.—*Tedaniopsis turbinata*, n. gen. et sp. R. N. XII. Portion of surface. Nat. size.
FIG. 3.—*Tedaniopsis turbinata*, n. gen. et sp., young specimen. R. N. XXVIII. Nat. size.
FIG. 4.—*Parahigginsia phakellioides*, n. gen. et sp. R. N. XVII. Nat. size.

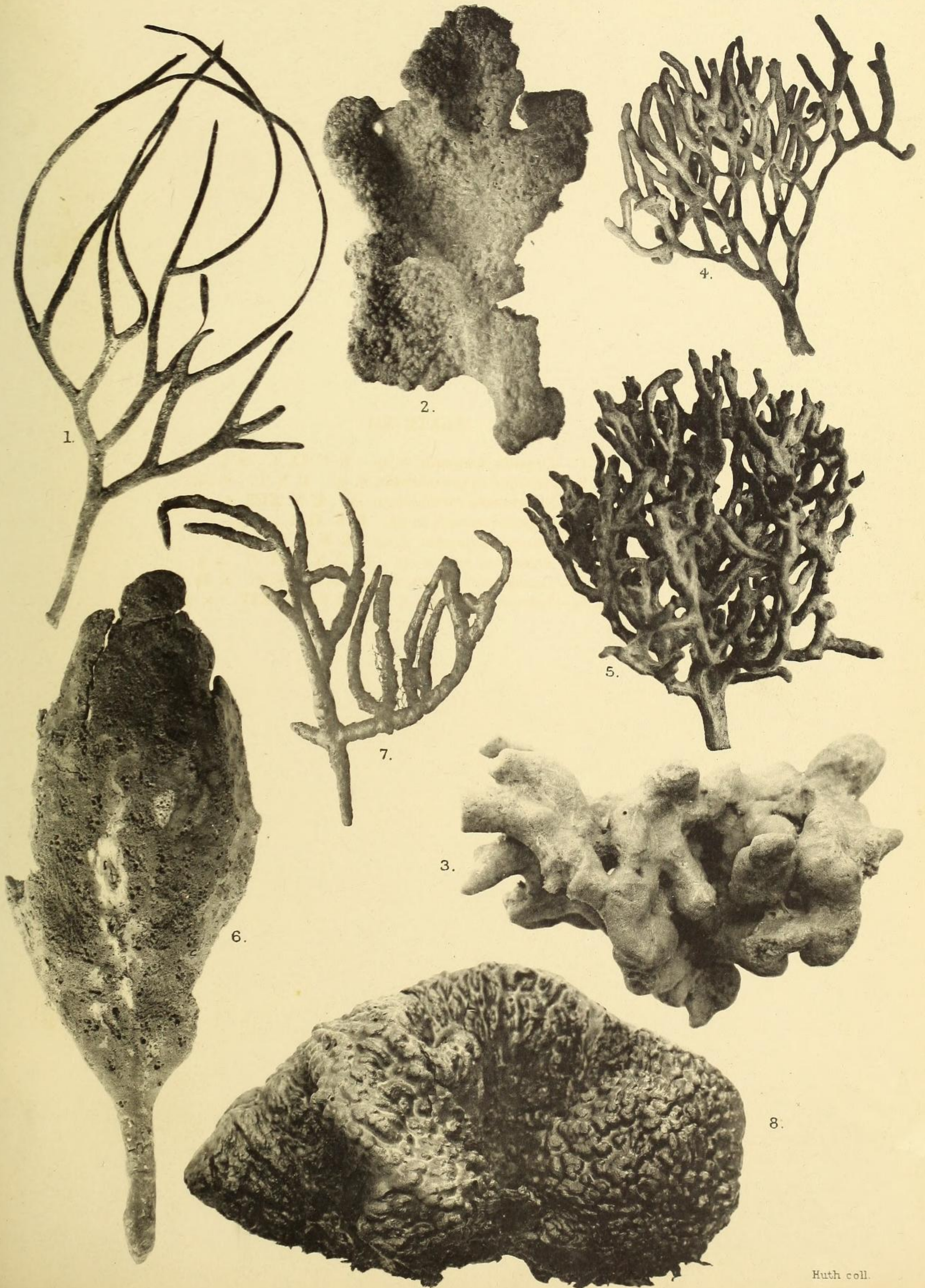




Porifera, Part I.—Non-Antarctic Sponges, Pl. XII.

PLATE XII.

- FIG. 1.—*Raspailia inæqualis*, n. sp. R. N. II. 4. $\times \frac{3}{8}$.
FIG. 2.—*Anchinoë novæ-zealandiæ*, n. sp. R. N. I. $\times \frac{7}{11}$.
FIG. 3.—*Rhabderemia coralloides*, n. sp. R. N. XIII. a. $\times \frac{4}{5}$.
FIG. 4.—*Raspailia topsenti*, n. sp. R. N. II. 1. $\times \frac{3}{8}$.
FIG. 5.—*Clathria terræ-novæ*, n. sp. R. N. V. 3. $\times \frac{3}{4}$.
FIG. 6.—*Artemisina jovis*, n. sp. R. N. XXXII. 7. $\times \frac{1}{2}$.
FIG. 7.—*Trachycladus stylifer*, n. sp. R. N. LV. 4. $\times \frac{11}{17}$.
FIG. 8.—*Tedania crista-galli*, n. sp. R. N. XXXIV. $\times \frac{2}{3}$.





Porifera, Part I.—Non-Antarctic Sponges, Pl. XIII.

PLATE XIII.

FIGS. 1-3.—*Lepidospongia incrustans*, n. gen. et sp. (R. N. XXXV. m).

FIG. 1.—Outlines of six discotriænes. × 59.

FIG. 2.—Discotriæne. × 210.

FIG. 3.—Microrhabds. × 485.

FIGS. 4-5.—*Oceanapia* (?) *arcifera*, n. sp. (R. N. LV. 3 a).

FIG. 4.—Oxeote. × 280.

FIG. 5.—Toxa. × 280.

FIGS. 6-13.—*Mycale novæ-zealandiæ*, n. sp. (R. N. XXIV).

FIG. 6.—Small sigmata. × 485.

FIG. 7.—Large sigmata. × 485.

FIG. 8.—Trichodragmata. × 485.

FIG. 9 a.—Small palmate anisochela, front view. × 485.

FIG. 9 b.—Small palmate anisochela, side view. × 485.

FIG. 10 a.—Intermediate palmate anisochela, front view. × 485.

FIG. 10 b.—Intermediate palmate anisochela, side view. × 485.

FIG. 11 a.—Large palmate anisochela, front view. × 485.

FIG. 11 b.—Large palmate anisochela, side view. × 485.

FIG. 12.—Short style. × 123.

FIG. 13.—Long styli. × 123.

FIGS. 14-20.—*Esperiopsis macrosigma* Stephens, var. *novæ-zealandiæ*, nov. (R. N. XXXV. j).

FIG. 14.—Subtylostyle. × 330.

FIG. 15 a.—Large palmate isochela, front view. × 550.

FIG. 15 b.—Large palmate isochela, side view. × 550.

FIG. 16 a.—Intermediate palmate isochela, front view. × 550.

FIG. 16 b.—Intermediate palmate isochela, side view. × 550.

FIG. 17 a.—Small palmate isochela, front view. × 550.

FIG. 17 b.—Small palmate isochela, side view. × 550.

FIG. 18.—Giant sigma. × 550.

FIG. 19.—Small sigma. × 550.

FIG. 20.—Intermediate sigmata. × 550.

FIGS. 21-25.—*Esperiopsis megachela*, n. sp. (R. N. XXXV. b).

FIG. 21.—Style. × 122.

FIG. 22.—Sigmata. × 485.

FIG. 23 a.—Intermediate palmate isochela, front view. × 485.

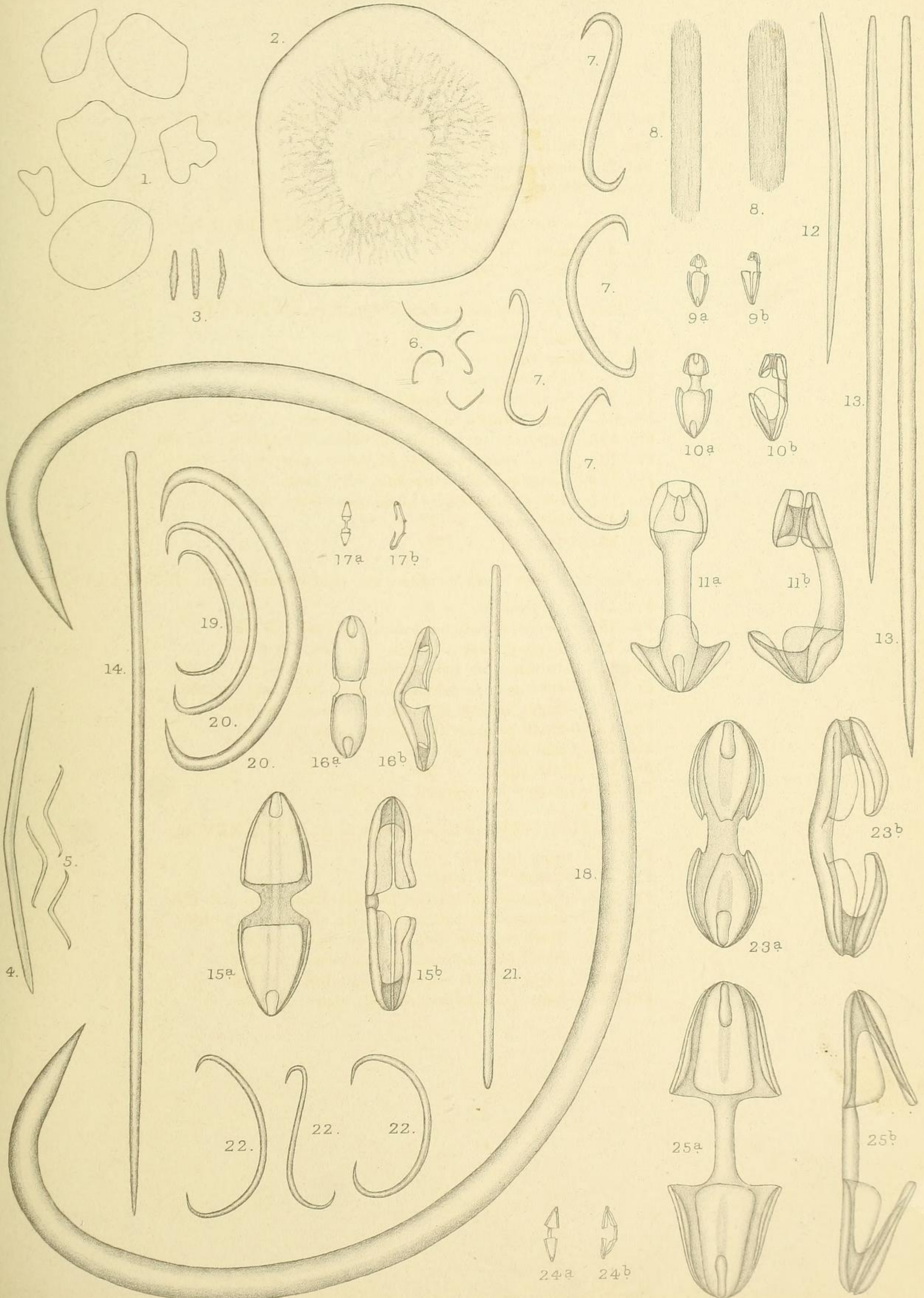
FIG. 23 b.—Intermediate palmate isochela, side view. × 485.

FIG. 24 a.—Small palmate isochela, front view. × 485.

FIG. 24 b.—Small palmate isochela, side view. × 485.

FIG. 25 a.—Large palmate isochela, front view. × 485.

FIG. 25 b.—Large palmate isochela, side view. × 485.





Porifera, Part I.—Non-Antarctic Sponges, Pl. XIV.

PLATE XIV.

FIGS. 1-4.—*Biemna novæ-zealandiæ*, n. sp. (R. N. XXXIII. 1 a).

- FIG. 1.—Style. × 122.
 FIG. 2.—Large sigma. × 470.
 FIG. 3.—Microxeote. × 470.
 FIG. 4.—Small sigma. × 470.

FIGS. 5-8.—*Clathria scotti*, n. sp. (R. N. LII).

- FIG. 5.—Large style. × 170.
 FIG. 6.—Tylostyle. × 170.
 FIG. 7.—Acanthostyles. × 170.
 FIG. 8.—Toxa. × 280.

FIGS. 9-13.—*Clathria terræ-novæ*, n. sp. (R. N. V).

- FIG. 9.—Large acanthostyles. × 170.
 FIG. 10.—Small acanthostyles. × 170.
 FIG. 10 a.—Intermediate acanthostyle. × 170.
 FIG. 11.—Slender tylostyle. × 170.
 FIG. 12.—Toxon. × 280.
 FIG. 13.—Isochela. × 280.

FIGS. 14-16.—*Raspailia topsenti*, n. sp. (R. N. II. 1).

- FIG. 14.—Stout styli. × 240.
 FIG. 15.—Slender styli or raphides of dermal brushes. × 240.
 FIG. 16.—Acanthosubtylostyli. × 240.

FIGS. 17-19.—*Raspailia inæqualis*, n. sp. (R. N. II. 4).

- FIG. 17.—Stout stylus. × 240.
 FIG. 18.—Slender styli. × 240.
 FIG. 19.—Acanthostyle. × 240.

FIGS. 20-21.—*Bubaris oxeata*, n. sp. (R. N. XXXV. f).

- FIG. 20.—Styli. × 170.
 FIG. 21.—Oxea. × 170.

FIGS. 22-24.—*Bubaris elegans*, n. sp. (R. N. XLI).

- FIG. 22.—Long stylus. × 170.
 FIG. 23.—Short stylus. × 170.
 FIG. 24.—Oxea. × 170.

FIGS. 25-27.—*Bubaris ornata*, n. sp. (R. N. XXXV. o).

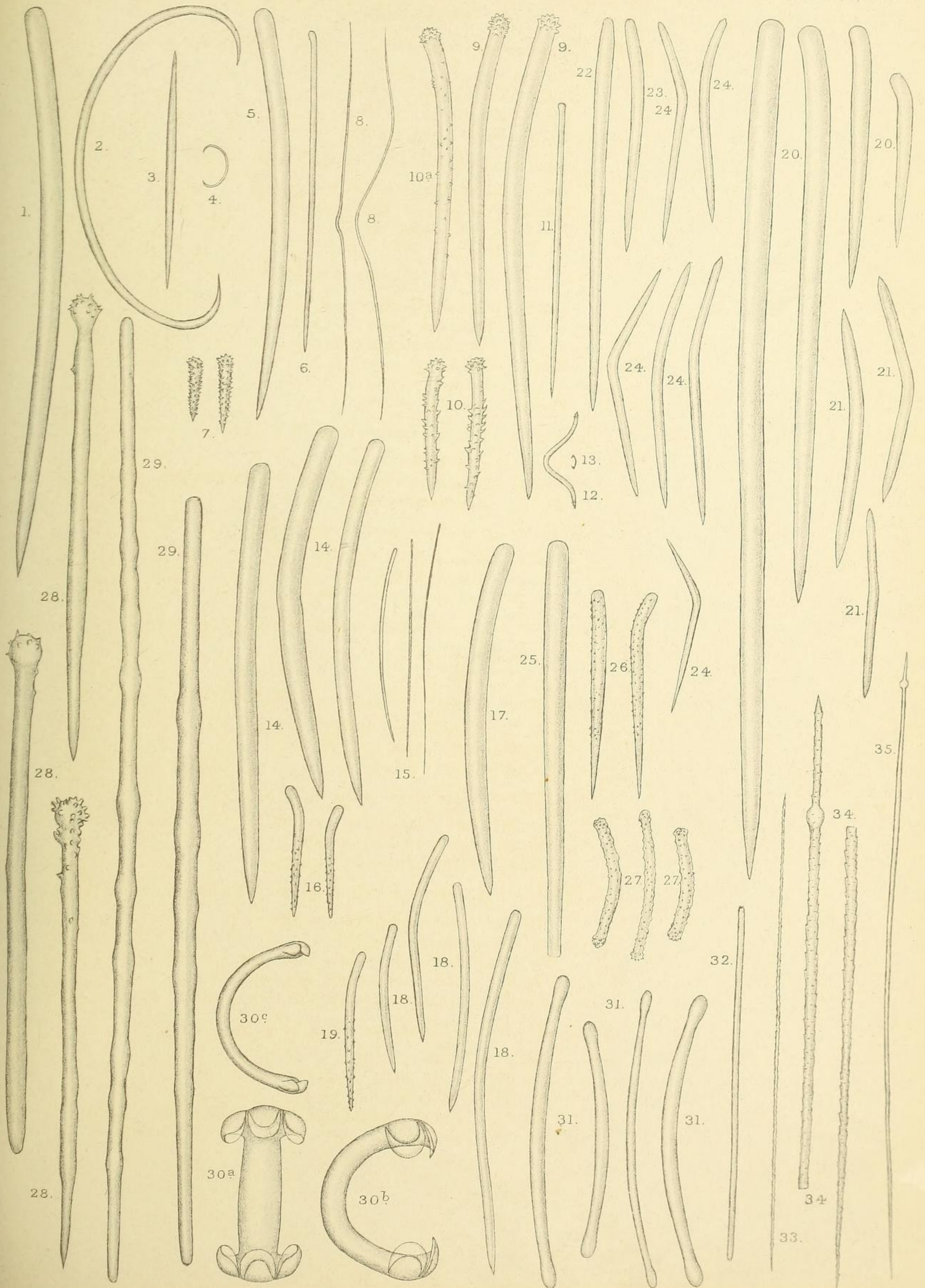
- FIG. 25.—Part of long style. × 280.
 FIG. 26.—Acanthostyles. × 280.
 FIG. 27.—Acanthostrongyla. × 280.

FIGS. 28-30 c.—*Hymedesmia lundbecki*, n. sp. (R. N. XXXV. c).

- FIG. 28.—Acanthotylostyles. × 330.
 FIG. 29.—Strongyla. × 330.
 FIG. 30 a.—Tridentate isochela, front view. × 550.
 FIG. 30 b.—Tridentate isochela, side view. × 550.
 FIG. 30 c.—Tridentate isochela, side view (young). × 550.

FIGS. 31-35.—*Tedaniopsis turbinata*, n. gen. et sp. (R. N. XII).

- FIG. 31.—Tylota. × 120.
 FIG. 32.—Slender diact. × 210.
 FIG. 33.—Smaller raphis. × 485.
 FIG. 34.—The two terminal portions of a tylorhaphis. × 485.
 FIG. 35.—Tylorhaphis. × 210.





Porifera, Part I.—Non-Antarctic Sponges, Pl. XV.

