REPORT

ON THE

NON-CALCAREOUS SPONGES

COLLECTED BY

MR. JAMES HORNELL

AT

OKHAMANDAL IN KATTIAWAR IN 1905-6.

BY

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[With Four Plates.]

Mr. Hornell's collection of Non-Calcareous Sponges contains about fifty-eight species, of which I have been able to identify no fewer than forty-two with previously described forms and to describe fifteen as new. Leaving out of account numerous fragments which were not sufficiently well-preserved for identification, the following is a complete list of the species represented. It will be observed that one species (*Higginsia* sp.) has only been generically identified, but the genus is of sufficient interest to make it worth recording.

ORDER TETRAXONIDA.

SUB-ORDER ASTROTETRAXONIDA.

Family Stellettidæ.

1. *Myriastra* (*Pilochrota*) *haeckeli* Sollas.
2. *Jaspis reptans* (Dendy).
3. *Asteropus simplex* (Carter).

Family Geodiidæ.

4. *Geodia variospiculosa* Thiele.

Family Donatiidæ.

5. *Donatia seychellensis* (Wright).
6. *Tuberella aaptos* (Schmidt).

Family Chondrosiidæ.

7. *Chondrilla australiensis* Carter.
8. *Chondrilla agglutinans* n. sp.

SUB-ORDER SIGMATOTETRAXONIDA.

Family Tetillidæ.

9. *Tetilla dactyloidea* (Carter).
10. *Tetilla hirsuta* Dendy.
11. *Tetilla pilula* n. sp.
12. *Tetilla barodensis* n. sp.

Family Haplosclerida.

13. *Gellius fibulatus* (Schmidt) var. *microsigma* nov.
14. *Gellius ridleyi* (Hentschel).
15. *Gelliodes fibrosa* Dendy.
16. *Reniera permollis* (Bowerbank).
17. *Reniera topsenti* Thiele.
18. *Reniera hornelli* n. sp.
19. *Reniera fibroreticulata* n. sp.
20. *Reniera semifibrosa* n. sp.
21. *Halichondria panicea* Johnston var.
22. *Halichondria reticulata* Baer.
23. *Siphonochalina crassifibra* Dendy.
24. *Siphonochalina minor* n. sp.
25. *Desmacella tubulata* Dendy.
26. *Thrinacophora cervicornis* Ridley and Dendy.
27. *Axinella virgultosa* Carter.
28. *Phakellia donnani* (Bowerbank).
29. *Auletta lyrata* var. *glomerata* Dendy.
30. *Auletta elongata* var. *fruticosa* nov.

31. *Ciocalypta dichotoma* n. sp.
32. *Higginsia* sp.

Family Desmacidonidæ.

33. *Esperella plumosa* (Carter).
34. *Desmacidon minor* n. sp.
35. *Iotrochota baculifera* Ridley.
36. *Guitarra indica* n. sp.
37. *Psammochela elegans* n. gen. et sp.
38. *Chondropsis kirkii* (Carter).
39. *Myxilla arenaria* Dendy.
40. *Clathria corallitincta* Dendy.
41. *Clathria spiculosa* Dendy.
42. *Echinodictyum gorgonioides* n. sp.
43. *Raspailia fruticosa* var. *tenuiramosa* Dendy.
44. *Acarnus tortilis* Topsent.
45. *Bubaris radiata* n. sp.

Family Spirastrellidæ.

46. *Spirastrella vagabunda* var. *tubulodigitata* Dendy.
47. *Placospongia carinata* (Bowerbank).

Family Clionidæ.

48. *Cliona coronaria* (Carter).

Family Suberitidæ.

49. *Suberites carnosus* (Johnston) var.
50. *Suberites flabellatus* Carter.
51. *Suberites cruciatus* Dendy.
52. *Polymastia gemmipara* n. sp.

ORDER EUCERATOSA.

Family Aplysillidæ.

53. *Megalopastas retiaria* n. sp.
54. *Darwinella australiensis* Carter.

Family Spongeliidæ.

55. *Spongelia fragilis* var. *ramosa* (Schulze).
56. *Spongelia cinerea* (Keller).
57. *Spongelia elegans* (Nardo) var.

Family Spongiidæ.

58. *Hippospongia clathrata* (Carter).

The fact that it has been possible to identify seventy-four per cent. of these species with previously described forms clearly indicates the progress that has been made in recent years in our knowledge of the Sponges of the Indian Ocean, especially when we consider that Mr. Hornell's collection was made in a locality from which, so far as I am aware, no sponges have hitherto been recorded.

As might naturally be expected, a large proportion of the previously known species are identical with more or less well-known Ceylon forms [*cf.* Dendy 1905]. The commonest species in the collection is *Esperella plumosa* (Carter), which attains a large size and has a very fully developed and very beautiful spiculation. Other common and characteristic Indian Ocean species are *Myriastra haeckeli*, *Donatia seychellensis*, *Chondrilla australiensis*, *Tetilla dactyloidea*, *Tetilla hirsuta*, *Phakellia donnani*, *Auletta lyrata*, *Iotrochota baculifera*, *Clathria corallitincta*, *Clathria spiculosa*, *Raspailia fruticosa*, *Spirastrella vagabunda*, *Placospongia carinata* and *Hippospongia clathrata*.

Of the fifteen new species, *Tetilla pilula*, *T. barodensis*, *Guitarra indica*, *Psammochela elegans* (for which a new genus is proposed), *Polymastia gemmipara* and *Megalopastas retiaria* may be mentioned as exceptionally interesting forms.

The scarcity of true Horny Sponges (Euceratosa) in the collection is remarkable. There is no true bath sponge and, indeed, only one representative of the family Spongiidæ, viz., the common but useless *Hippospongia clathrata*. On the whole, however, the Sponge-Fauna of Okhamandal is undoubtedly a rich one, and I am very glad to have had the opportunity of investigating it.

All the specimens in the collection seem to have come from shallow water, the greatest depth recorded being seventeen fathoms. A considerable number of them were growing upon the large, branching, parchment-like tubes of a polychæte worm,* which appears to be extremely common. It is unfortunate that so many of the specimens were originally preserved in formalin, a medium which is entirely unsuited for sponges and in which they undergo extensive maceration.

As regards the classification employed in this Report it will be observed that certain innovations have been introduced. The Axinellidæ are included in the Haplosclerida, and the Spirastrellidæ, Clionidæ and Suberitidæ are placed in the Sigmatotetraxonida. I cannot attempt to justify these changes in this place, but must refer the reader to my Reports on the Sponges of the *Sealark* Expedition, now in course of publication, and to future publications by myself and my colleague, Mr. R. W. H. Row, in which we hope to discuss the question of the

* I am indebted to Dr. J. H. Ashworth and Professor Fauvel for the information that this worm is a species of the genus Eunice, possibly *Eunice tubifex* Crossland. [A photograph of a forest of the tubes of this worm draped with masses of zoophytes and polyzoa, as seen at extreme low water on the Kiu littoral, Beyt harbour, is reproduced as Plate VI. in "Marine Resources of Okhamandal," in Part I. of this Report.—J. H.]

classification of the Non-Calcarea from the phylogenetic point of view in some detail.

My account of the six species of Calcareous Sponges collected by Mr. Hornell has already been published [Dendy 1915].

1. **Myriastra (Pilochrota) haeckeli** Sollas.

Pilochrota haeckeli Sollas [1888].
Stelletta haeckeli Lendenfeld [1903].
Pilochrota haeckeli Dendy [1905].

There are in the collection nineteen specimens which I refer to this species. The smallest are approximately spherical and no larger than a pea. The largest is irregular, like a potato; measures about 45 mm. in length by 33 mm. in transverse diameter, and has three vents. They closely resemble the specimens collected by Professor Herdman at Ceylon, but the thin, membranous lip of the vent appears to be devoid of oxeote spicules.

The largest specimen (R.N. IV. 3) shows to a very marked degree the curious abnormality of some of the triænes which I described and figured in the case of the Ceylon material. The reduction of the rays, however, is carried to such an extent in this specimen that in extreme cases the entire spicule is reduced to a perfectly spherical ball of concentrically laminated silica (opal). A precisely similar modification of tetract megascleres occurs in the two known species of the genus Yodomia [Lebwohl 1914, and Dendy 1916].

Previously known Distribution. Philippine Islands (Sollas); Ceylon (Dendy).

Register Numbers, Localities, &c. II. 5 (four small specimens), off Poshetra, Jan. 7, 1906; IV. 3 (two large specimens), IV. 9 *a* (seven small specimens), off S.W. coast of Beyt Island; XIV. (small fragment), off S.W. of Beyt, 6.1.06; XV. 2 (four specimens, varying greatly in size), three miles W.N.W. of Samiani Light-house, 17 fms., 22.12.05; XX. 9 (one specimen), Adatra.

2. **Jaspis reptans** (Dendy).

Coppatias reptans Dendy [1905].

This species is represented in the collection by three specimens, of which it is possible that R.N. XX. 4 and R.N. XX. 7 may be parts of the same. The shape is extremely irregular. R.N. XX. 4 is a flattened, cake-like fragment, measuring about 35 by 25 mm., with a maximum thickness of 12 mm., and a rounded margin except where broken. R.N. XX. 7 is a very irregular fragment of about the same size, throwing off irregular digitiform processes. Both have a coarse, firm, harsh consistency and are of a greyish-fawn colour in spirit (having been first preserved in formalin). R.N. XXXIII. 2 *b* is a massive but flattened specimen measuring about 50 by 50 mm., and

completely overgrown by a specimen of *Reniera semifibrosa*. It has now, in alcohol, a slightly pinkish tint, having also been originally preserved in formalin.

These specimens differ from the Ceylon type in the less abundant development of pigment. The oxea are a good deal more robust and longer, especially in R.N. XX. 4 and 7 ; R.N. XXXIII. 2 *b* being intermediate in this respect. The asters also appear to be somewhat larger, though still very minute.

Previously known Distribution. Ceylon (Dendy).

Register Numbers and Localities. XX. 4, 7, Adatra ; XXXIII. 2 *b*, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fm., 21.12.05.

3. **Asteropus simplex** (Carter).

Stellettinopsis simplex Carter [1879, 1886].
Asteropus simplex Sollas [1888].
Asteropus haeckeli Dendy [1905].
Asteropus simplex Hentschel [1909].
Asteropus simplex Dendy, [1916].

This species is evidently an " epipolasid " form from which the triænes have completely disappeared. It was first described by Carter from Fremantle, Australia, and in the same paper that author also recorded it from Hayti. He subsequently recorded it again from Victoria, Australia, where it was collected by Mr. J. B. Wilson.

The Okhamandal specimen forms a mass of sponge cementing together and filling the interstices in an agglomeration of shells (chiefly Siliquaria) and other *débris*. It is now a very light pinkish-grey in colour, having been first preserved in formalin, and in this respect differs from, at any rate, the Victorian and Haytian specimens, which contain large, dark brown pigment-cells in the more superficial part of the sponge. It also differs from Carter's Australian specimens in the more robust character of the oxea, while the Haytian specimen, of which the type slide is in my possession, appears to be to some extent intermediate in this respect. The spiculation of the Okhamandal sponge is as follows :—

(1) Oxea ; stout, curved, fusiform, sharply pointed ; measuring about 1·7 by 0·07 mm. (or even more) when full-sized, but often smaller. The main skeleton is a confused reticulation of these spicules.

(2) Oxyasters ; with small centrum (if any), and rather few (up to about ten) slender rays, which sometimes seem to be very slightly roughened ; total diameter about 0·03 mm. These spicules have only about half the diameter of those of the type as given by Carter ; they also seem to be very local in their distribution, so that they may easily be overlooked if only one sample is examined.

(3) Sanidasters (the " sceptrelliform " spicule of Mr. Carter's description). Extremely numerous, especially in the dermal membrane ; about 0·02 mm. long, with slender axis and rather few, moderately long, irregularly arranged, slender spines.

It is interesting to speculate as to whether or not this widely distributed form has arisen polyphyletically by reduction of species of Ancorina in the different localities where it occurs, or whether such reduction has taken place only once in one locality and been followed by extensive migration. In the present state of our knowledge this question cannot, of course, be settled.

Previously known Distribution. West Australia (Carter); Victoria (Carter); Hayti (Carter); South West Australia (Hentschel); Cargados Carajos (Dendy).

Register Number and Locality. V. 2, S. of Chindi Reef, 6–10 fms., 18.12.05.

4. **Geodia variospiculosa** Thiele.

Geodia variospiculosa Thiele [1898].
Geodia variospiculosa var. *clavigera* Thiele [1898].
Geodia variospiculosa Lendenfeld [1903].
Geodia variospiculosa var. *typica* Lendenfeld [1910].
Geodia variospiculosa var. *intermedia* Lendenfeld [1910].
Geodia variospiculosa var. *micraster* Lendenfeld [1910].
Geodia variospiculosa var. *aapta* Lebwohl [1914].

Although this species has hitherto been recorded only from Japanese waters, I have no hesitation in referring to it the only specimen of a geodiid sponge in Mr. Hornell's collection, and in support of my identification I furnish the following details.

The sponge is almost spherical, about 14 mm. in diameter, and has evidently been attached to the substratum by one side. The surface is almost smooth, but slightly uneven. No pores or vents are visible under a pocket lens. The colour in alcohol (after formalin) is very light grey.

There is a thin external fur of small, radially disposed oxea, containing also the cladi of protriænes (and possibly anatriænes). This rests upon the cortical layer of sterrasters, which is about 0·26 mm. thick. The main choanosomal skeleton consists of dense radial bundles composed of large oxea and of the shafts of triænes, whose cladi are for the most part extended just beneath the cortical layer of sterrasters.

Spiculation. (1) Long, slender oxea of the choanosome; straight or nearly so, gradually and finely pointed at each end, measuring about 2·0 by 0·028 mm.

(2) Short oxea of the surface fur; fusiform, almost straight, almost stylote, with the narrow inner end slightly rounded off; measuring about 0·2 by 0·0082 mm.

(3) Orthotriænes; with long, straight shaft tapering gradually to a slender point, and simple, conical cladi; shaft about 1·8 by 0·05 mm., with cladi about 0·24 by 0·034 mm.

(4) Dichotriænes; resembling (3) but with cladi once bifurcate.

(5) Mesoprotriænes; shaft very long and slender, say about 3·7 by 0·017 mm.;

cladi sharp-pointed, approximately equal in length, about 0·07 by 0·0086 mm.; prolongation of shaft sharp-pointed and almost equal in length to cladi; cladi sometimes irregular.

(6) Anatriænes; cladi sharply recurved, sharply pointed; occasionally split at the apex into two almost parallel branches. Dimensions much the same as for protriænes but shaft rather more slender.

(7) Sterrasters; of normal form, with well-marked hilum; elliptical, measuring about 0·08 by 0·065 mm.

(8) Subcortical spherasters, with numerous fairly long, sharp-pointed rays, total diameter about 0·012 mm. Not sharply distinguishable from (9).

(9) Oxyasters; with few or fairly numerous, slender, perhaps faintly roughened rays; total diameter varying up to about 0·05 mm.

(10) Minute chiasters or strongylospherasters of the dermal layer, about 0·006 mm. in diameter.

Previously known Distribution. Japan (Thiele, Lendenfeld, Lebwohl).

Register Number and Locality. XV. 1, three miles W.N.W. of Samiani Lighthouse, 17 fms., 22.12.05.

5. **Donatia seychellensis** (Wright).

Alemo seychellensis Wright [1881].
Tethya seychellensis Sollas [1888].
Tethya seychellensis Keller [1891].
Tethya seychellensis Topsent [1893].
Tethya ingalli (pars) Lindgren [1898].
Tethya seychellensis Kirkpatrick [1900].
Tethya lyncurium var. *c.* Dendy [1905].
Donatia Ingalli Topsent [1906].
Donatia Ingalli (pars) Hentschel [1909].
Tethya seychellensis Row [1911].
Donatia seychellensis Dendy [1916].

The three specimens in the collection agree so closely with those obtained by the *Sealark* Expedition in the Indian Ocean and dealt with by me in my Report [1916] that it is unnecessary to describe them in this place. Two of them (R.N. XXVI. 8 *a*, *b*) are well provided with buds and are also remarkable for the presence of immense numbers of oscillatorian algæ in the cortex, which I have rarely seen before in a Donatia. In all the specimens the sex-radiate condition of the tylasters and large oxyasters is very strongly pronounced though by no means constant, and the latter frequently have branching rays.

Previously known Distribution. Seychelles (Wright); Samboangan (Sollas); Flinders Passage, Torres Straits (Sollas); Red Sea (Keller, Row, Topsent); ? South

West Australia (Hentschel); Gulf of Mannar, Praslin Reef, Egmont Reef and Salomon, Indian Ocean (Dendy); Xmas Island (Kirkpatrick).

Register Numbers, Localities, &c. II. 9, off Poshetra, 7 January, '06; XXVI. 8 *a*, *b*, Adatra Reefs, 25 December, '05.

6. **Tuberella aaptos** (Schmidt).

(For Literature and Synonymy, *vide* Topsent [1900]).

There is one very typical specimen of this curious sponge in the collection. It is irregularly tuberous, elongated, with an uneven surface beset here and there with small papillæ, some of which have each a small vent. The texture is compact but fairly compressible, the colour in alcohol (after formalin) brown. Length of specimen about 60 mm., greatest breadth 32 mm., greatest thickness 21 mm.

The main skeleton consists of loose bundles of large strongyloxea radiating towards the surface, with scattered spicules between. The dermal skeleton consists of dense brushes of small styli with outwardly directed apices. The large strongyloxea measure about 1·1 by 0·034 mm.; the small styli about 0·26 by 0·0086 mm.

This specimen agrees very closely in all respects with the description and figures given by Topsent, whose views as to the correct generic name and synonymy I accept provisionally. It seems possible, however, that Gray's generic name Aaptos [1867] may have to be revived, and also that Keller's *Tuberella tethyoides* [1880] may, after all, be a distinct species.

Previously known Distribution. Mediterranean (Schmidt, Lendenfeld, Topsent); Gulf of Mexico (Topsent); S.W. Australia (Hentschel); Aru Islands (Hentschel).

Register Number, Locality, &c. VI., S. of Chindi Reef, 6–10 fms., 18.12.05.

7. **Chondrilla australiensis** Carter.

Chondrilla australiensis Carter [1873].
Chondrilla australiensis Lendenfeld [1886].
Chondrilla australiensis Lindgren [1898].
Chondrilla australiensis Dendy [1905].
Chondrilla australiensis Hentschel [1909 and 1912].
Chondrilla australiensis Dendy [1916].

Several pieces of considerable size, representing one or more flat, spreading crusts, were obtained from Adatra Reef. They appear to have been originally preserved in formalin, but are now in alcohol, and exhibit the usual light brown colour of the species.

Previously known Distribution. Port Jackson, E. Coast of Australia (Carter, Lendenfeld); Sharks Bay, S.W. Australia (Hentschel); Coast of Cochin China (Lindgren); Ceylon, Cargados Carajos, Amirante, Seychelles (Dendy); Aru Islands (Hentschel).

Register Number, Locality, &c. XXVI. 13, Adatra Reef, 25 December '05.

8. **Chondrilla agglutinans,** n. sp.—(Plate I., Figs. 1*a*, 1*b*.)

The sponge occurs as a sort of matrix, holding together and partially enveloping a mass of Siliquaria and other shell-fragments, together with sand and pebbles. The surface is glabrous and approximately smooth except where wrinkled by contraction in spirit. The colour in spirit is chocolate-brown of varying shades. Oscula small, in irregular groups, their margins flush with the general surface.

The cortex is barely 0·1 mm. thick, and is covered by a very distinct cuticle. Even in stained paraffin sections I have been unable to detect the inhalant cortical canals, so conspicuous in the closely related *C. mixta* [Schulze 1877]. It is distinctly fibrous and also contains numerous pigment-cells filled with minute brown granules. Its outer half is densely packed with spherasters arranged in several layers.

The colour of the sponge appears to be due chiefly to the presence in the choanosome of numerous spherical cells of a brown colour, scattered singly and in dense groups. Each of these brown cells is about 0·01 mm. in diameter. Their colour may, however, possibly be due to staining by colouring matter extracted by alcohol from the pigment-cells. They remind one of the fat-like bodies described by Schulze [1877] as possible reserve-material in *Chondrosia reniformis*, and of the similar bodies described by Carter [1887 *bis*] in his *Chondrosia spurca*, and of the bodies regarded as possible symbiotic algæ by myself [1905] in *Hexadella indica*, &c.

There are two kinds of aster present, closely resembling those of *Chondrilla mixta*, viz. spherasters and oxyasters. The former (Fig. 1*a*) occur chiefly in the outer part of the cortex, but also sparingly in the inner part of the cortex, and still more sparingly in the choanosome. They have a very large centrum and numerous smooth, sharp, conical rays touching each other at their bases; the total diameter is about 0·028 mm. The oxyasters (Fig. 1*b*) appear to be confined to the choanosome, where they are very sparingly scattered. They have a small or indistinguishable centrum, and comparatively few, rather slender, smooth, sharp-pointed, conical rays, say about eight or ten in number. The total diameter of this spicule is about 0·02 mm.

Register Number, Locality, &c. V. 1, S. of Chindi Reef, 6–10 fms., 18.12.05.

9. **Tetilla dactyloidea** (Carter).—(Plate II., Figs. 10*a*–10*c*.)

Tethya dactyloidea Carter [1869].
Tethya dactyloidea Carter [1872].
Tethya dactyloidea Carter [1887].
Tetilla dactyloidea Sollas [1888].
Tetilla dactyloidea Keller [1891].
Tetilla dactyloidea var. *lingua* Annandale [1915].

There are five specimens of this sponge in the collection. They are all subcylindrical, provided with a single vent at the upper extremity and a root-tuft of long, silky spicules at the lower (*cf.* Figs. 10*a*–10*c*). The general surface is smooth and porous, the consistence soft and compressible, the colour in alcohol light grey. The smallest specimen measures about 19 mm. in height by 5·5 mm. in diameter ; the largest 38 mm. by 13 mm., in both cases excluding the root-tuft. In one specimen the root-tuft extends downwards for 18 mm. before meeting the mass of sand-grains with which it is still in connection. In the other specimens a similar mass of sand-grains is attached by the root-tuft close to the lower extremity of the sponge.

In one of the larger specimens, which I cut open, the vent forms the terminal aperture of a cylindrical cloacal chamber about 10 mm. in length and 2·5 mm. in diameter, into which numerous larger and smaller exhalant canals open at various levels, the larger ones being continuations of the cloacal cavity deep down into the body of the sponge (Fig. 10*a*). Just below the point where the larger canals, coming from below, join to form the cloacal cavity, lies the so-called " nucleus," from which the principal fibres of the skeleton radiate, mostly in a downward direction. Curving gently outwards, these fibres break up, over the general surface, into dense surface-brushes, which, however, do not project sufficiently to render the surface hispid to the naked eye. At the lower extremity of the sponge they are continued downwards, outside the sponge-body, to form the root-tuft.

Throughout the greater part of the sponge-body the fibres appear to be composed exclusively of very long and very slender oxea, and they are crossed at various angles by irregularly scattered oxea of similar form, but perhaps shorter.

The dense surface-brushes are composed mainly of long, slender oxea, but mingled with these occur many protriænes with very slender shaft and almost hair-like cladi of unequal length.

The anatriænes appear to be confined to the lower parts of the sponge, where they seem to form the principal constituents of the descending fibres both inside the sponge and in the root-tuft. Their shafts are very long and slender, hair-like, and their cladomes unusually well developed, with sharp, strongly recurved cladi. Protriænes also occur in the root-tuft, but less abundantly than the anatriænes. The microscleres are minute, slender, contort sigmata, of the ordinary Tetilla type, not very abundant.

This interesting and easily recognisable sponge appears to be characteristic of sandy and muddy flats along the shores of the Indian Ocean. Sollas has expressed a doubt whether the specimen from the Mergui Archipelago identified by Carter as belonging to this species is really specifically identical with the type from the S.E. coast of Arabia, but I do not think it at all likely that there is a specific difference. On the other hand, I have myself [1905] described a distinct, but closely-related species (*T. limicola*) from Ceylon, differing from *T. dactyloidea* in external form and in the arrangement of the exhalant canal-system. Annandale has recently [1915] described

a variety of *T. dactyloidea* (var. *lingua*) from the Chilka Lake, growing in fresh water.

Previously known Distribution. S.E. coast of Arabia, on shallow sandy bottom near shore (Carter); ? on the sandy bottom of the Mahim Estuary, off the Island of Bombay (Carter)[1]; King Island, Mergui Archipelago (Carter); Chilka Lake, Bay of Bengal (Annandale).

Register Number and Locality. II. 2 *a–e.* From muddy shore, Balapur, Jan. 1906.

10. **Tetilla hirsuta** Dendy.

Tetilla hirsuta Dendy [1889].

Cinachyra hirsuta Lendenfeld [1903].

Tetilla hirsuta Dendy [1905].

I identify with this species two specimens (R.N. XIX., 5, 6), neither of which is in a very good state of preservation and neither of which shows the arrangement of the inhalant and exhalant apertures. They agree closely with the type as regards spiculation, but the triænes are very scarce.

R.N. XXI. 5 may also possibly belong to this species. It contains, however, numerous small, scattered oxea, and may possibly be a specimen of *T. poculifera* Dendy [1905]. It is, however, a mere fragment and cannot be safely identified.

Previously known Distribution. Gulf of Mannar and Ceylon coast (Dendy).

Register Number and Locality. R.N. XIX., 5, 6, Vamiani Point, January 5, '06; ? R.N. XXI., 5, off Rupan Bander and Kutchegudh, 4–7 fms., 8.12.05.

11. **Tetilla pilula** n. sp.—(Plate I., Figs. 2*a*–2*c*.)

There are three specimens of this fascinating little sponge in the collection, all closely resembling one another in external form and microscopic details of structure. The form is spherical, with a single small vent surrounded by a distinct spicular, membranous collar. The largest specimen (R.N. IV. 9*b*) measures only about 5 mm. in diameter, the other two only about 3 mm. The surface is minutely conulose, not visibly hispid, and there is no root-tuft. The texture is rather soft and compressible, and the colour in spirit pale greyish-yellow.

The arrangement of the skeleton is very strongly radial. Dense and closely-placed bundles of slender oxea and triænes radiate outwards from a central "nucleus," while the hair-like shafts of the triænes are often collected together in wavy fibres which also diverge from the centre of the sponge. As they approach the surface the spicule-bundles spread out very gradually into surface-brushes (Fig. 2*a*) composed of oxea, protriænes and anamonænes, the apices of

[1] The evidence of the specific identity in this case is insufficient.

the more distally placed oxea and the cladomes of the more distally placed triænes and monænes projecting slightly beyond the surface. The spicule-bundles are crossed at various angles by loosely scattered oxea.

There is no cortex and (in unstained preparations) no visible distinction between ectosome and choanosome.

Spicules. (1) Oxea; straight, slender, fusiform; gradually and finely pointed at each end; measuring about 0·85 by 0·012 mm.

(2) Protriænes (sometimes diænes ?); with equal or unequal, slender, straight, sharp-pointed cladi, and very long, slender shaft tapering off into a fine hair. Shaft measured up to 1·1 mm. in length with a thickness of 0·004 mm. (near the cladal end), and cladi about 0·033 by 0·002 mm. Both shaft and cladi are sometimes of hair-like fineness.

(3) Anamonænes (Fig. 2*b*); shaft measured up to 2·5 mm. in length (and then probably broken off); of hair-like fineness throughout the greater part of its length, attaining a thickness of 0·008 mm. immediately below the cladome; the single cladus sharply recurved, gradually and sharply pointed, measuring about 0·025 by 0·008 mm. (at the base) in a well-developed example.

(4) Slender, spirally twisted (contort) sigmata (Fig. 2*c*), of the usual Tetilla type; measuring about 0·009 mm. in a straight between extreme points. Very numerous throughout the sponge.

The most characteristic spicules of this species are undoubtedly the anamonænes, and it appears to me a very noteworthy fact that, although these occur in immense numbers, I have not met with a single anatriæne or anadiæne. The only other known species in which the anatriænes appear to be represented exclusively by anamonænes is, so far as I am aware, *Tetilla pedifera* Sollas [1888].

In *Tetilla pedifera*, however, there are, according to Sollas, no sigmata, nor any other form of microsclere, an unusual feature which serves at once to distinguish it from *T. pilula*. On account of this character Lendenfeld [1903] has included *T. pedifera* in his genus *Tethyopsilla*, but it is evidently very closely related to *T. pilula*, and it may well be doubted whether *Tethyopsilla* is a monophyletic genus.

In *Tetilla coronida* Sollas [1888] anamonænes occur together with anatriænes.

In *Cinachyra hamata* Lendenfeld [1906] anamonænes sometimes occur alone and sometimes associated with a few anatriænes.

Register Numbers and Localities. IV. 9 *b*, dredged off S.W. coast of Beyt Island; XXXV. 8 *a*, *b*, dredged off Dwarka, January '06.

12. **Tetilla barodensis** n. sp.—(Plate I., Figs. 3*a*–3*d*).

The single specimen in the collection is approximately spherical and about

13 mm. in diameter. The surface is not strongly hispid, but is covered with an encrustation of sand-grains between the projecting ends of megascleres. Three small mammiform projections, terminally fringed with projecting spicules, presumably indicate vents; another smaller one, without a terminal fringe of spicules, may bear inhalant pores. Colour internally pale greyish-yellow.

There is a well-developed, dense cortex, about 0·26 mm. thick, full of granular cells and perhaps to some extent fibrous.

The skeleton radiates from a very dense central "nucleus" and consists of well-defined bundles of oxea and triænes, the bundles being separated from one another by fairly wide intervals free from megascleres.

The cladomes of the orthotriænes and anatriænes for the most part lie in the cortex, but some of them project, along with the ends of some of the oxea, into the encrusting layer of sand and foreign spicules. I have seen no protriænes, neither in sections nor in boiled-out preparations, but it is quite possible that their ends lie outside the cortex and have all been broken off.

Spicules. (1) Oxea ; very long, straight, slender, fusiform, tapering very gradually to a fine point at each end, but one end may taper less gradually than the other; size up to about 2·9 by 0·05 mm.

(2) Orthotriænes (Fig. 3 *a*); shaft tapering very gradually to a long-drawn-out, hair-like extremity; cladi simple but often irregularly bent, normally conical, sharp-pointed, gently recurved. Dimensions of a typical example: shaft 1·6 by 0·03 mm. (thickness just below cladome), cladi about 0·17 by 0·025 mm. In another example, of different proportions, the shaft measured about 1·0 by 0·037 mm. and the cladi 0·26 by 0·033 mm. Sometimes the hair-like portion of the shaft is abbreviated and abruptly truncated.

(3) Anatriænes (Fig. 3 *b*); shaft very long and slender, hair-like, measured up to about 2·75 by 0·007 mm. (thickness just below cladome); cladi slender, sharp-pointed, about equal, recurved not very abruptly, measuring about 0·06 by 0·006 mm.

(4) Sigmata (Fig. 3 *c*); very slender, spirally curved (contort), measuring about 0·012 mm. in a straight line between extreme points; of the typical tetillid form; extremely numerous in the choanosome.

(5) Trichodragmata (Fig. 3 *d*); bundles of long, slender, hair-like raphides; the entire bundle may measure up to about 0·13 by 0·028 mm. Abundantly scattered through the choanosome. Usually they contain fewer raphides and are therefore more slender than the specimen measured.

The most characteristic feature of this species is the presence of the trichodragmata, which, so far as I am aware, are known to occur in only one other species of Tetillidæ, viz. *Cinachyra eurystoma* Keller [1891].

Register Number and Locality. XXIII. 8, off Dwarka, 15–17 fms., 12.12.05.

13. **Gellius fibulatus** (Schmidt) var. **microsigma** nov.

Reniera fibulata Schmidt [1862].
Reniera fibulifera Carter [1880].
Gellius fibulatus Topsent [1892].
Gellius fibulatus Dendy [1905].
Gellius ridleyi (pars) Hentschel [1912].

Very little is known about the external form of the European type. Schmidt, however, says that it is not easily distinguishable from small specimens of *Reniera alba*. The latter is described (*loc. cit.*) as a shapeless crust between the branches of Clathria and in other situations, with single vents on the summit of short, projecting tubes. This description applies very well to a small specimen in Mr. Hornell's collection. It consists of a thin crust growing over a mass of calcareous *débris* and giving off three short processes of unequal length, the longest measuring about 10 by 3·5 mm. The processes are hollow, and each bears a terminal vent.

The specimen seems to differ from the European form only in the small size of the sigmata. The oxea measure about 0·25 by 0·01 mm., which seems to agree very well with the type, but the sigmata measure only about 0·0164 mm. from bend to bend.

Previously known Distribution of Species. Adriatic (Schmidt); North Atlantic (Topsent); Gulf of Mannar, Ceylon Seas (Carter, Dendy): ? other localities in Indian Ocean (see under *Gellius ridleyi*).

Register Number, Locality, &c. XXIII. 7, off Dwarka, 15–17 fms., 12.12.05.

14. **Gellius ridleyi** Hentschel.

(For possible Synonymy, see Hentschel [1912]).

I refer to this species a number of irregularly massive specimens bearing large vents at the ends of deep, cylindrical oscular tubes. The largest specimen (R.N. XVII. 1) is a clathrous mass of thick, anastomosing branches, for the most part vertical and more or less fused laterally; each pierced by a wide, cylindrical oscular tube. Colour in spirit (after formalin), light brown. Texture loose and friable, slightly fibrous. The whole mass measures about 70 mm. in greatest breadth and 65 mm. in height, but it has been a good deal damaged. The oscular tubes measure up to 10 mm. in diameter.

The skeleton is a sub-isodictyal reticulation of oxea, with only a slight tendency to collect in fibres. The oxea are gently curved, gradually and sharply pointed at each end, and measure about 0·2 by 0·0096 mm.; numerous more slender forms occur, presumably young. The sigmata are simply C-shaped, or only slightly contort, slender, and measure about 0·02 mm. from bend to bend.

Hentschel distinguishes his species from the European *Gellius fibulatus* (Schmidt) by the spicular measurements. He states that in the Atlantic–Mediterranean form the oxea measure more than 0·22 mm. and the sigmata more than 0·028 mm. in length,

while in the Indian Ocean form the oxea measure less than 0·2 mm. and the sigmata usually less than 0·025 mm.

It appears to me that these differences are too slight to be of any specific value in themselves, especially as I have in my possession (in Mr. Carter's cabinet) a preparation from a specimen from the Devonshire coast (Budleigh Salterton), in which the oxea measure only 0·14 by 0·006 mm., while the sigmata measure about 0·03 mm. from bend to bend.

On the other hand, I think that it may be possible to distinguish an Indian Ocean species characterised by its robust growth and large oscular tubes. For this form I adopt Hentschel's name *ridleyi*, though I must regard it as very doubtful whether all the specimens from the Indian Ocean which have been referred by various authors to *Gellius fibulatus* can now be referred to *Gellius ridleyi*. Mr. Hornell's collection contains, as we have already seen, another *Gellius* which seems to be quite distinct from *G. ridleyi*, and which I regard as a mere variety of *G. fibulatus*, and I consider it highly probable that the specimens which I described from Ceylon in 1905 belong to *G. fibulatus* rather than to *G. ridleyi*.

Previously known Distribution. Indian Ocean (?) (auctorum); Aru Islands (Hentschel).

Register Number, Localities, &c. XVII. 1, Kiu, littoral, 24.12.05; XXVI. 5, Adatra Reef, 25 Dec. '05; XXXIII. 7, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fm., 21.12.05.

15. **Gelliodes fibrosa** Dendy.

Gelliodes petrosioides, var *fibrosa* Dendy [1905].

In my report on Professor Herdman's Ceylon sponges I suggested that my *Gelliodes petrosioides* var. *fibrosa* might, when better material was forthcoming, have to be considered as a distinct species. The occurrence of two fairly good specimens in Mr. Hornell's collection leads me to carry out this suggestion. The two specimens come from the same locality and are possibly parts of the same. One (R.N. XXXIV. 6) is an irregular, flattened sponge which has been attached to the substratum at a few points only, and with a tendency to throw off digitiform processes. The upper surface is almost flat and minutely conulose. It bears several fair-sized but shallow vents, whose margins are very slightly raised above the general surface. The specimen measures about 48 mm. in length by 28 mm. in greatest breadth and 10 mm. in average thickness. Texture rather soft and compressible. Colour in spirit (after formalin) very pale brown. The second specimen is an irregularly subcylindrical fragment (?), about 56 mm. in length by 7 mm. in diameter in the middle, broadening out suddenly to about 18 mm. at one end.

The skeleton arrangement is identical with that of a typical Pachychalina. The main skeleton consists of a subrectangularly meshed network of stout spicular fibre

with very little spongin, with numerous scattered oxea in the meshes between the fibres. The dermal skeleton is an irregular network of similar fibre.

Spicules. (1) Slightly curved oxea, gradually and sharply pointed at each end, measuring about 0·19 by 0·008 mm. (2) Slender sigmata, usually simply C-shaped, measuring about 0·0164 mm. from bend to bend.

Previously known Distribution. Ceylon Seas (Dendy).

Register Numbers, Locality, &c. XXXIV. 6, 12, Channel, W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

16. **Reniera permollis** (Bowerbank).

Isodictya permollis Bowerbank [1866].

I identify with this species a number of encrusting specimens growing over the parchment-like worm-tubes that are so abundant in the collection. The colour in spirit (after formalin) is rather dark brown; the texture very soft and friable; the surface very minutely hispid owing to the projection of the ends of the primary skeletal lines. The oscula are small and scattered. The crusts attain a considerable size, but are so irregular that it is useless to give dimensions.

The skeleton is an irregular isodictyal reticulation, for the most part of single spicules, but there is a strong tendency to form primary lines several spicules thick and separated from one another by intervals of about one spicule's length.

The oxea are gently curved, gradually and sharply pointed, and measure up to about 0·12 by 0·006 mm., agreeing very closely with Bowerbank's figure and measurement.

This seems to be quite a good identification, especially as Bowerbank mentions the "nut-brown colour," but whether *R. permollis* is more than varietally distinct from *R. cinerea* may be regarded as an open question.

Previously known Distribution. British Seas (Bowerbank).

Register Numbers, Localities, &c. XX. 1, Adatra; XXX. 3, $3\frac{3}{4}$–4 fms., N. of Poshetra, 20.12.05; XXXII. 4, off Beyt.

17. **Reniera topsenti** Thiele.

Reniera cinerea (Grant) var. *porosa* Topsent [1901].

Reniera topsenti Thiele [1905].

Three well-preserved pieces, possibly parts of the same specimen, agree remarkably closely in external form with Topsent's figure and fairly closely with Thiele's. The sponge is depressed and ramo-lobose in form, with numerous large, slightly prominent vents. The surface has a porous appearance, but is really covered by a thin, almost aspiculous dermal membrane. The texture is rather soft and friable; the colour in alcohol (after at any rate some formalin) light brown. The skeleton is a rather irregular network of mostly single spicules,

but with a tendency to form slender, multispicular primary lines running towards the surface.

The oxea are slightly curved, sharply and fairly gradually pointed, and measure about 0·2 by 0·009 mm., being thus a little larger than those of Topsent's specimens, from which they also differ in the absence of abnormal forms.

Previously known Distribution. Magellan Straits (Topsent); Punta Arenas (Thiele).

Register Number, Locality, &c. XXVI. 6, Adatra Reef, 25.12.05.

18. **Reniera hornelli** n. sp.—(Plate II., Fig. 11).

The sponge (Fig. 11) consists of an irregularly subglobose body contracted almost (or quite) to a short stalk at the point of attachment. There are numerous large vents, scattered, usually on more or less strongly developed prominences, over the upper parts of the sponge, and varying in diameter up to about 5 mm. Each vent is the terminal opening of a very deep, cylindrical oscular tube. The largest specimen measures about 45 mm. in height by 53 mm. in greatest breadth. The surface of the sponge has a characteristic woolly appearance, due to the fact that the sponge-tissue is broken up into a sort of network of villi by the innumerable narrow, but deep and close-set, inhalant canals. In life the surface was doubtless covered all over by a very thin, translucent, pore-bearing dermal membrane, but this is now nearly all rubbed off. The texture is very soft, spongy and resilient; the colour in spirit, pale yellowish-grey.

The main skeleton consists of numerous slender, multispicular fibres running at right-angles to the surface at distances of about one spicule's length from one another. These lines are united with one another cross-wise by numerous single spicules and the whole skeleton forms a rather irregular, almost isodictyal network. The dermal membrane appears to be almost aspiculous, and one cannot speak of a definite dermal skeleton. There is very little spongin present in any part of the skeleton.

Spicules. Rather slender, slightly curved oxea, gradually and sharply pointed at each end; measuring about 0·14 by 0·008 mm., but somewhat variable and often more slender.

I have much pleasure in naming this beautiful and well-characterised species after its discoverer, Mr. James Hornell. As there are four specimens in the collection it is probably not uncommon on the west coast of India.

Register Numbers, Localities, &c. II. 12 (locality uncertain); IV. 4, three specimens, dredged off S.W. coast of Beyt Island.

19. **Reniera fibroreticulata** n. sp.—(Plate II., Fig. 12.)

The sponge (Fig. 12) has the appearance of being made up of short, anastomosing branches, sometimes united laterally so as to give a plate-like form,

and sometimes, at any rate, ending blindly. Vents relatively large, about 2 mm. in diameter, situated on the sides of the branches or the upper margin of the plate, each the terminal opening of a deep, cylindrical oscular tube. Surface smooth, covered by a closely adherent, translucent dermal membrane, through which the subdermal reticulation shows faintly. Colour in spirit pale yellow, texture fairly firm but friable.

There are several pieces of this sponge in the collection, which, as they all come from the same jar, probably belong to the same specimen. The largest, represented in Fig. 12, is, as a whole, lamellar, measuring about 31 mm. in length, 20 mm. in height and 5 mm. in thickness (this being also about the usual diameter of freely projecting branches).

The main skeleton is a close, irregular network of single spicules, penetrated by long, multispicular fibres about 0·04 mm. thick. These fibres are numerous and run for the most part lengthwise in the branches; they also form a well developed subdermal reticulation, with very irregular, unequal meshes.

The dermal skeleton consists of single spicules, thickly and evenly scattered through the dermal membrane, crossing one another at all angles, but not united in a regular network.

There is little, if any, spongin present.

Spicules. Short and fairly stout oxea, slightly curved and gradually and sharply pointed at each end, measuring about 0·1 by 0·006 mm., but often rather more slender.

This sponge reminds one rather of the European *Reniera simulans*, but differs in the smaller size of the spicules and in the strongly developed reticulation of spicular fibre. In this respect, like *Reniera semifibrosa*, it approaches the genus Pachychalina.

It also resembles, both in external form and spiculation, the new species *Siphonochalina minor*, described below (*cf.* Fig. 15). The growth of the sponge, however, is on a much smaller scale, and the arrangement of the main skeleton is different, for in *S. minor* it is entirely composed of multispicular fibres.

Register Number, Locality, &c. II. 8 (exact locality uncertain).

20. **Reniera semifibrosa** n. sp.—(Plate II., Fig. 13).

The sponge forms massive, convex crusts, closely adherent to other objects or hollow underneath. The finest specimen (R.N. XXXIII. 1, Fig. 13) has the form of a deep, inverted cup, the margin of which has been broken away all round from the substratum, while the interior is quite hollow and empty. The total height of the specimen is 85 mm.; the maximum breadth of the base about the same; the thickness of the wall of the cup about 15 mm. The wall of the cup is perforated by two large, irregular apertures (natural) with rounded margins, which lead right through into the

spacious interior. The inner surface of the cup is smooth but uneven ; it bears no vents. The outer surface is similar, but bears numerous large, prominent, circular vents, up to about 9 mm. in diameter, leading out of wide exhalant canals which come from deep down in the interior of the sponge. The texture is fairly firm but rather cavernous and friable ; the colour in spirit (after formalin) pale yellowish-grey, with a transparent look which is probably due largely to the imperfect preservation.

Another specimen (R.N. XXXIII. 2*a*) forms a much flatter crust growing over a massive specimen of *Jaspis reptans*, and there are also a number of broken fragments evidently of the same species.

The main skeleton is a typical unispicular, isodictyal reticulation of short oxea, and there is a similar unispicular dermal reticulation, except that here the spicules all lie in one plane, parallel to the surface. Just beneath the surface, however, there is a well developed subdermal reticulation of short, multispicular fibres. This reticulation lies parallel to the surface. Its meshes are very irregular in shape and vary greatly in size, and the component fibres vary very much in thickness, up to at least 0·17 mm. The dermal and subdermal skeleton are similar on the inner and outer surfaces of the sponge. Here and there in the interior of the sponge a reticulation of coarse spicular fibre similar to the subdermal reticulation is to be found, probably representing lines of growth (earlier surface levels).

There is little, if any, spongin present in the skeleton.

Spicules. Oxea ; fairly stout, slightly curved, sharply and rather abruptly pointed, but not tornote. Size about 0·16 by 0·0095 mm.

This handsome species, with its well developed subdermal reticulation of stout multispicular fibre, seems to be intermediate between Reniera and Pachychalina.

Register Numbers, Localities, &c. XXXIII. 1, 2*a*, 3, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fm., 21.12.05 ; XXXIV. 7, 9, Channel, W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

Reniera spp.

There are also in the collection a number of more or less fragmentary specimens probably representing other species of this difficult genus.

21. **Halichondria panicea** Johnston vars.

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

There are several specimens in the collection which may be considered as varieties of this ubiquitous species. R.N. XX. 3*a* is the best preserved and characterised. It consists of a compressed, lobose fragment (? erect), 51 mm. in length and 30 mm. in greatest breadth (near the top, where it expands somewhat). A number of good-sized vents occur around the margin. The surface, under a pocket lens, appears very distinctly

reticulate. The texture is firm and rather coarse, the colour in spirit (after formalin) light brown.

The skeleton is a confused reticulation of large oxea which show a strong tendency to arrange themselves in coarse fibres. There is a very well developed dermal reticulation of spicular fibre varying in diameter.

The oxea are slightly curved, gradually and sharply pointed at each end, and commonly measure about 0·77 by 0·023 mm., although variable.

R.N. XXXII. 5 is more massive, with a more compact and less distinctly fibrous skeleton, and comes very near to Ceylon specimens of *Halichondria panicea* var. *megalorhaphis* collected by Professor Herdman [Dendy 1905]. Most of the specimens are in a very poor state of preservation, owing, doubtless, to the use of formalin as a preservative.

Previously known Distribution of the Species. Almost cosmopolitan.

Register Numbers, Localities, &c. XVII. 3, Kiu littoral; XX. 3 *a*, *b*, Adatra; XXIX. 4, 3¾–4 fms. N. of Poshetra, 20.12.05; XXXII. 5, off Beyt; XXXIV. 8, Channel, W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

22. **Halichondria reticulata** Baer [1905].—(Plate II., Figs. 14 *a*, 14 *b*.)

The sponge, of which there is a good deal in the collection, consists of slender, irregular, often tortuous, creeping branches, which frequently anastomose and unite with one another in irregular, massive lumps (Figs. 14 *a*, 14 *b*). Individual branches are usually about 2 or 3 mm. in diameter. They are generally subcylindrical, but may be flattened; they may be bluntly rounded at the extremity or drawn out into a long point. The surface is finely granular and marked by ramified, meandering, subdermal canals. Vents minute, few, scattered. The colour in spirit is very pale yellow; the texture rather compact and fleshy, but soft and compressible.

The main skeleton consists of slender oxea, partly scattered quite irregularly and partly in loose wisps or fibres which run towards the surface. The dermal skeleton consists of irregularly scattered spicules of the same kind, lying tangentially and crossing one another in all directions.

Spicules. Slender oxea; very slightly curved, gradually sharp-pointed at each end, measuring about 0·21 by 0·006 mm.; very uniform in shape and size.

This species seems to be well characterised by its peculiar mode of growth and by the small size of its spicules. Although Baer's description is very brief, and although the spicules in the Okhamandal sponge seem to be somewhat stouter, I think the identification is a fairly safe one. Baer observes that the flagellate chambers are round and 0·03 mm. in diameter, and that the ground substance is homogeneous and filled with round granule-cells.

The histological features of the Okhamandal sponge, which I have studied by means of paraffin sections of material stained with borax-carmine, confirm the identi-

fication with Baer's species. The flagellate chambers are approximately spherical and about 0·03 mm. (or a little more) in diameter, scattered rather sparsely in a compact ground-substance densely charged with minute, spherical, granule-bearing cells, measuring up to about 0·008 mm. in diameter. There is a fairly thick ectosome, more or less interrupted by the spacious subdermal cavities and also containing small granule-cells.

Throughout the sponge, but especially in parts of the ectosome, where they are densely crowded together, occur numerous large, spherical cells, filled with granules of various sizes and each with a compact, deeply staining nucleus of moderate size. The diameter of the entire cell is about 0·025 mm.; of the nucleus about 0·008 mm. These cells resemble immature ova, but they may be merely large amœbocytes charged with food-material or excretory products.

Although Baer has figured both external form and spicules in the case of the Zanzibar sponge, I have thought it desirable to add illustrations of the Indian form.

Previously known Distribution. Zanzibar (Baer).

Register Numbers, Locality, &c. II. 6, 11 (altogether a considerable number of pieces), probably off Poshetra, January 7, 1906.

23. **Siphonochalina crassifibra** Dendy.

Siphonochalina crassifibra Dendy [1889].
Siphonochalina communis (pars) Dendy [1905].

The best of the two specimens in the collection closely resembles in external form Carter's *Siphonochalina* (*Patuloscula*) *procumbens* from the West Indies, a figure of which will be found in my memoir on the West Indian Chalininæ [1890]. It consists of a spreading base from which a dozen or more tubes rise obliquely upwards, branching and anastomosing with one another to a slight extent. The tubes are subcylindrical, about 50 mm. in height and 12 or 14 mm. in diameter, and each terminates in a wide, circular vent about 6 mm. in diameter. They are thus considerably smaller than in the type. The surface is smooth but finely granulated.

In skeletal peculiarities the specimens exaggerate the distinguishing character of the type. The main skeleton is a rectangularly or polygonally meshed network of fairly stout fibre, almost completely filled with the very numerous, close-packed spicules, so that there is only a thin investment of spongin. The primary fibres are about 0·05 mm. in diameter and the secondaries only a little less. The dermal skeleton in the best specimen, from which this description is taken, is chiefly a unispicular reticulation, in which the spicules are held together by very pale-coloured spongin, with a much coarser subdermal reticulation formed by the

outer part of the main skeleton. The spicules are very slightly curved, fairly sharply pointed oxea, measuring about 0·078 by 0·004 mm.

In my Report on Professor Herdman's Ceylon Sponges [1905] I suggested that my *Siphonochalina crassifibra* should be regarded as a variety of Carter's *Siphonochalina* (*Tubulodigitus*) *communis*, also an Indian Ocean species. Probably we shall ultimately have to unite in one species a considerable number of varieties which exhibit the same characteristic external form, *e.g.*, *Tubulodigitus communis* Carter [1881], *Siphonochalina crassifibra* Dendy [1889], *Siphonochalina communis* var. *tenuispiculata* Dendy [1905], from the coasts of India and Ceylon; *Patuloscula procumbens* Carter [1882, 1885 *bis*], from Australia and the West Indies; *Siphonochalina intermedia* Ridley and Dendy [1887], from Australia; *Siphonochalina spiculosa* Dendy and *S. ceratosa* Dendy [1890], from the West Indies. In all these localities there seems to be much variation in the relative amounts of spicules and spongin in the skeleton fibres. There is also a good deal of variation in the length and diameter of the tubes, but I do not see how it is feasible to make really satisfactory specific distinctions between the forms mentioned.

Until, however, it is possible to make a more thorough comparative study of this interesting group of varieties I propose to revert to the specific name "*crassifibra*" for the Indian form in question.

Previously known Distribution. Gulf of Mannar (Dendy).

Register Numbers, Localities, &c. VII., Adatra Reef, 5.12.05; XXXIV. 5, Channel W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

24. **Siphonochalina minor** n. sp.—(Plate II., Fig. 15.)

The sponge (Fig. 15) consists of a horizontal, subcylindrical or vertically somewhat flattened, branching and anastomosing stolon, from which arise short, slightly branching and sometimes anastomosing, ascending tubes, terminating each in a wide vent. In the best specimen (R.N. XXVI. 4) there is a continuous stolon 53 mm. in length by about 6 mm. in diameter; the largest tube arising from it is about 35 mm. in height and 10 mm. in average diameter, with a terminal vent about 3·5 mm. in diameter. The stolon itself, though penetrated by smaller canals, does not contain a single, wide, central cavity, as do the tubes that arise from it. The surface is subglabrous, slightly uneven, very minutely granular. The texture is very compressible and resilient, easily torn. The colour in spirit (after formalin) is light brown.

The main skeleton is a rectangularly meshed network of stout multispicular fibre, the meshes becoming irregularly polygonal in the deeper parts. Primary and secondary fibres are alike and of about the same diameter, 0·034 mm. They are composed of a great number of oxea and a small quantity of spongin, which does not seem to form a continuous investment but is sometimes visible in the angles

of the reticulation. The dermal skeleton is an irregular, unispicular reticulation of oxea, in which the individual spicules overlap one another extensively; without obvious spongin.

The spicules are very slightly curved oxea, gradually and sharply pointed at each end, measuring about 0·13 by 0·006 mm.

This species shows very clearly the difficulty of differentiating between the genera Pachychalina and Siphonochalina. The whole structure of the stolon is typically that of a Pachychalina, and only the presence of the tubular ascending branches justifies its inclusion in Siphonochalina. The entire sponge resembles *Siphonochalina crassifibra* on a smaller scale, but with decidedly larger spicules. It makes a near approach to my *Pachychalina subcylindrica* from Ceylon [1905]. I have already pointed out the resemblance which it bears to *Reniera fibroreticulata* (*vide supra* and *cf.* Fig. 12).

Register Numbers, Localities, &c. XXVI. 4, Adatra Reef, 25 December, '05; XXXIII. 5, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fm., 21.12.05.

Chalininae spp.

There are several other small chalinine sponges in the collection which are not in a sufficiently good state of preservation or sufficiently well characterised to make identification or description desirable.

25. **Desmacella tubulata** Dendy [1905].

It is very interesting to meet with this curious and well characterised species again in Mr. Hornell's collection. So far as I am aware it has not been recorded since I first described it from Ceylon in 1905. The material now before me consists of a number of fragments of thin-walled tubes, some of which seem to have been 10 mm. or more in diameter. At one point some of these tubes have grown into close union with a specimen of Gellius sp.

The agreement in spiculation with the type is very close, but I must add that I have observed a few slender toxa, about 0·032 mm. long, on one occasion arranged in a sheaf or toxodragma, differing only in the curvature of the toxa from the smaller trichodragmata. I did not observe any toxa in the type specimens, but probably they occur there amongst the vast number of trichodragmata. I must also add to my original description that the individual trichites of which the trichodragmata are composed, although slender, are not nearly so slender as in some cases. The sheaves or dragmata themselves may be very thick.

Previously known Distribution. Gulf of Mannar (Dendy).

Register Number, Locality, &c. XXVI. 7, Adatra Reef, 25 December, '05.

26. **Thrinacophora cervicornis** Ridley and Dendy.

Thrinacophora cervicornis Ridley and Dendy [1887].

Thrinacophora cervicornis Hentschel [1912].

This species is represented in the collection by two small specimens. The branching, so far as the specimens show, is dichotomous and in one plane, the branches being very short and bluntly rounded off. Surface sparsely hispid owing to the long, slender styli, which project for nearly two millimetres, with shorter projecting styli between. The two specimens are very similar to one another in appearance and closely resemble the young antlers of a stag "in velvet." Total height of each about 20 mm.; diameter of main stem and branches about 3·5 mm., but variable. Colour in spirit light brown.

There is a very stout skeletal axis composed of a dense reticulation of stout and rather short oxea. This is surrounded by a comparatively thin layer of soft tissue in which loose bundles of very long styli run lengthwise. Similar styli, with their bases implanted in the central axis, extend through the outer layer and for a long distance beyond the surface. These are arranged singly and each is surrounded, where it leaves the surface, by a radiate tuft of comparatively short and very slender styli. There is no conspicuous spongin in any part of the skeleton (in balsam preparations).

Spicules. 1. Oxea of the central axis; rather short, stout, distinctly but not very strongly curved or angulated in the middle, usually fairly gradually and sharply pointed at each end. Size fairly uniform, about 0·26 by 0·013 mm.

2. Large styli, running lengthwise in the outer part of the sponge and also projecting more or less at right angles from the surface. These spicules are stoutest at the base and from there taper very gradually to very fine points. They measure about 2·24 mm. in length by 0·02 mm. in thickness at the base. They are slightly curved.

3. Small styli of the radiate surface-tufts; very slender and finely pointed; measuring about 0·55 by 0·0043 mm.

4. Trichodragmata; occurring in immense numbers in the outer part of the sponge; each bundle rather long and narrow, measuring about 0·1 by 0·0082 mm., often curved, easily separating out into trichites.

In spite of some slight apparent differences in spicular proportions, especially as regards the smaller size of the large styli, I think that there can be no reasonable doubt that we have here two small and probably young examples of the *Challenger* species described by Mr. Ridley and myself under the name *Thrinacophora cervicornis*.

In the *Challenger* Report the length of the trichodragmata is given as 0·0126 mm. It should be 0·1 mm., as determined by re-measurements of the type.

I believe that this remarkable and well-characterised species has only been recorded once since it was first described in the *Challenger* Report.

Previously known Distribution. Philippine Islands (Ridley and Dendy); Aru Islands (Hentschel).

Register Number, Locality, &c. III. 6 *a*, *b*, dredged off Dwarka.

27. **Axinella virgultosa** Carter [1887].

There is in the collection one remarkably beautiful specimen, which agrees so closely in its very characteristic external form with the description and figure given by Carter of his *Axinella virgultosa* from Mergui that I have little doubt in making a specific identification. Carter's description of the spiculation, however, without either figures or measurements, is so inadequate that it is impossible, without referring to the type, presumably in Calcutta, to be quite certain. Unfortunately, there is no microscopic preparation of the sponge in Mr. Carter's cabinet.

Mr. Hornell's specimen consists of a large number of slender, vertical, stiff processes, rising up side by side from a thin, encrusting base which measures about 35 by 22 mm. The larger processes are in the middle and measure about 20 mm. in height. They are about 2 mm. in diameter at the base and taper gradually to sharply pointed apices. The processes may give off branches, chiefly from their outer sides near the base. They are all abundantly but shortly hispid with projecting spicules. The colour in spirit (after formalin) is almost white.

Little more than the skeleton of the sponge remains. Each process consists of a plumose column of short, stout spicules arranged in typically axinellid fashion.

The spicules are typically stout styli, sometimes becoming oxeote by more or less pronounced sharpening of the inner end. They are commonly a little bent and the outer end is gradually sharp-pointed. I have seen nothing of the subterminal inflation which Mr. Carter says is often present in his specimens. These spicules measure about 0·77 by 0·04 mm.

Previously known Distribution. Mergui Archipelago (Carter).

Register Number, Locality, &c. IX., off Dwarka, 15–17 fms., 12.12.05.

28. **Phakellia donnani** (Bowerbank).

Isodictya donnani Bowerbank [1873].
Axinella donnani Dendy [1887].
Phakellia donnani Dendy [1905].
Phakellia donnani Row [1911].

This well-known Ceylon species is represented in the collection by a single specimen of the ordinary, pedunculate, cup-like form. The colour in life was, as

usual, orange. It differs from my Ceylon specimens only in the somewhat larger, and especially stouter, spicules, which measure, when full-grown, about 0·38 by 0·025 mm.

Previously known Distribution. Gulf of Mannar, Ceylon Seas (Bowerbank, Dendy); Red Sea (Row).

Register Number, Locality, &c. II. 7, Poshetra Head, 7.1.06.

29. **Auletta lyrata** var. **glomerata** Dendy.—(Plate II., Fig. 16).

Spongia lyrata Esper [1794–1806].
Raspaigella lyrata Ehlers [1870].
Auletta aurantiaca Dendy [1889].
Auletta lyrata var. *glomerata* Dendy [1905].

The single specimen (Fig. 16) in the collection agrees very closely in general form with the type of the variety. The strongly sphinctrate vents are situated each in a cup-shaped depression at the extremity of a short branch. The average thickness of the spicules is, however, much greater than in the type of the variety.

The species of the genus Auletta are evidently extremely variable both in external form and spiculation, and it will be extremely difficult to differentiate them from one another.

Previously known Distribution of Species. Ceylon, Gulf of Mannar (Esper, Dendy).

Register Number, Locality, &c. III. 3, off Dwarka.

30. **Auletta elongata** Dendy var. **fruticosa** nov.—(Plate II., Fig. 17).

Auletta elongata Dendy [1905].

The single specimen (Fig. 17) differs from the type in its much more spreading mode of branching and in the considerably smaller average size of the spicules.

Previously known Distribution of Species. Ceylon, Gulf of Mannar (Dendy).

Register Number, Locality, &c. XXIII. 2, off Dwarka, 15–17 fms., 12.12.05.

31. **Ciocalypta dichotoma** n. sp.—(Plate III., Fig. 18).

The single specimen (Fig. 18) consists of a cylindrical stem dividing at half the total height of the specimen into two approximately equal branches diverging from one another at an acute angle. Each branch terminates in a bluntly pointed apex. The base of the stem is slightly enlarged and attached to it are a few grains of coarse sand and a comparatively large shell-fragment, which seem to indicate that the stem was directly attached to the substratum and did not spring from a massive body. The surface is stellately reticulate as in *Ciocalypta hyaloderma* Ridley and Dendy [1887], though hardly so distinctly. There is a

translucent dermal membrane, supported by a reticulation of spicular fibre and overlying extensive subdermal cavities. There are a number of small, inconspicuous vents, chiefly in single series along the sides of stem and branches. Colour in spirit very pale yellow; texture stiff, resilient. Total height of specimen 46 mm.; diameter of stem and branches about 4–5 mm.

The sponge consists, as usual in the genus, of a central axis, surrounded by wide subdermal cavities which are traversed by spicular columns supporting the dermal membrane. The axis is very thick and the radiating spicule columns very short. Numerous loose fascicles of large oxea run lengthwise through the axis, separated from one another by a fair amount of soft tissue and crossed here and there by scattered oxea. The radiating columns which support the dermal membrane are loose fascicles of similar spicules, ending in surface brushes of short styli. The dermal skeleton is a very irregular reticulation of loose spicular fibre composed of the large oxea. In the dermal membrane also occur numerous small styli, mostly arranged in the above-mentioned brushes at the ends of the radial columns.

The spicules are very sharply differentiated into two kinds:—(1) Large oxea; slightly curved, fusiform, symmetrical, gradually and sharply pointed at each end, size about 0·8 by 0·02 mm. (smaller ones also occur). (2) Small styli; short, usually slightly bent; well rounded off, but somewhat narrowed, at one end, and gradually sharp-pointed at the other, size about 0·2 by 0·008 mm.

The spiculation of this sponge seems to be identical with that of my *Hymeniacidon* (?) *fœtida* [1889], originally from the Gulf of Manaar, which has been included by Lindgren [1898], Thiele [1900] and Hentschel [1912] in the genus *Ciocalypta*, probably quite rightly. The external form of *Ciocalypta dichotoma*, however, is so definite, and so different from that of *C. fœtida*, that I think they may, for the present, be regarded as distinct, though closely related species. It should be borne in mind, on the other hand, that Hentschel [1912] describes specimens of *C. fœtida* with finger-shaped processes.

Register Number, Locality, &c. IV. 21, dredged off S.W. Coast of Beyt Island.

32. **Higginsia** sp.

I have no hesitation in referring to this genus a subcylindrical fragment measuring about 30 by 8 mm. Unfortunately, the specimen was preserved in formalin, and is in a very badly macerated condition, practically nothing but the skeleton remaining, while it contains a large number of evidently foreign spicules.

The main skeleton is a very irregular, subfibrous reticulation of large, stout oxea, measuring about 0·9 by 0·03 mm., only very slightly curved and gradually and sharply pointed. These are accompanied by a number of very much longer and very much more slender oxea and styli, which seem to belong to the sponge.

There are two kinds of microxea; (1) covered with small sharp spines; more or less sharply angulated in the middle; size about 0·15 by 0·006 mm.; (2) smooth, but with a distinct swelling at one side of the central angulation (subcentrotylote); of about the same length as the spined ones but much more slender, even when allowing for the absence of spines. An intermediate form may occasionally be found, but on the whole the two kinds seem to be fairly distinct. It is possible, however, that the smooth ones may be merely young forms of the other.

I refrain from giving a name to this species until better material is forthcoming.

Register Number, Locality, &c. XVIII. 4 *a*, Channel W. of Beyt Island, 3–4 fms., January 7, '06.

33. **Esperella plumosa** (Carter).—(Plate I., Figs. 4*a*–4*g*; Plate III., Fig. 19).

Esperia plumosa Carter [1882, 1887].

Esperella plumosa Dendy [1905].

Not *Esperella plumosa* Arnesen [1903].

This appears to be a very common and characteristic Indian Ocean species and is by far the most abundant sponge in Mr. Hornell's collection. It was also abundant in Professor Herdman's Ceylon collection. As yet, however, no figures, either of the external form or of the very well developed spiculation, have been published, and it seems desirable to make good this omission on the present occasion.

The external form appears to be very characteristic, though varying much according to the stage of growth. The sponge seems to begin life as an irregular crust, which becomes massive and then grows out into long, flattened, tongue-shaped processes, finally breaking up into slender, pointed, digitiform branches; or possibly such branches may be formed first as outgrowths of the massive crust, and subsequently fuse to form the flattened tongue-shaped portions. One of the best pieces is represented of the natural size in Fig. 19, but this is not the largest specimen.

The irregularly conulose or cactiform surface also seems to be characteristic. The surface is subglabrous between the conuli and the dermal reticulation of spicular fibre appears to be very unequally developed; in one specimen which I have dried it is quite conspicuous in some places, under a pocket lens, while apparently absent in others. The oscula are represented by larger and smaller circular apertures scattered here and there between the conuli.

Most of the specimens are now, in spirit and dry, of a dull reddish colour, but I suspect that this may be due to their having been preserved in the first instance in formalin.

I have nothing further to add to my previous description of the skeleton arrange-

ment, but a more complete account of the spiculation seems desirable to accompany the illustrations, especially as I omitted before to mention two types of spicule which occur both in Carter's type and in the Ceylon and Okhamandal specimens. These are the small, palmate anisochelæ and the small, slender sigmata. I think I must have regarded these formerly as merely young forms, but I do not think that that view can be accepted. There are, then, no fewer than seven different kinds of spicule in the sponge, and the constancy in form and size in all the specimens I have examined, including the type, is very remarkable.

1. Tylostyli (Fig. 4*a*), of the usual Esperella type, generally slightly crooked; size about 0·3 by 0·009 mm. (much more slender forms also occur).

2. Large, broad, palmate anisochelæ (Figs. 4*b*–4*b*″), about 0·049 mm. in length by 0·022 mm. in greatest width from one lateral palm to the other.

3. Small palmate anisochelæ (Figs. 4*c*, 4*c*′), about 0·02 mm. long by 0·008 mm. in greatest width.

4. Minute palmate isochelæ (Figs. 4*d*, 4*d*′), resembling those of Clathria, about 0·012 mm. long.

5. Large, stout sigmata (Figs. 4*e*, 4*e*′), probably all really more or less contort, with abruptly recurved and very sharply pointed ends; length in a straight line from bend to bend about 0·094 mm., thickness about 0·0054 mm.

6. Small, slender, contort sigmata (Fig. 4*f*); length in a straight line from bend to bend about 0·033 mm., thickness about 0·0013 mm.; but variable in dimensions.

7. Slender toxa (Fig. 4*g*), gently curved like a parenthesis mark; length about 0·065 mm., thickness about 0·0013 mm.; sometimes arranged in toxodragmata.

Pending a much-needed revision of the esperelline sponges I adhere to the genus Esperella for this species, but, apart altogether from the question whether or not that name should be replaced by Mycale, it seems probable that the genus will have to be split up in the near future.

I have already [1905] pointed out the close resemblance of the characteristic large anisochelæ of this species to the corresponding spicules of *Esperella simonis* Ridley and Dendy [1887], from Simon's Bay, Cape of Good Hope. It is obvious that the two species are closely related, but there are certain well-marked differences in the spiculation. Chief amongst these are the absence from the spiculation of *E. simonis* of the minute, palmate isochelæ and of the small, slender sigmata, both of which are very abundant in *E. plumosa*, which has an extraordinarily full complement of spicules. Other differences concern the size of the spicules and the shape of the toxa, which are much more strongly arcuate in *E. simonis*.

Previously known Distribution. Mauritius and Mergui Archipelago (Carter); Ceylon (Dendy).

Register Numbers, Localities, &c. XX. 2, 8, Adatra; XXII. 1, 3, ½ mile N. of Poshetra, 20.12.05; XXIV. 1, 2, Kiu, low water, 24.12.05; XXVI. 3, 12, Adatra Reef, 25 Dec. '05; XXXII. 1, 2, 7, off Beyt; XXXIV. 3 *a*, channel, W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

34. **Desmacidon minor** n. sp.—(Plate III., Figs. 20*a*, 20*b*.)

There are two specimens of this sponge in the collection, both from the same locality. One of them (R.N. XX. 6 *a*, Fig. 20*a*) is compressed, flabellate, with a much contracted base, almost forming a short peduncle. The upper margin of the sponge is widely extended and produced into short conical processes, apparently the ends of laterally fused branches. The vents are of fair size, shallow and scattered on one surface of the sponge only, not marginal; owing to the maceration of the specimen they are no longer very distinct. The surface is finely granular. The specimen measures about 26 mm. in greatest height, 41 mm. in width, and 3 mm. in average thickness. The texture is soft and resilient; the colour in spirit (after formalin), light brown.

The second specimen (R.N. XX. 6 *b*, Fig. 20*b*) is very similar in most respects, but is divided into digitiform branches from the contracted base upwards, most of the branches lying in approximately the same plane. The branches are subcylindrical or slightly compressed, and about 3–6 mm. in diameter. The shallow vents tend to arrange themselves in longitudinal series on the branches. The maximum height of the specimen is about 33 mm.

The skeleton is a sub-isodictyal reticulation of short oxea, but with the meshes composed of plurispicular fibres in which the spicules are held together by a considerable amount of very pale-coloured spongin.

The spiculation consists of the following:—

(1) Fairly stout, slightly curved oxea, gradually and sharply pointed at each end, measuring about 0·13 by 0·008 mm. Much more slender oxea also occur, which are probably young forms.

(2) Slender, palmate isochelæ ("naviculiform"), about 0·0164 mm. long; abundant.

This species might almost be regarded as a dwarf variety of *Desmacidon compressa* (Carter's *Chalina compressa*), which appears to be a South African species, but the spicules of the latter are very much larger, the oxea measuring, according to Carter [1882 *bis*], about 0·37 by 0·023 mm, and the isochelæ ("naviculiform equianchorates") 0·025 mm. in length.

Register Numbers, Locality, &c. XX. 6 *a*, *b*, Adatra.

35. **Iotrochota baculifera** Ridley.

Iotrochota baculifera Ridley [1884].
Iotrochota baculifera var. *flabellata* Dendy [1887].
Iotrochota baculifera Topsent [1893].

Iotrochota baculifera Topsent [1897].
Iotrochota baculifera Lindgren [1898].
Iotrochota baculifera Thiele [1899].
Iotrochota baculifera var. *tumescens* Kirkpatrick [1900].
Iotrochota baculifera Thiele [1903].
Iotrochota baculifera Dendy [1905].
Iotrochota baculifera var. *minor* Hentschel [1911].
Iotrochota baculifera Hentschel [1912].

There is in the collection only a single specimen of this widely distributed and well known Indian Ocean species. It forms a rather thick, irregular crust of a dark brownish-purple colour, attached to a calcareous nodule, the greatest diameter of the specimen being about 30 mm. The specimen was preserved in alcohol and is in good condition.

The skeleton arrangement and spiculation are typical. The styli measure about 0·13 mm. in length by from 0·004 to 0·008 mm. in thickness. The diactinal megascleres are strongylote or have only very feebly developed heads; they measure about 0·2 by 0·004 mm. The "birotulates" are very abundant but very minute, only about 0·0125 mm. long. The spicules therefore are decidedly smaller than in Professor Herdman's Ceylon specimens.

Previously known Distribution. North Australia and Mascarene Islands (Ridley); Gulf of Mannar and Ceylon Seas (Dendy); Seychelles and Amboina (Topsent); Coast of Cochin China (Lindgren); Celebes and Ternate (Thiele); Christmas Island (Kirkpatrick); S.W. Australia and Aru Islands (Hentschel).

Register Number, Locality, &c. XIII., Adatra Reefs, 25 December, '05.

36. **Guitarra indica** n. sp.—(Plate I., Figs. 5*a*–5*b*''''; Plate III., Fig. 21).

This very interesting sponge is represented in the collection by eight good specimens. Five of these (Fig. 21) are attached to a branching, parchment-like tube, belonging to some polychæte worm*, along with other sponges, including an Esperella and an encrusting Aplysillid. Two other loose specimens, in the same jar, have probably been broken away from the same association. The eighth specimen (R.N. II. 4) is also loose and comes from a different locality.

The specimens are irregularly cushion-shaped and tend to surround by overgrowth the object to which they are attached; they bear a general resemblance, in form and colour, to some species of Chondrilla.

The largest measures about 28 mm. in maximum diameter, with a true thickness (from the outer surface to the surface of attachment) of about 7 mm. The colour, in spirit, ranges from slate grey (on the surface which was evidently exposed to the light) to pale yellow (on what was evidently the shaded surface). R.N. II. 4 is pale yellow all over.

* Probably *Eunice tubifex*, see p. 96.

The vents are numerous and irregularly scattered on the more exposed parts of the surface. They are mostly minute and each at the summit of a small conical projection, formed by a contracted spicular, membranous margin, but I have seen one expanded up to nearly 2 mm. in diameter. The surface is smooth and appears porous under a pocket lens, but I have not been able to detect the actual inhalant pores. These, however, are no doubt scattered in the thin dermal membrane between the surface-brushes of megascleres.

The main skeleton is a very irregular, rather close-meshed reticulation of somewhat loose spicular fibre, with a certain number of isolated megascleres scattered between. At the surface this gives place to a velvety pile composed of well defined brushes of megascleres with outwardly directed apices projecting for a short distance beyond the surface. I have detected no spongin.

Spicules. (1) Styli (tornostrongyla) (Fig. 5*a*); nearly straight, rather abruptly sharp-pointed at one end and rounded off at the other; often a little crooked; measuring about 0·266 by 0·007 mm., but often more slender.

(2) Placochelæ (Figs. 5*b*–5*b*''''); of the typical Guitarra form but with the shaft very abruptly constricted in the middle; length about 0·041 mm., with greatest breadth of expanded shaft about 0·0143 mm. Numerous smaller forms occur with less sharp constriction in the middle of the shaft; also numerous very slender forms of various sizes, without fimbriæ or with very feebly developed fimbriæ, which I take to be early developmental stages. The placochelæ are abundantly scattered throughout the choanosome.

So far as I am aware, only three species of Guitarra have hitherto been described; viz. *Guitarra fimbriata* Carter [1874], from deep water in the North Atlantic, *Guitarra voluta* Topsent [1904], from deep water off the Azores, and *Guitarra antarctica* Hentschel [1914 ?], from deep water in the Antarctic. Unfortunately, no depth was recorded for our new species, but it was associated with typical shallow water sponges and the depth was probably not more than a few fathoms.

Guitarra indica differs from all its congeners in the comparatively small size of the placochelæ. It seems to come nearest to *G. voluta*, but differs from that species in the smaller size of the spicules, the presence of the surface pile of megasclere-brushes (in which it agrees with *G. fimbriata*), and in the abrupt constriction of the shaft of the placochelæ. It differs from *G. fimbriata* and agrees with *G. voluta* in having tornostrongylote megascleres (styli), and it differs from *G. antarctica* in having no sigmata. The youngest stages (Fig. 5*b*''') in the development of the placochelæ, however, resemble sigmata, but they have a peculiar, indefinite, rough outline which seems to indicate immaturity.

Locality, Register Numbers, &c. II. 4, off Poshetra, 7 January '06; IV. 5 *a–g*, dredged off S.W. coast of Beyt Island.

Genus **Psammochela** n. g.

Desmacidonidæ with a reticulate skeleton composed of sandy and sometimes partly spicular fibres. Megascleres styli or strongyla or both. Microscleres isochelæ, which may be very minute and with vestigial teeth ; to which sigmata may be added.

I propose this genus for some interesting sand-sponges from the neighbourhood of Beyt Island, which seem to represent a stage in the regressive evolution of such genera as Phoriospongia and Chondropsis. These two genera have no chelæ, and I have hitherto excluded them from the Desmacidonidæ, but the occurrence of the vestigial isochelæ in Psammochela seems to indicate a probable desmacidonid origin.

I regard *Psammochela elegans* n. sp. as the type of the genus. Hentschel's *Desmacidon psammodes* from S.W. Australia [1911] evidently belongs to the same genus. My own *Desmacidon* (?) *arenifibrosa* [1896] and Carter's *Dysidea chaliniformis* (= *Desmacidon* (?) *chaliniformis* Dendy [1896]), may belong to a closely related genus in which the megascleres have been completely suppressed.

37. **Psammochela elegans** n. sp. (Plate I., Figs. 6*a*–6*e* ; Plate III., Figs. 22*a*, 22*b*).

Sponge (Figs. 22*a*, 22*b*) irregular, lamellar or digitate, often running out into long, slender, sometimes bifurcating processes, from 3 to 10 mm. in diameter and up to about 90 mm. in length in the specimens before me. Surface irregularly rugose or conulose, but with the intervals between the rugæ or conuli spanned over in life by a delicate, translucent, minutely reticulate and finely porous dermal membrane. In formalin specimens (Fig. 22*b*) the dermal membrane has completely disappeared, and the sponge has a curiously eroded appearance, the surface being deeply and irregularly grooved and pitted,the grooves and pits being obviously uncovered subdermal cavities. Vents probably rather small and scattered.

The main skeleton is a fairly close-meshed but very irregular reticulation of rather slender fibre, composed of sand-grains and proper megascleres in varying proportions, with no visible spongin ; with numerous megascleres and sand-grains scattered in the soft tissues between the fibres. The dermal skeleton is composed chiefly of very fine, scattered sand-grains, with a more or less pronounced tendency to arrange themselves in a fine-meshed reticulation.

Spicules. (1) Slender styli (Fig. 6*a*) ; evenly rounded off at the base, rather abruptly sharp-pointed at the apex, often a little crooked ; size about 0·16 by 0·005 mm., but very variable in thickness (? sometimes becoming strongylote). (2) Tridentate isochelæ (Figs. 6*b*, 6*b'*) ; fairly robust, with stout, curved shaft ; length about 0·024 mm. These are usually scarce. (3) Very minute, C-shaped isochelæ (Figs. 6*c*, 6*c'*) ; resembling in side view slender, strongly curved, C-shaped sigmata with slightly enlarged ends ; in front view like an Iotrochota "birotulate," with indications of three vestigial teeth at each end ; length from bend to bend about 0·012 mm.

Very numerous. (4) Slender or fairly stout, more or less contort sigmata (Figs. 6*d*, 6*d'*); with short, strongly recurved, finely pointed ends; measuring commonly about 0·033 mm. from bend to bend. Much smaller sigmata also occur (Fig. 6*e*), which may belong to a different category.

Register Numbers, Localities, &c. IV. 12, 16, 20, dredged off S.W. coast of Beyt Island; X., XXXIV. 11, channel, W. side of S. end of Beyt Island, 3–4 fathoms, 3.1.06; XVIII. 3, channel, W. of Beyt Island, 3–4 fathoms, Jan. 1906; XXXIII. 6, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fathom, 21.12.05.

38. **Chondropsis kirkii** (Carter).

Dysidea kirkii Carter [1885].
? *Sigmatella australis* Lendenfeld [1889].
Sigmatella corticata Lendenfeld [1889].
Chondropsis kirkii Dendy [1895].

I identify with this species a single well preserved specimen which differs in no important respect from the common Australian form. The specimen is subdigitate, consisting of two or three tubular processes partially fused together side by side and each terminating in a conspicuous but constricted vent, surrounded by a membranous collar. The surface is slightly conulose, minutely reticulate where rubbed, sub-glabrous where uninjured. The texture is rather soft and compressible, the colour in spirit pale grey. Height of specimen 31 mm., breadth 36 mm., diameter of digitiform processes about 12 mm.

The main skeleton consists of the usual irregular reticulation of fine-grained sand-fibre. The dermal sand-reticulation is less strongly developed than is usual in Australian specimens. The spicules are the usual slender strongyla and small sigmata, the strongyla perhaps rather better developed than in most Australian specimens.

Previously known Distribution. Australian Seas (Carter, Lendenfeld, Dendy).

Register Number, Locality, &c. IV. 11, dredged off S.W. coast of Beyt Island.

39. **Myxilla arenaria** Dendy [1905].

I identify with this species three specimens in the collection, all from about the same locality. The one (R.N. IV. 2 *a*) upon which the following notes are based is irregularly and massively lobose, slightly clathrous, about 66 mm. in height and 50 mm. in greatest breadth. It looks (in spirit) like a mass of sand held together by pale grey, gelatinous "sarcode," which forms a thicker or thinner surface layer. The surface is uneven and slightly conulose or rugose. The vents are rather small and arranged in a row on the prominent ridges which form the top of the sponge.

The skeleton is composed chiefly of a dense agglomeration of coarse sand-grains which, to the naked eye, show, through the translucent dermal membrane, a distinct tendency to be arranged in ascending columns. These sand-grains are very sparsely

echinated by small spined styli, while slender diactinal megascleres occur scattered and in loose wisps in the soft tissues between. Towards the surface the diactinal megascleres become much more abundant and form radiating dermal brushes. The megascleres are rather more robust than in the type and the diactinal megascleres are distinctly tornote, *i.e.* very abruptly pointed at each end, rather than rounded off.

Previously known Distribution. Gulf of Mannar, Ceylon Seas (Dendy).

Register Numbers, Locality, &c. IV. 2 *a*, *b*, dredged off S.W. coast of Beyt Island; XXXIV. 4, channel, W. side of S. end of Beyt Island, 3–4 fathoms, 3.1.06.

40. **Clathria corallitincta** Dendy.

Clathria corallitincta Dendy [1889].
Clathria frondifera Dendy [1905].
? *Clathria frondifera* Ridley [1884].
? *Halichondria frondifera* Bowerbank [1875].

There are three good-sized specimens and one small specimen of this sponge in the collection. They have, each as a whole, a massive form with a slight tendency to become lamellar, but each is in reality made up of an immense number of slender, anastomosing branches, forming a close network, with the ends of the branches projecting on the surface in the form of conuli. All three specimens exhibit large pseudoscula on prominent parts of the sponge.

The spiculation calls for no special comment except as regards the presence of numerous large, stout, strongly bent toxa.

It is quite possible that Bowerbank's *Halichondria frondifera* may be a very variable and widely distributed species, with which the Indian specimens might be identified, as I did with Ceylon specimens in 1905; but I am now more inclined, in view of Bowerbank's original description and the new material to hand, to regard the Indian and Ceylon specimens as belonging to a distinct species, as I did in 1889, under the name *Clathria corallitincta*.

Previously known Distribution. Gulf of Mannar, Ceylon (Dendy).

Register Numbers, Localities, &c. IV. 14, off S.W. coast of Beyt Island; XVIII. 2, channel, W. of Beyt Island, 3–4 fathoms, January, 1906; XIX. 1, Vamiani Point, January 5, 1906; XXXIV. 2, channel, W. side of S. end of Beyt Island, 3–4 fms., 3.1.06.

41. **Clathria spiculosa** Dendy.

Rhaphidophlus spiculosus Dendy [1889].
Clathria spiculosa Dendy [1905].
Clathria spiculosa var. *ramosa* Dendy [1905].
Clathria spiculosa vars. *ramosa* and *macilenta* [Hentschel 1912].

There are several specimens in the collection which I identify with this common

Ceylon species. The branching is extremely irregular, and the branches vary in form from short, broad and flattened to slender, long and cylindrical. The long, slender-branched specimens evidently belong to my var. *ramosa*, but I do not think that this can be at all sharply distinguished from the type.

One of the specimens contains a number of grapnel spicules, which seem to be foreign, as they were seen only in one small part.

Previously known Distribution. Gulf of Mannar, Ceylon Seas (Dendy); Aru Islands, Arafura Sea (Hentschel).

Register Numbers, Locality, &c. XX. 5, 10, Adatra.

42. **Echinodictyum gorgonioides** n. sp.—(Plate I., Figs. 7*a*–7*b*′; Plate IV., Fig. 23.)

So far as external appearance goes this is perhaps the prettiest sponge in the collection, with an extremely characteristic mode of growth. There are three separate pieces of it, but they all come from the same locality and may possibly be parts of one and the same specimen. The sponge (Fig. 23) consists of a number of slender stems springing close together from a somewhat spreading, encrusting base. The stems rise almost vertically from the points of attachment and bifurcate repeatedly and very frequently. All the branches—and no distinction can be drawn between stems and branches—are of about the same diameter, say 3 mm. They mostly lie in approximately the same plane and occasionally anastomose with one another. The surfaces of the branches are subrugose and minutely conulose. The branches terminate in rounded extremities and there are no conspicuous vents. The whole growth reminds one forcibly of some species of Gorgonia.

The total height of the largest piece is about 110 mm., and the greatest width nearly as much.

The colour in spirit (after formalin) is very pale brown. The texture is fairly tough, very compressible and resilient.

The skeleton is composed of stout primary fibres, which branch repeatedly as they approach the surface and are more or less interconnected by secondary fibres. The main fibres consist chiefly of plumose columns of spined styli, some of which are completely embedded in the pale-coloured spongin, while others echinate the surface of the fibre at various angles. The secondary fibres consist mainly or entirely of spongin, echinated more or less by the spined styli.

Fairly numerous oxea (tornotoxea) accompany the fibres or are scattered between them, but they rarely, if ever, form a spicular core to the fibre. They are not nearly so numerous as the spined styli, which form the chief part of the spiculation.

Spicules. (1) Oxea (tornotoxea) (Fig. 7*a*); straight, slender, thicker at one end than at the other, abruptly pointed at the thicker end, gradually sharp-pointed at the other; occasionally with a bulbous inflation at from $\frac{1}{3}$ to $\frac{1}{4}$ the length from the thicker

end; size about 0·14 by 0·0041 mm. (2) Spined styli (acanthostyli) (Figs. 7*b*, 7*b'*); tapering gradually from the base to the sharply pointed apex; straight; rather sparsely covered with small spines, except towards the apex; size variable, say about 0·11 by 0·01 mm.; a number of very slender forms also occur (Fig. 7*b'*).

The sponge also contains numerous other types of spicule, most of which, at any rate, have certainly been derived from other sponges, including Spirastrella, Esperella, Donatia and Reniera. There are, however, a fair number of stoutish, strongly angulated toxa, a very few minute Clathria-like, palmate isochelæ, and a fair number of long, straight, slender tylostyles with well-developed heads, which may possibly belong to the species.

The plumose character of the main skeleton fibres suggests a close affinity with the genus Plumohalichondria.

Register Number, Locality, &c. XXI. 1, 3, 4–7 fms. off Rupan Bandar and Kutchegudh, 8.12.05.

43. **Raspailia fruticosa** var. **tenuiramosa** Dendy.

Raspailia fruticosa Dendy [1887].
Raspailia fruticosa var. *tenuiramosa* Dendy [1905].
Raspailia fruticosa var. *aruensis* Hentschel [1912].

The two specimens in the collection differ from the Ceylonese types of the variety in their much more sparingly branched character, being, in fact, less instead of more bushy than the type of the species. Both specimens, however, have much more slender branches than the type of the species. As regards skeleton arrangement and spiculation they agree very closely with the types of the variety.

Previously known Distribution of the Species. Gulf of Mannar (Dendy); Aru Islands, Arafura Sea (var. *aruensis* Hentschel).

Register Numbers, Localities, &c. II. 13, off Poshetra, January 7, 1906; XXIX. 2, N. of Poshetra, $3\frac{3}{4}$–4 fms., 20.12.05.

44. **Acarnus tortilis** Topsent [1892 *bis*, 1897, 1904].

I identify with this widely distributed but apparently rare species a small, presumably encrusting sponge of a brown colour and irregular shape. The spiculation agrees closely with that described and figured by Topsent for his species, even down to the minute spination of the bases of the stout styli and the ends of the diactinal megascleres. The very characteristic grapnel-spicules, with usually four strongly recurved, sharp hooks at the apex, strongly spined shaft, and base with spines curved in the opposite direction, are identical. The toxa, however, appear to be all of the strongly arcuate form, though varying much in dimensions. The chief difference that I have been able to detect, however, lies in the presence of a considerable amount of spongin, partially uniting and enveloping some of the spicules, but this difference can hardly

be regarded as of specific value and may be associated with temperature conditions. A great many foreign spicules are present in the sponge, possibly owing to its association with other sponges in the dredge.

Previously known Distribution. Mediterranean, Azores, Amboina (Topsent).

Register Number, Locality, &c. XXIX. 3, N. of Poshetra, $3\frac{3}{4}$–4 fms., 20.12.05.

45. **Bubaris radiata** n. sp. (Plate I., Figs. 8*a*–8*b*; Plate IV., Figs. 24*a*, 24*b*).

Sponge (Figs. 24*a*, 24*b*) encrusting, cushion-shaped, composed of close-set, stout, radiating skeletal columns, united by a small quantity of gelatinous soft tissue. Surface conulose owing to the projecting ends of the spicular columns, with a thin, translucent dermal membrane in the grooves between the conuli. No oscula or pores seen. The largest piece (R.N. II. 10) measures about 18 mm. in maximum diameter and 6 mm. in thickness, the thickness being equal to the length of the spicular columns, which extend from the base to the upper surface almost without branching and approximately parallel to one another. The individual columns are about 1 mm. in diameter. The colour in spirit is light, dull yellow.

A second specimen (R.N. III. 7 *a*), rather smaller, looks like a fragment of an almost spherical sponge. The spicular columns are rather stouter, a little more branched, and radiate almost from a common centre. The colour in spirit is rather darker.

The skeleton consists of very strong columns of spicules arranged in a plumose fashion. Each column contains a very dense axis composed of an interlacement of short strongyla, in which are implanted the bases of some of the stout styli which radiate obliquely outwards and upwards from the axis. There is sometimes a tendency to the formation of secondary plumose spicular columns coming off from the axis of the primary. At the ends of the columns the apices of the styli project freely beyond the surface of the sponge, but lower down between the columns they are completely enveloped in gelatinous tissue.

Spicules. (1) Stout styli (Fig. 8*a*), more or less bent towards the base, tapering gradually to a sharply pointed apex; commonly measuring about 0·55 by 0·026 mm., often smaller and occasionally a trifle larger. (2) A few very much longer and more slender styli (Fig. 8*a*‴) occur in boiled-out preparations, measuring up to about 1·3 by 0·016 mm. (3) Strongyla (Fig. 8*b*); comparatively short and irregularly curved or bent to a varying but not very high degree, approximately equal-ended; size commonly about 0·26 by 0·01 mm., but variable. Intermediate forms are represented by Figs. 8*a*′ and 8*a*″.

In general appearance and skeleton arrangement this sponge reminds one very strongly of the common Ceylon species *Aulospongus tubulatus*. The latter, however, has not got any strongyla in the axes of the plumose spicular columns, while, on the other hand, it has got minutely spined, echinating styli, which are absent in the present species.

From *Bubaris vermiculata* the species differs in its mode of growth and in the replacement of the " vermicular " spicules by much less bent strongyla.

The descriptions, measurements and figures of the spicules, as well as the figures of the external form, are taken from R.N. III. 7 *a*, which may be regarded as the type of the species.

Register Numbers, Localities, &c. II. 10, off Poshetra, 7 January, '06 ; III. 7*a*, *b*, (two fragments), off Dwarka.

46. **Spirastrella vagabunda** var. **tubulodigitata** Dendy.—(Plate IV., Fig. 25).
(For possible Synonymy, *vide* Vosmaer [1911]).

There is in the collection a single specimen (Fig. 25) which agrees very closely in external form and spiculation with the Ceylon types. It consists of a single tubular process with terminal vent, and a few much smaller, irregularly ramified, blind processes, all arising from a common base containing much coarse sand.

Previously known Distribution of the Variety. Gulf of Mannar and Ceylon Seas (Dendy).

Register Number, Locality, &c. IV. 10, off S.W. coast of Beyt Island.

47. **Placospongia carinata** (Bowerbank).

(For Literature and Synonymy *vide* Vosmaer and Vernhout [1902] and Dendy [1905]).

This remarkable sponge appears to be quite common in the Indian Ocean.

Previously known Distribution. Tropical Seas between 30° N. and 20° S. of the equator (Vosmaer and Vernhout, &c.).

Register Numbers, Localities, &c. XXVI. 9, Adatra Reefs, 25 December, '05 ; XXVII. 2, 3 and XXXIII. 4, Dhed Mora and adjacent rocky ground between Beyt and Aramra, 1 fm., 21.12.05.

48. **Cliona coronaria** (Carter).

Suberites coronarius Carter [1882, 1887].

This interesting species was first described by Carter from specimens in the Bowerbank collection in the British Museum, coming from Honduras, Jamaica and the Bahamas. These specimens were described as " massive, lobate, verrucose on the surface." The characteristic microsclere was described as a " Spinispirula consisting of one bend, semicircular, with the spines on the outside and over the ends only ; spines capitate and in single file."

Mr. Carter's original preparations of these three sponges are in my possession, and I am able to verify the general accuracy of his brief description and figures of the spiculation. The capitate character of the spines of the microscleres is, however, not always recognisable, and may be in part due to optical illusion.

In 1887 the same species was recorded by Mr. Carter from the Mergui Archipelago and some interesting particulars added as to its mode of growth, as follows :—" Its growth is more remarkable than in that [the Honduras] example, for it is laminar, and extends in a horizontal direction for several square inches ; the superficial stratum, which is comparatively thin and buff-yellow in colour, changes to black or dark brown in the cancellated cavities to be presently mentioned for half an inch downwards, where it rests on granite. The explanation of this abrupt termination is that the lower portion is mingled with a layer of coral which has been cancellated by the excavating habit of these sponges, which exhibit an apparent fondness for calcareous material, whether in a mineral or organic form."

Mr. Carter thus clearly recognises that his *Suberites coronarius* may, at any rate under some circumstances, be an excavating sponge. A specimen in Mr. Hornell's collection (R.N. XXVI. 10), also excavating and encrusting a piece of coral, agrees very closely with the Mergui specimen, and its examination, I think, fully justifies the transference of the species to the genus Cliona. In all probability the massive West Indian specimens stand in exactly the same relation to the excavating Indian Ocean specimens as does the massive " *Raphyrus griffithsii* " to the excavating *Cliona celata* of European seas, or to the encrusting form of the latter described by Topsent [1900].

Mr. Hornell's specimen consists, in the first place, of a thin crust (about 1 mm. thick), with smooth outer surface. The underlying coral has been eroded and largely disintegrated by the sponge, giving rise to the " cancellated " structure described by Mr. Carter, which, when teased up and examined microscopically, is seen to consist of a mixture of coral fragments and sponge.

In the outer portion of the sponge the skeleton consists of dense, irregular wisps of tylostyles running towards the surface, where they form a thick dermal pile with outwardly directed apices. In the cancellated portion the tylostyles seem to be quite irregularly scattered. The spiculation consists of tylostyles and spirasters only; I have seen no oxea such as sometimes occur in Cliona (*fide* Topsent). The tylostyles are straight or very slightly curved, usually very sharply and gradually pointed. They have well developed, almost spherical heads. When fully grown they measure about 0·35 by 0·012 mm., with head 0·014 mm. in diameter. The greatest diameter of the shaft is at about one-third of the distance from head to apex. The spirasters are very slender and measure about 0·02 mm. in a straight line from end to end. Many of them have the typical " semicircular " form described by Carter, but many show a very obvious spiral twist. They resemble bent fragments of broken fretsaws. It is not easy to assure oneself that the short spines are really capitate, though they may have the appearance of being so.

As might be expected, the spiculation, as well as the mode of growth, of the Okhamandal sponge seems to agree more closely with that of the Mergui than with that of the West Indian specimens. Thus the heads of the tylostyles are more nearly spherical

in both the Indian Ocean specimens (compare Carter's figures of the Mergui and West Indian sponges), but I do not think there is anything to justify a specific distinction.

It should be noted that the Okhamandal specimen was first preserved in formalin, which may possibly have assisted in bringing about the eroded condition of the coral on which it is growing.

Some larger fragments from the same locality (R.N. XXVI. 2), possibly parts of the same specimen, have been completely stripped off from the substratum in the form of a thin sheet about 48 square centimetres in extent and about 1 mm. thick. They have an almost smooth surface, minutely reticulate in places when viewed under a lens, and no visible vents.

Previously known Distribution. Honduras, Jamaica, Bahamas, Mergui (Carter).

Register Number, Locality, &c. XXVI. 2, 10, Adatra Reefs, 25 December, '05.

49. **Suberites carnosus** (Johnston) var.

(For Literature and Synonymy, *vide* Topsent [1900]).

This common and widely distributed species is represented in the collection by two specimens of massive, subovoid form, without any indication of stalks, and with no visible vents. One of the two specimens (R.N. XIX. 3) measures about 44 by 29 mm. and is compact and solid. The other (R.N. XIX. 2), of about the same size, has been damaged in collecting, and a superficial cortical layer, made coherent by the extremely dense surface-skeleton, has been separated in large measure from the remainder, which seems to have shrunk away or been partially removed, so that the specimen looks like a broken egg with a dried up yolk adherent to the shell at one side only. In both the surface is smooth but very minutely velvety, and the colour throughout (in spirit) is pale yellow.

The skeleton consists exclusively of tylostyles. In the interior of the sponge these spicules are thickly but quite irregularly scattered, while at the surface they arrange themselves with their apices projecting outwards, not in distinct brushes but in a dense, continuous layer.

The tylostyles are approximately straight, gradually and sharply pointed, and with well rounded heads only occasionally of the " enormispinulate " type. They vary in size up to about 0·77 by 0·018 mm.

A direct comparison with a preparation of Johnston's type-specimen shows that the latter has decidedly smaller spicules with a strong tendency to develop a secondary inflation just below the head. The measurements of the spicules in our variety also exceed the range of variation for the species given by Topsent.

Previously known Distribution. Atlantic, Mediterranean, Red Sea, Indian Ocean and Australian Seas (*vide* Ridley and Dendy [1887] and Topsent [1900]).

Register Numbers, Locality, &c. XIX. 2, 3, Vamiani Point, January 5, '06.

50. **Suberites flabellatus** Carter.

Suberites flabellatus Carter [1886].
? *Suberites globosa* (elongated form) Carter [1886].
? *Suberites carnosus* Keller [1891].
Suberites flabellatus Dendy [1897].

A single good specimen in the collection closely resembles in external form Keller's figure of "*Suberites carnosus*" from the Red Sea. It agrees very closely, however, with the Victorian species described by Carter and myself, and I have no hesitation in identifying it with that, which may be, after all, merely a variety of *S. carnosus*. The tylostyles in the Okhamandal sponge are long, straight and slender, and they all seem to have well-developed heads, usually of the "enormispinulate" type. In the interior of the sponge they attain a length of about 0·7 mm., with a diameter of about 0·01 mm.; but they are much smaller in the surface-brushes.

Previously known Distribution. Near Port Phillip Heads, Australia (Carter, Dendy); ? Red Sea (Keller).

Register Number, Locality, &c. II. 1, off Poshetra, January 7, '06.

51. **Suberites cruciatus** Dendy [1905].

I identify with this species, originally described from Ceylon, two small, irregularly massive specimens, each of which shows a tendency to give off digitiform processes. The larger of the two measures about 18 mm. in greatest length by 9 mm. in greatest breadth. The colour in spirit is pale yellow. The surface is uneven but nearly smooth, and shows small, rounded, translucent (pore ?—) areas, as described for the type.

The arrangement of the skeleton agrees on the whole with that found in the type. The tylostyles exhibit the same peculiar form of the heads but are considerably larger than in the type; in fact, they may be nearly twice as large, at any rate in the deeper parts of the sponge, while they diminish in size in the surface-brushes. A large number of tylostyles occur scattered tangentially in the dermal membrane between the ends of the surface-brushes, a feature which is not conspicuous in the type.

Previously known Distribution. Ceylon (Dendy).

Register Numbers, Locality, &c. III. 10 *a* and *b* (possibly parts of same specimen); dredged off Dwarka.

52. **Polymastia gemmipara** n. sp.—(Plate I., Figs. 9*a*, 9*b*; Plate IV., Figs. 26*a*, 26*b*).

The single specimen (Figs. 26*a*, 26*b*) has evidently been torn off from the substratum, part of which, in the form of a small pebble, remains attached at one side. It now has the form of a hollow, thin-walled sac, widely open below, where it has been damaged, and produced above into five slender, hollow processes or fistulæ, one of

which is branched. In life, no doubt, the interior of the sponge was filled with soft, pulpy, choanosomal tissue, part of which remains in the form of irregular masses adherent to the inner surface of the cortex, as shown at *ch.* in Fig. 26*b*.

The thin cortex is supported internally by a few very stout spicular columns, one of which is shown at *sp. c.* in the illustrations. No doubt in life these columns, of which I have only been able to find two in the specimen before me, were attached to the substratum, and formed pillars supporting the dome-like cortex.

The fistulæ are very remarkable structures. They have no visible openings, but most of them taper off distally into fine threads, which in three cases are swollen out to form either one or two small buds, as shown at *b.* in the figures.

The colour of the cortex (in alcohol) is white, that of the soft internal pulp very pale yellow.

The greatest diameter of the specimen, at the base, is 17 mm.

The skeleton may be subdivided as follows: (1) that of the soft internal choanosome or pulp consists of loosely scattered tylostyles or subtylostyles, varying in size but mostly small and often very slender; (2) that of the internal spicular columns consists of a dense mass of relatively large subtylostyles closely packed together lengthwise; (3) that of the cortex consists of an inner and an outer portion; the inner portion is a fairly close interlacement of the larger subtylostyles lying tangentially, not much more than one layer thick, with a tendency to the formation of broad bands, which can be seen under a pocket-lens converging towards the bases of the fistular processes; the outer portion is a thin but rather close pile or fur of short tylostyles or subtylostyles arranged more or less vertically to the surface, with outwardly projecting apices; (4) that of the fistular processes is merely a continuation of the cortical skeleton. The principal bundles of the larger subtylostyles run lengthwise in the wall of the fistula; where the fistula is drawn out into a solid thread at the end they unite to form a single stout spicular fibre, and in this region the surface-fur of short spicules is almost absent, but becomes strongly developed again when the thread swells out to form a bud.

Spicules. (1) Subtylostyles of the internal columns and cortex (Fig. 9*a*); straight, slender, tapering gradually to a finely pointed apex, also tapering gradually to the base, where there is usually a very slightly developed head; the base sometimes appears constricted somewhat suddenly, the "head" being a good deal narrower than the adjacent part of the shaft, as in the specimen figured; commonly measuring about 0·72 by 0·0164 mm.; (2) small tylostyles (Fig. 9*b*); chiefly in the surface pile; usually curved; apex gradually sharp-pointed; with rather feebly developed head of smaller diameter than the middle of the spicule; size about 0·15 by 0·0068 mm.; (3) spicules of the soft internal pulp; a mixture of the two kinds already described, together with intermediate forms and very slender forms which are probably young; perhaps never quite so large as in the spicular columns and cortex, and usually much smaller.

This species seems to be intermediate in character between the genera Polymastia

and Quasillina as at present understood, the soft, pulpy internal structure and thin cortex being suggestive of the latter, and the hollow fistular processes of the former. It seems quite possible that, after all, the distinction between these two genera may have to be abandoned.[1]

The process of bud-formation by gemmation from the filiform ends of tapering fistulæ appears to be identical with that described, with admirable illustrations, by Merejkowsky [1878] in *Polymastia* (*Rinalda*) *arctica*, a species from the White Sea. A somewhat similar process is, of course, familiar in certain other genera, such as Donatia.

In *Polymastia arctica* there are one or more osculum-bearing fistulæ between the gemmiparous ones. This may also be the case with the present species, but the specimen is not in a fit condition to enable me to determine the point with certainty.

Register Number, Locality, &c. IV. 7, dredged off S.W. coast of Beyt Island.

53. **Megalopastas retiaria** n. sp.—(Plate IV., Fig. 27.)

This is certainly one of the most interesting, and at the same time one of the most beautiful species in the collection, in which it is well represented by three good spirit specimens and a couple of washed-out skeletons. The general appearance of the sponge is well shown in Fig. 27, which represents the best preserved specimen twice the natural size. The sponge is irregularly lobose, or simply massive. Apparently it is sessile, with several points of attachment to relatively small foreign objects, as though it had grown on a gravelly or shelly bottom. The surface is produced into moderate-sized, acute conuli, scattered at rather wide and irregular intervals, the height of the conuli being about 1–2 mm. Internally the sponge is cavernous and the wide vestibules open on the surface by large pseudoscula. These pseudoscula, of various shapes and sizes, are frequently (perhaps always in life) covered over by a very beautiful network, which is a continuation of the delicately reticulate dermal membrane, but with much coarser meshes. The dermal membrane in general covers the whole sponge like a gauzy veil. It is strengthened by a close reticulation of delicate, deeply staining, fibrillar bands (not horny). Under a pocket-lens the principal lines of this network appear (in the spirit specimens) as fine white lines radiating from the apices of the conuli into the hollows between, where they lose themselves in a network of finer lines. The meshes of this network are occupied by the pore-bearing dermal membrane, which is itself reduced to a secondary, quite microscopic network by the very numerous inhalant pores, each only about 0·03 mm. in diameter. The dermal membrane is interrupted here and there, pretty frequently, by small circular apertures about 1 mm. in diameter. These apertures have well-defined margins, being bounded each by an unusually large, circular

[1] *Cf.* my remarks on *Quasillina brevis* in *Journ. Linn. Soc. Zool.*, Vol. XXXII. (1914), p. 271.

mesh of the network of fibrillar bands described above. They are the openings of deep cylindrical canals of similar diameter, and probably represent true oscula. Between them numerous smaller apertures, the openings of the inhalant canals leading from the subdermal cavities, can be seen through the transparent dermal membrane. In some places the soft tissues seem to have shrunk away from the skeleton, showing the coarsely reticulate, dark-coloured, horny fibre projecting beyond the surface; while the pale-coloured growing points of the primary fibres appear in the conuli, supporting the dermal membrane.

The largest specimen (R.N. VIII.) is an irregular lobose mass about 100 mm. in diameter. The texture (in spirit) is very soft and compressible, but resilient owing to the coarse, stiff, horny skeleton. The colour in life (R.N. VIII.) was recorded as pink, in spirit all three specimens are very pale grey.

Of two specimens preserved in formalin (R.N. XXIX. 1) practically nothing remained but the skeleton.

The skeleton is a very coarse reticulation of dark-brown, almost black, horny fibre. It is only occasionally possible to recognise main stems springing from points of attachment. Indeed the abundant development of secondary connecting fibres almost completely conceals any original tree-like growth there may have been, except towards the surface, where branching main fibres terminate in the conuli. The connecting fibres are developed chiefly in the angles of the main branching system, with the result that we can distinguish meshes of two quite distinct orders, large and small, the small ones occurring in groups at the nodes of the reticulation formed by the large ones. The large meshes average perhaps 5 mm. in diameter, the small ones, say, about 0·5 mm., but very variable. The thickest primary fibres measure up to about 0·34 mm. in diameter and the thinnest secondary ones about 0·034 mm., between which extremes all gradations occur. The fibres are entirely free from foreign inclusions and consist of more or less numerous concentric layers of spongin. It is not possible to distinguish sharply between the so-called pith and the surrounding spongin-lamellæ, and, in spite of the numerous descriptions in which such distinction is insisted upon, I believe that this is frequently the case in the Aplysillidæ.

There is no dermal or subdermal reticulation of horny fibres.

The canal-system is typically aplysillid. The flagellate chambers are very large and thimble-shaped, measuring about 0·17 by 0·085 mm. Favourable sections show them arranged in a single, much folded layer between the inhalant and exhalant canals. Each chamber has numerous prosopyles.

Register Numbers, Localities, &c. II. 3, off Poshetra, January 7, '06; IV. 13, off S.W. coast of Beyt Island; VIII., Mangunda Reef; XXIX. 1 (two skeletons), N. of Poshetra, $3\frac{3}{4}$–4 fms., 20.12.05.

54. **Darwinella australiensis** Carter.

Darwinella australiensis Carter [1885].
Darwinella australiensis Lendenfeld [1889].
Darwinella australiensis Topsent [1905].
Darwinella australiensis Hentschel [1912].

There are in the collection the remains of two or three specimens of this sponge, which has thickly encrusted some of the large polychæte worm-tubes before mentioned. Unfortunately the specimens were preserved in formalin and are very badly macerated. There can, however, be little doubt about the identification.

The surface, where preserved, is strongly conulose, the colour (in alcohol after formalin) is dull red. The largest specimen is about 25 mm. in maximum thickness (the height of the largest skeletal trees).

The skeleton is composed of elegant little trees of pale amber-coloured horny fibre, growing up vertically and side by side from a thin basal layer of spongin. The trees are well branched, but anastomosis between the branches takes place only rarely.

The horny spicules seem to be much less numerous than in Australian specimens. They are triradiate, with long, slender, gradually sharp-pointed rays. They all seem to lie freely in the soft tissues. I have measured the rays up to about 0·85 mm. in length. I have observed in some of the older fibres apparently the same parasitic fungus (?) as I described [1905] in the case of *Darwinella simplex*, Topsent, from Ceylon. It now appears to me very doubtful whether that species is distinguishable from *D. australiensis*.

Previously known Distribution. Victoria, Australia (Carter, Lendenfeld); Arafura Sea (Hentschel).

Register Number, Locality, &c. XXV. 2, Kiu, littoral at low water, 24.12.05.

55. **Spongelia fragilis** var. **ramosa** (Schulze).

Spongelia pallescens subspecies *fragilis* var. *ramosa* Schulze [1879].
Spongelia fragilis var. *irregularis* (pars) Lendenfeld [1889].
Spongelia fragilis var. *ramosa* Dendy [1905].
? *Spongelia fragilis* var. *clathrata* Hentschel [1912].

There are several specimens of this sponge in the collection. I pointed out in my Ceylon Report that the species, at any rate, is probably cosmopolitan, if not the variety.

Previously known Distribution of Variety. Adriatic (Schulze); Ceylon (Lendenfeld, Dendy); ? Aru Islands (Hentschel).

Register Numbers, Localities, &c. XII., XXXII. 3, off Beyt; XXV. 5, Kiu, littoral.

56. **Spongelia cinerea** (Keller).

Dysidea cinerea Keller [1889].

Spongelia elastica var. *crassa* Dendy [1905].

There are three specimens of this sponge in the collection, one large one (R.N. IV. 1) very similar to that figured in my Report on Professor Herdman's Ceylon Sponges, and two small ones more nearly resembling the figure given by Keller. I think there can be little doubt that my var. *crassa* is identical with Keller's *Dysidea cinerea* from the Red Sea, which is possibly merely a variety of *Spongelia elastica*, which, in turn, according to Schulze [1879], is merely a subspecies of *Spongelia pallescens*. It is very doubtful how far it is desirable to separate these different forms.

Previously known Distribution. Red Sea (Keller); Gulf of Mannar (Dendy).

Register Numbers, Localities, &c. IV. 1, 15, 23, dredged off S.W. coast of Beyt Island.

57. **Spongelia elegans** Nardo var.

(For Synonymy, *vide* Schulze [1879] and Lendenfeld [1889].)

A number of branched and anastomosing, digitiform pieces, all from the same locality and probably all parts of one specimen, closely resemble Schulze's figure of *Spongelia elegans*. The specimen seems, however, to have been less robust than that figured by Schulze and the conuli less strongly developed. The colour in spirit (after formalin) is light brown; texture very soft and compressible. The skeleton is a loose, irregular network of rather slender, strongly arenaceous fibre, in which the fibres are all equally charged with sand, there being no secondary horny fibres more or less free from sand and connecting the fibres which run into the conuli, as described by Schulze. Stained preparations, however, show darkly staining fibrillar bands of nucleated cells running lengthwise through the sponge. These commonly contain a few sand-grains. Their relation to the ordinary skeletal fibres is doubtful, though they appear to be connected with them in places.

Schulze says nothing about the occurrence and distribution of spongin, and one merely assumes that the sand-free secondary fibres in his material are composed of that substance. In the Okhamandal specimen spongin is nowhere strongly developed, and I have recognised it only in the sandy fibre.

Previously known Distribution. Mediterranean (Nardo, Schmidt, Schulze, &c.); East Coast of Australia (Lendenfeld).

Register Number, Locality, &c. XXIII. 4, off Dwarka, 15–17 fms., 12.12.05.

58. **Hippospongia clathrata** (Carter).

Hircinia clathrata Carter [1881].
Hircinia clathrata Dendy [1887, 1889].
Hyatella clathrata Lendenfeld [1889].
Hippospongia clathrata Dendy [1905].

There are several large pieces of this sponge in the collection.

Previously known Distribution. Gulf of Mannar and Red Sea (Carter); Gulf of Mannar (Dendy); Australia (Dendy, Lendenfeld); American coast of N. Atlantic (Lendenfeld).

Register Numbers, Localities, &c. XVIII. 1, channel, W. of Beyt Island, 3–4 fms., January, '06; XXXII. 6, off Beyt.

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DESCRIPTIONS OF PLATES.

PLATE I.

Figs. 1*a*, 1*b*. *Chondrilla agglutinans* n. sp. (R.N. V. 1).

Fig. 1*a*. Spherasters from cortex. × 650.

,, 1*b*. Oxyasters from choanosome. × 650.

Figs. 2*a*–2*c*. *Tetilla pilula* n. sp. (R.N. XXXV. 8 *b*)

Fig. 2*a*. Outer part of surface-brush of megascleres, partially separated by teasing. × 280.

,, 2*b*. Cladome of anamonæne. × 860.

,, 2c. Sigmata. × 860.

Figs. 3*a*–3*d*. *Tetilla barodensis* n. sp. (R.N. XXIII. 8).

Fig. 3*a*. Orthotriænes. × 70.

,, 3*b*. Cladome of anatriæne. × 290.

,, 3*c*. Sigmata. × 870.

,, 3*d*. Trichodragma. × 385.

Figs. 4*a*–4*g*. *Esperella plumosa* (Carter). (R.N. XXXII. 1).

Fig. 4*a*. Tylostyles. × 290.
„ 4*b*. Large anisochela, front view. × 870.
„ 4*b'*. „ „ side view. × 870.
„ 4*b''*. „ „ end view (small end). × 870.
„ 4*c*. Small anisochela, front view. × 870.
„ 4*c'*. „ „ side view. × 870.
„ 4*d*. Small isochela, front view. × 870.
„ 4*d'*. „ „ side view. × 870.
„ 4*e*. Large sigma, side view. × 870.
„ 4*e'*. „ „ front view. × 870.
„ 4*f*. Small sigmata. × 870.
„ 4*g*. Toxa. × 870.

Figs. 5*a*–5*b''''*. *Guitarra indica* n. sp. (R.N. IV. 5).

Fig. 5*a*. Styli (tornostrongyla). × 290.
„ 5*b*. Placochela, front view. × 870.
„ 5*b'*. „ ¾ front view. × 870.
„ 5*b''*. „ side view. × 870.
„ 5 *b'''*–5*b''''*. „ developmental stages, side views. × 870.

Figs. 6 *a*–6 *e*. *Psammochela elegans* n. gen. et sp. (R.N. XVIII. 3).

Fig. 6*a*. Styli. × 290.
„ 6*b*. Larger isochela, front view. × 870.
„ 6*b'*. „ „ side view. × 870.
„ 6*c*. Small isochela, front view. × 870.
„ 6*c'*. „ „ side view. × 870.
„ 6*d*. Larger sigma, side view. × 870.
„ 6*d'*. „ „ back view. ×870.
„ 6*e*. Smaller sigmata. × 870.

Figs. 7*a*–7*b'*. *Echinodictyum gorgonioides* n. sp. (R.N. XXI.).

Fig. 7*a*. Tornotoxeote. × 380.
„ 7*b*, 7*b'*. Acanthostyli. × 380.

Figs. 8*a*–8*b*. *Bubaris radiata* n. sp. (R.N. III. 7*a*).

Figs. 8*a*–8*a'''*. Styli of various forms. × 90.
Fig. 8*b*. Strongyla of various forms. × 90.

Figs. 9*a*, 9*b*. *Polymastia gemmipara* n sp. (R.N. IV. 7).

Fig. 9*a*. Subtylostyle from skeleton column. × 110.
„ 9*b*. Small tylostyle. × 380.

PLATE II.

Figs. 10*a*–10*c*. *Tetilla dactyloidea* (Carter) (R.N. II. 2). Three specimens; one cut in half lengthwise to show exhalant canal-system. × 1½.

Fig. 11. *Reniera hornelli* n. sp. (R.N. IV. 4). ×1½.

„ 12. *Reniera fibroreticulata* n. sp. (R.N. II. 8). × 2.

„ 13. *Reniera semifibrosa* n. sp. (R.N. XXXIII. 1.). Nat. size.

„ 14*a*. *Halichondria reticulata* Baer (R.N. II. 6). Nat. size.

„ 14*b*. „ „ „ (R.N. II. 11). „

„ 15. *Siphonochalina minor* n. sp. (R.N. XXVI. 4). Nat. size.

„ 16. *Auletta lyrata* var. *glomerata* Dendy (R.N. III. 3). × 2.

„ 17. *Auletta elongata* var. *fruticosa* nov. (R.N. XXIII. 2). Nat. size.

PLATE III.

Fig. 18. *Ciocalypta dichotoma* n. sp. (R.N. IV. 21). × 2.

„ 19. *Esperella plumosa* (Carter) (R.N. XXXII. 2). Nat. size.

„ 20*a*. *Desmacidon minor* n. sp. (R.N. XX. 6 *a*). Flabellate specimen; surface without oscula. Nat. size.

„ 20*b*. *Desmacidon minor* n. sp. (R.N. XX. 6 *b*). Digitate specimen; osculum-bearing surface. Nat. size.

„ 21. *Guitarra indica* n. sp. (R.N. IV. 5). Several specimens attached to the branching tube of a polychæte worm (*Eunice*, sp.); the uppermost (*a*) showing oscula. Nat. size.

„ 22*a*. *Psammochela elegans* n. gen. et sp. (R.N. IV. 20). Specimen preserved in alcohol, with dermal membrane remaining. × 1½.

„ 22*b*. *Psammochela elegans* n. gen. et sp. (R.N. XVIII. 3). Specimen originally preserved in formalin; the dermal membrane has been removed by maceration. × 1½.

PLATE IV.

Fig. 23. *Echinodictyum gorgonioides* n. sp. (R.N. XXI. 1.). Nat. size.

„ 24*a*. *Bubaris radiata* n. sp. (R.N. III. 7 *a*). Upper surface. × 2.

„ 24*b*. „ „ „ Lower surface. × 2.

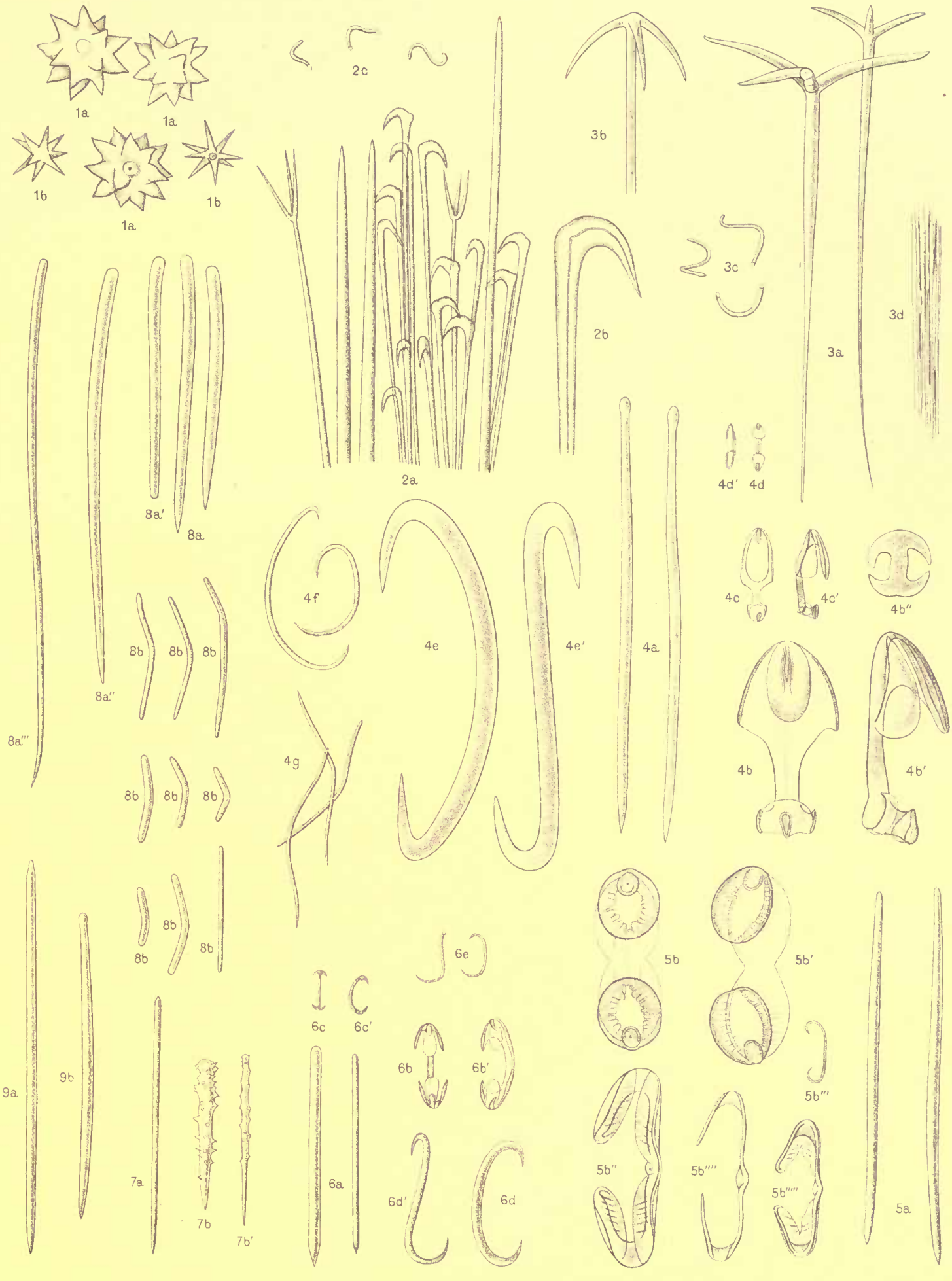
„ 25. *Spirastrella vagabunda* var. *tubulodigitata* Dendy (R.N. IV. 10). Nat. size.

„ 26*a*. *Polymastia gemmipara* n. sp. (R.N. IV. 7). Viewed from above. *b*. buds; *p*. pebble; *sp. c*. internal spicular column. × 3.

„ 26*b*. *Polymastia gemmipara* n. sp. (R.N. IV. 7). Viewed obliquely from below, showing interior. *ch*. coagulated masses of choanosomal tissue attached to inner surface of cortex. Other lettering as before. × 3.

„ 27. *Megalopastas retiaria* n. sp. (R.N. IV. 13). × 2.

(All the figures on Plates II–IV are reproduced from drawings by Mr. T. P. Collings, with the exception of Fig. 23, which is based on a photograph.)



Arthur Dendy del

NON-CALCAREOUS SPONGES.

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10a.

10b.

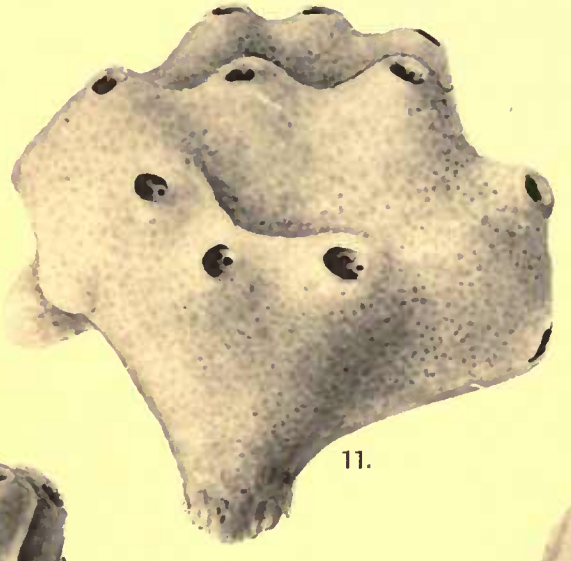
10c.

14a.

14b.

17.

16.



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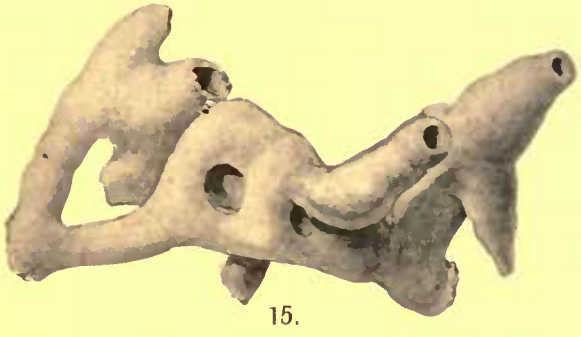


15.

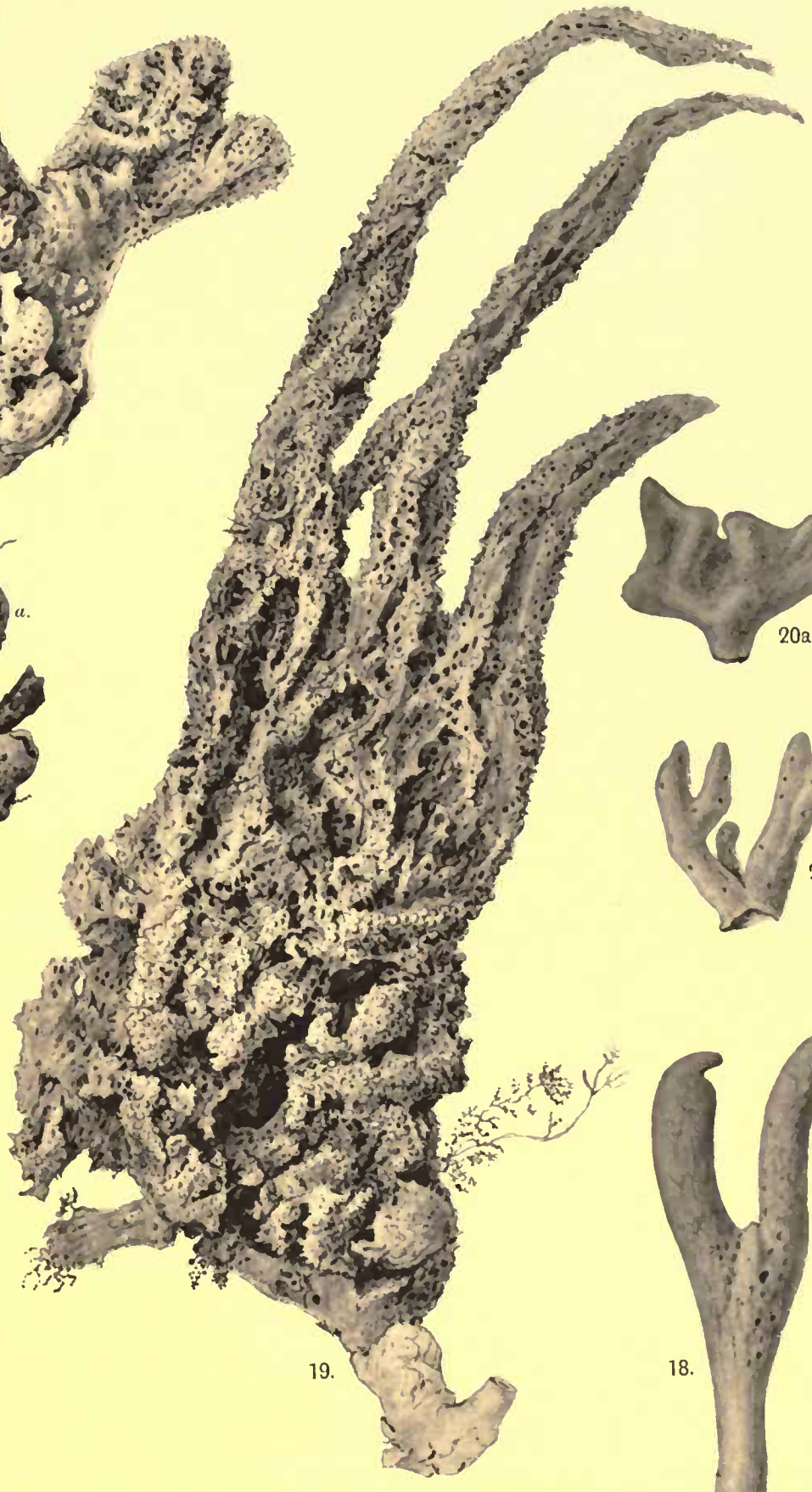
T. P. Collings.

NON-CALCAREOUS SPONGES.

22b.

a.

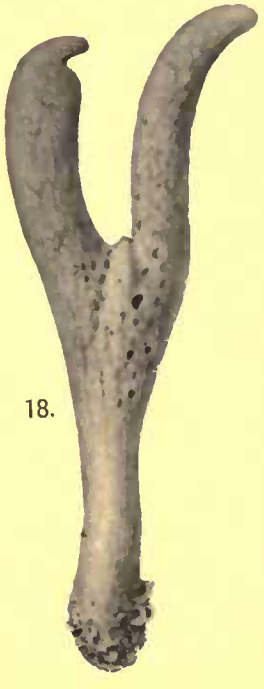
21.



19.

20a.

20b.



18.

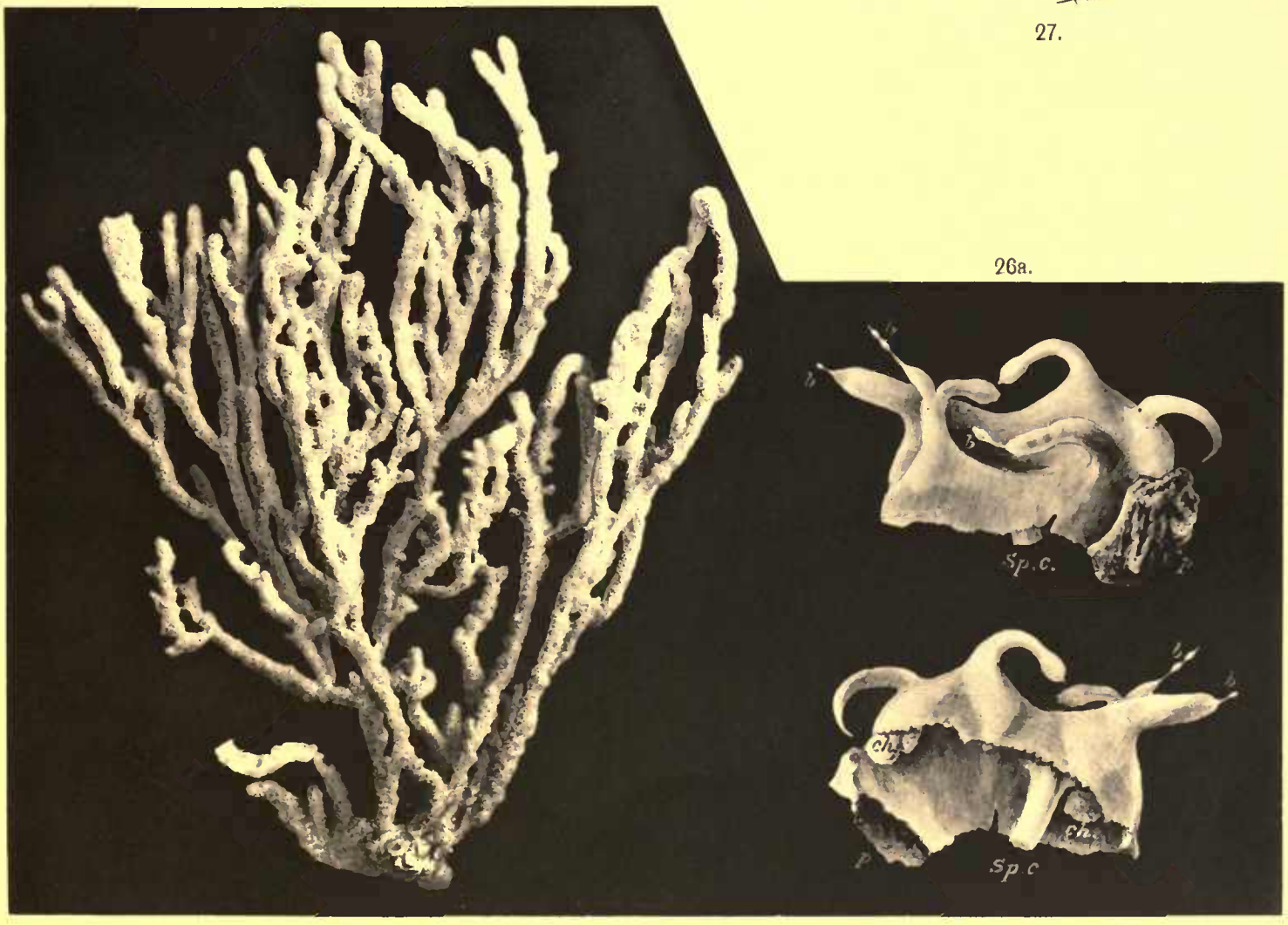
22a.

24a.

24b.

25.

27.



26a.

23

26b.