

# REPORT ON THE SHALLOW-WATER MARINE SPONGES IN THE COLLECTION OF THE INDIAN MUSEUM.

## PART I.

By M. BURTON, *M.Sc.*, Assistant Keeper, Department of Zoology, British Museum (Natural History), London.

and

H. SRINIVASA RAO, *M.A.*, *D.Sc.*, Assistant Superintendent, Zoological Survey of India, Calcutta.

(Plate XVIII.)

The present paper is one of a series dealing with the Sponges of the Indian Museum collected at various periods in different parts of the Bay of Bengal, the Arabian Sea and connected waters. The work on the deep-sea Sponges in the collection was commenced by Dendy<sup>1</sup> and completed by Burton.<sup>2</sup> Kumar<sup>3</sup> reported on some of the shallow-water Sponges collected by the Bengal Fisheries steamer "Golden Crown" and by Dr. S. W. Kemp at Kilakarai and Waltair on the Madras coast, but a great proportion of the collections of shallow-water Sponges from the coasts of India, Burma, Ceylon and the Andaman Islands had not been studied for several years. We have to thank Col. R. B. Seymour Sewell, Director of the Zoological Survey for having given us the opportunity to study the material.

The Sponge fauna of the Indian ocean, and its associated localities such as the Red sea, has been the subject of numerous memoirs in the past, the result of which is reflected in this present work in the comparatively few species it has been found necessary to describe as new. Even with such new species as it has been necessary to describe, it is not improbable that when a detailed revision of the general systematics of the group has been effected, many of these will be found to be synonymous with species already known, but which are obscured by reason of their inclusion in wrong genera.

Although this report contributes little in the way of descriptions of new species, the work done in connection with it has been of interest in affording an opportunity of assessing the real value of many of the better known species.

The present collection includes 82 species belonging to 50 genera. Of these, 12 species and 3 genera are new to science.

The following is a list of the species :—

### Order Hexactinellida

*Euplectella aspergillum* Owen.

*Aphrocallistes beatrix* Gray.

*Monorrhaphis* sp.

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<sup>1</sup> Dendy, *Rec. Ind. Mus.*, XXVIII, pp. 225-248, (1926).

<sup>2</sup> Burton, *Rec. Ind. Mus.*, XXX, pp. 109-135, (1928).

<sup>3</sup> Kumar, *Rec. Ind. Mus.*, XXVII, pp. 211-229, (1925).

## Order Calcareo

- Leucosolenia coriacea* (Montagu).  
*Leucosolenia* sp.  
*Pericharax heteroraphis* Poléjaeff.  
*Pericharax canaliculata*, sp. nov.  
*Sycon grantioides* Dendy.  
*Ute syconoides* (Carter).

## Order Lithistida

- Discodermia papillata* Carter.  
*Discodermia japonica* Döderlein.  
*Discodermia sceptrifera* Carter.  
*Theonella swinhoei* Gray.  
*Theonella pulchrifolia* Dendy.  
*Azorica pfeifferae* Carter.  
*Seliscotho chonelleides* Döderlein.

## Order Tetraxonida

## Sub-order Homosclerophora

- Dercitus plicatus* var. *simplex* (Carter).

## Sub-order Streptastrosclerophora

- Poecillastra tenuilaminaris* Sollas.

## Sub-order Astrosclerophora

## Family Stellettidae

- Stelletta validissima* Thiele.  
*Stelletta purpurea* Ridley.  
*Stelletta orientalis* Thiele.  
*Stelletta clavosa* Ridley.  
*Stelletta cavernosa* (Dendy).  
*Stelletta aruensis* Hentschel.  
*Stelletta* sp.  
*Cryptotethya agglutinans* Dendy.  
*Aurora globostellata* (Carter).  
*Aurora rowi* Dendy.  
*Ecionemia carteri* Dendy.  
*Amphius sollasi*, sp. nov.

## Family Erylidae

- Erylus lendelfeldi* Sollas.  
*Erylus geodioides*, sp. nov.

## Family Geodiidae

- Geodia inconspicua* (Bowerbank).  
*Geodia perarmata* Bowerbank.

## Family Chondrosiidae

- Chondrosia reniformis* Nardo.  
*Chondrilla sacciformis* Carter.  
*Chondrilla australiensis* Carter.  
*Chondrilla australiensis* var. *mixta* Schulze.

## Sub-order Sigmatosclerophora

## Family Tetillidae

- Paratetilla bacca* (Selenka).
- Tetilla cranium* (Müller).
- Tetilla dactyloidea* (Carter).
- Cinachyra arabica* (Carter).
- Cinachyra australiensis* (Carter).
- Cinachyra simplex* (Sollas).

## Family Desmacidonidae

## Sub-family Mycaleae

- Biemna fortis* (Topsent).
- Biemna tubulata* (Dendy).
- Mycale indica* (Carter).
- Mycale parishii* (Bowerbank).
- Mycale monanchorata*, sp. nov.

## Sub-family Myxillae

- Lissodendoryx similis* Thiele.
- Lissodendoryx ternatensis* (Thiele).
- Kirkpatrickia spiculophila*, sp. nov.
- Ectyobatzella enigmatica*, sp. nov.
- Psammochela elegans* Dendy.

## Sub-family Clathriae

- Clathria lendenfeldi* Ridley and Dendy.
- Clathria indica* Dendy.
- Tenacia frondifera* (Bowerbank).
- Tenacia robusta* (Dendy).
- Tenacia procera* (Ridley).
- Tenacia micropunctata*, sp. nov.
- Isociona tuberosa* (Hentschel).
- Raspailia viminalis* Schmidt.
- Raspailia tenuis* Ridley and Dendy.
- Protoraspailia cactoides*, Gen. et. sp. nov.
- Acanthostylotella cornuta* (Topsent).
- Microciona prolifera* Verrill.
- Microciona atosanguinea* Bowerbank.
- Aulenella foraminifera* Gen. et. sp. nov.
- Hemectyon thurstoni* (Dendy).
- Aulospongus tubulatus* (Bowerbank).
- Echinodictyum nervosum* (Lamarck) Ridley.
- Echinodictyum asperum* Ridley and Dendy.
- Echinodictyum gorgonoides* Dendy.
- Dendrocia antyaja*, sp. nov.

## Sub-family Hymedesmieae

- Hymedesmia dendyi* Burton.
- Hymedesmia crelloides*, sp. nov.
- Hymedesmia parvispicula*, sp. nov.

## Sub-family Acarneae

*Acarneus ternatus* Ridley.*Iotrochota baculifera* Ridley.

## Sub-family Tedaniae

*Tedania nigrescens* (Schmidt).*Histoderma fucoides* Topsent.

## Sub-family Plocamiae

*Plocamia manaarensis* (Carter).

## Sub-family Cyamonae

*Cyamon vickersii* (Bowerbank).

## Order HEXACTINELLIDA.

**Euplectella aspergillum** Owen.1887. *Euplectella aspergillum*, Schulze, *Challenger Rep. Hexactinellida*, XXI, p. 64, pls. i-iv.

The sole representative of this species is a fragment which appears to belong to this species.

*Locality*.—N. Andaman Is.

**Aphrocallistes beatrix** Gray.1904. *Aphrocallistes beatrix*, Schulze, *Wiss. Ergebn. Deutsch. Tiefsee Exped. Valdivia*, IV, p. 39, pls. xi-xiii; xiv, figs. 1-6.1926. *Aphrocallistes beatrix*, Dendy and Burton, *Rec. Ind. Mus.*, XXVIII, p. 226.

The species is represented by a fragment only.

*Locality*.—13 miles S. W North Sentinel I., Andamans.

**Monorrhaphis** sp.

A small portion (93 mm. long and  $\times 0.5$ mm. thick) of a single large spicule, around which *Kirkpatrickia spiculophila* sp. nov. has grown may represent a species of *Monorrhaphis*.

*Locality*.—Port Blair, Andaman Is., (G. H. Booley, 3rd April 1890).

## Order CALCAREA.

Genus **Leucosolenia** Bowerbank.1862. *Leucosolenia*, Bowerbank, *Phil. Trans. Roy. Soc. Victoria*, p. 1094, pl. LXXII, fig. 2.1896. *Clathrina*, Minchin, *Ann. Mag. Nat. Hist.*, Ser. 6, XVIII, p. 358.1913. *Leucosolenia*, Dendy and Row, *Proc. Zool. Soc. London*, p. 779.

The genus *Clathrina* has been generally abandoned by systematists of recent years. This seems to be the wisest course for, although, Minchin gave excellent reasons for the retention of the genus, the arguments of Dendy and Row in favour of regarding it as a synonym of *Leucosolenia* appear at the moment, unanswerable.

**Leucosolenia coriacea** (Montagu).

1818. *Spongia coriacea*, Montagu, *Mem. Wernerian Nat. Hist. Soc.*, II, p. 116.  
 1842. *Grantia coriacea*, Johnston, *Hist. Brit. Sponges and Lithophytes*, p. 183, pl. xxi, fig. 9.  
 1866. *Leucosolenia coriacea*, Bowerbank, *Monogr. Brit. Sponges*, II, p. 34.  
 1867. *Leucosolenia coriacea*, Gray, *Proc. Zool. Soc. London*, p. 556.  
 1871. *Clathrina sulphurea*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 4, VII, p. 278.  
 1872. *Ascetta coriacea*, Hæckel, *Syst. der Kalkschwamme*, p. 24, pl. iii, pl. v, fig. 2.  
 1874. *Leucosolenia coriacea*, Bowerbank, *Monogr. Brit. Sponges.*, III, p. 8, pl. iii, figs. 11-14.  
 1881. *Clathrina coriacea*, Ridley, *Proc. Zool. Soc. London*, p. 132.  
 1882. *Ascetta coriacea*, Bowerbank (Norman), *Monogr. Brit. Sponges*, IV, p. 225.  
 1885. *Ascetta coriacea*, Fristedt, *Kongl. Svens. Vet. Akad. Handl.*, XXI, p. 8.  
 1886. *Ascetta coriacea*, Higgin, *Rep. Liverpool Mar. Biol. Comm.*, No. 1, p. 90, in *Proc. Lit. Phil. Soc. Liverpool*, XL, Append.  
 1887. *Ascetta coriacea*, Fristedt., *Vega Exped. Vetenskap. Arb.*, IV, p. 405, pl. 22, figs. 1-2.  
 1887. *Leucosolenia coriacea*, Priest, *Journ. Quekett Micr. Club*, III, p. 8.  
 1890. *Ascetta coriacea*, Hanitsch, *Rep. Liverpool Mar. Biol. Comm.*, No. 3, p. 232 in *Trans. Biol. Soc. Liverpool*, IV.  
 1891. *Ascetta coriacea*, Hanitsch, *Trans. Biol. Soc. Liverpool*, V, Append. p. 213.  
 1891. *Leucosolenia coriacea*, Grentzenberg, *Inaugural Dissert, Erlang. Phil. Fakult. Zool. Inst. Univ. Kiel.*, p. 40.  
 1891. *Leucosolenia coriacea*, Topsent, *Arch. Zool. Exp. Generale*, IX, p. 530.  
 1892. *Leucosolenia coriacea*, Topsent, *Res. Campag. Sci.*, II, p. 21.  
 1898. *Leucosolenia coriacea*, Breitfuss, *Ann. Mus. Zool. Acad. Imp. Sci. St. Petersbourg*, pp. 9-20.  
 1898. *Leucosolenia coriacea*, Breitfuss, *Mem. Acad. Imp. Sci. St. Petersbourg*, VI, p. 12.  
 1900. *Ascetta coriacea*, Arnesen, *Bergens Mus. Aarbog*, No. 5, p. 10.  
 1905. *Leucosolenia (Clathrina) coriacea* var. *ceylonensis*, Dendy, *Rep. Ceylon Pearl Oyster Fisheries*, Suppl. Rep. No. XVIII, p. 226, pl. xiii, fig. 8.  
 1912. *Clathrina coriacea*, Stephens, *Proc. Roy. Irish Acad.*, XXXI, p. 8.  
 1917. *Clathrina coriacea*, Stephens, *ibid.*, XXXIV, p. 2.  
 1929. *Leucosolenia coriacea*, Burton, *Nat. Hist. Rep. Brit. Antarct. "Terra Nova" Exped. 1910, Zoology*, VI, p. 402.

The above synonymy list, though containing only the principal references, emphasises the broad distribution of the species. It is probable, moreover, that many closely related species, at present regarded as distinct, must eventually be included under the same name.

The species is represented in the collection by a small specimen enclosing a piece of a Gorgonid. The anastomosing tubes and the interstices between are slightly broader than usual.

*Locality*.—(Marine Survey Sta. 640)—Bay between Huludu and Heratera Islands, Maldives (Shore-collecting on reef-flat, 6th March 1923.)

**Leucosolenia** sp.

On the surface of *Amphius sollasi* (q.v.) are some minute growths of a *Leucosolenia* in the form of a few irregularly branching and anastomosing tubes. The largest is 1 mm. across and it is fairly clear that they represent the immediate post-larval stages of a species closely allied to *L. coriacea*. The spicules are triradiates and quadriradiates with rays about 0.06 mm. long, and oxea measuring 0.15 × 0.003 mm.

*Locality*.—'Ain Musa, Gulf of Suez. (R. B. S. Sewell, 8th January 1917).

**Pericharax heteroraphis** Poléjaeff.

1883. *Pericharax carteri* var. *heteroraphis*, Polejaeff, *Challenger Rep. Calcareo*, VIII, p. 66, pl. ii, fig. 5, pl. vii, fig. 8.

1913. *Pericharax heteroraphis*, Dendy, *Trans. Linn. Soc. London*, XVI, p. 13, pl. i, fig. 8; pl. 5, figs. 1, 2.

An incomplete and somewhat damaged specimen, and not unlike the figure in the Challenger Report (pl. ii, fig. 5) is referred to this species.

*Locality*.—Off Rutland I., Andamans ("Investigator," 35 fathoms).

**Pericharax canaliculata** sp. nov.

(Pl. XVIII, Fig. 1.)

*Diagnosis*.—Sponge small (probably young), more or less oval, with a shallow depression on one side; surface, to naked eye, even, minutely and irregularly tuberculate; without specialised vent, exhalant openings probably represented by minute pits in the shallow depression already referred to; colour, in spirit, yellow; no central cloaca, but body traversed by a few irregular, longitudinal canals; skeleton composed of small triradiates, equi-angular, or occasionally inequi-angular, closely packed to form an irregular reticulation, with a few large triradiates scattered therein; rays of smaller radiates measuring  $0.15 \times 0.012$  mm., those of larger radiates about three times as large.

*Holotype*.—P.  $\frac{782}{1}$  Zool. Surv. Ind. (*Ind. Mus.*).

*Remarks*.—The species differs from the only other species of the genus, *P. heterorhaphis* and *P. peziza*, in external form almost entirely. The compact structure and the conspicuous canals running through the body are also features which serve to characterise the species, but it is questionable how far these may be of taxonomic importance.

*Locality*.—2 miles N. W. of Torres Straits, Mergui (40 fathoms. 5th March, 1886).

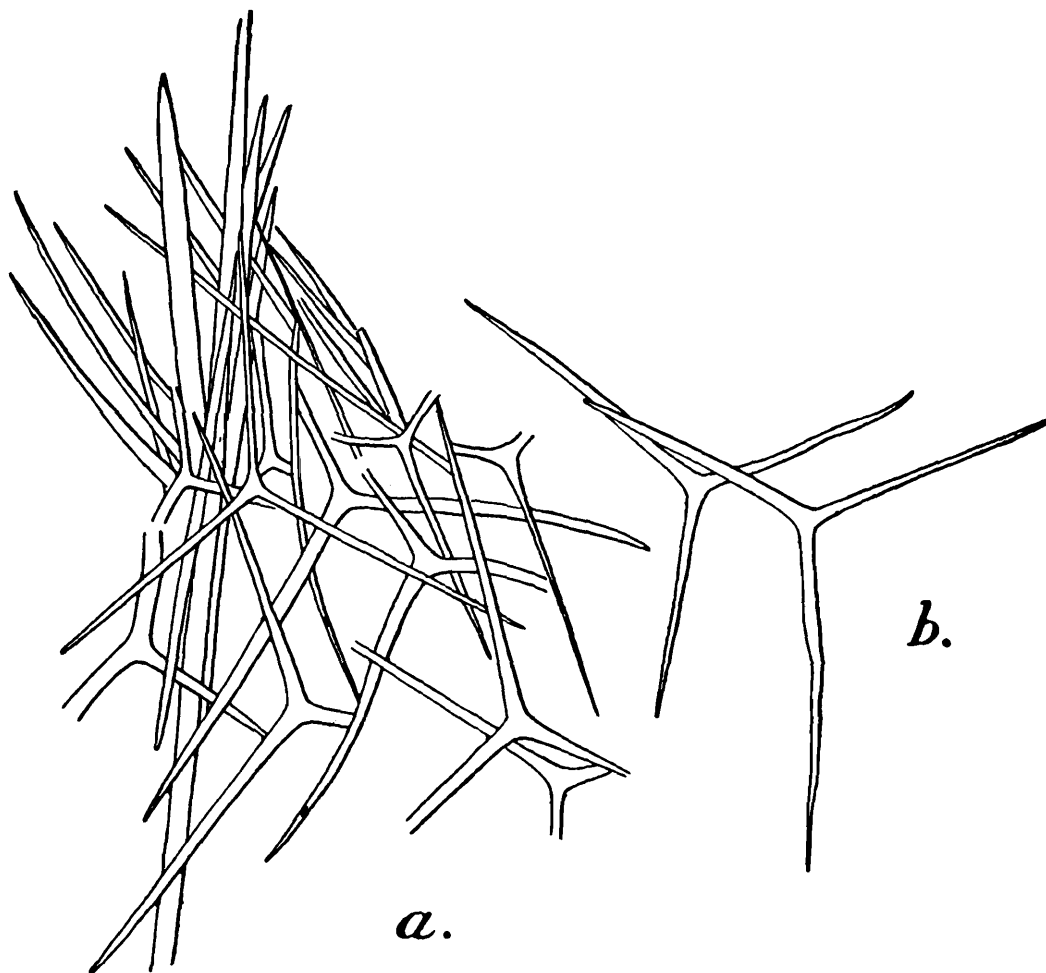
**Sycon grantioides** Dendy.

(Pl. XVIII, Fig. 2.)

1915. *Sycon grantioides*, Dendy, *Rep. Govt. Baroda Mar. Zool. Okhamandal, Kattiawar*, II, p. 79, pl. i, fig. 1.

The specimen undoubtedly belongs to *Sycon grantioides*. The holotype of this species was much macerated, but as our specimen is more or less complete and contains several features not mentioned in the original description we give a photograph of it. The measurements of the spicules agree closely but the oxea are fewer in number. The outer ends of the chambers bear tufts formed by the basal rays of the triradiates (fig. 1a). The gastral surface bears a similar layer of triradiates whose rays project into the central cloaca (fig. 1b). The dimensions of the triradiates of both the gastral surface and of the outer ends

of the chambers are:—basal rays  $0.15 \times 0.006$  mm., and apical rays  $0.195 \times 0.006$  mm.



TEXT-FIG. 1.—*Sycon grantioides*. a. skeleton of one of the radial chambers showing the large oxea and the triradiates; b. gastral triradiates (both  $\times 146$ ).

The sponge itself is 9 mm. high, with conspicuously hirsute surface.  
*Locality*.—Pedro shoal, Ceylon (“Investigator”).

#### ***Ute syconoides* (Carter).**

1886. *Aphroceras syconoides*, Carter, *Ann. Mag. Nat. Hist.* Ser. 5, XVIII, p. 135.

1892. *Ute syconoides*, Dendy, *Proc. Roy. Soc. Victoria*, (n. s.) V, p. 92.

Three small individuals attached to calcareous nodules from the Pearl Oyster banks, off Tuticorin (March 1926) are the only representatives of this species, which is little known in Indian waters.

#### Order LITHISTIDA.

#### ***Discodermia papillata* Carter.**

1880. *Discodermia papillata*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, VI, p. 146, pl. viii, fig. 48.

1888. *Discodermia papillata*, Sollas, *Challenger Rep. Tetractinellida*, XXV, p. 330.

1903. *Discodermia papillata*, Lendenfeld, *Das Tierreich*, XIX, p. 131.

The specimen from the Andamans (“Investigator” Coll.) here regarded as identical with Carter’s species agrees very closely with the published description of the holotype of *D. papillata* in spiculation.

Its external form is irregularly massive. In addition to this specimen there are two others in the present collection which agree with the Andaman specimen in external form. Slight differences may be seen in their spiculation, however, and these differences are sufficient to justify our identifying them with *Discodermia laevidiscus* and *D. aspera* respectively. At the same time the strong resemblance all the three species bear to one another makes it probable that the two last named species are synonymous with *D. papillata*. We refrain, however, from definitely committing ourselves to this synonymy until the holotypes of all three have been re-examined.

*D. sinuosa* Carter also appears to be synonymous with *D. papillata*.

Sollas (*l. c.* p. 327) describes the microscleres of *D. aspera* as microxea (0.058 mm. long) and microstrongyles (0.016 mm. long). Carter does not mention the former, nor is it present in our specimen, and it is difficult to understand how Sollas should have been led to make the statement.

*Locality*.—(M. S. Sta. 384)—off C. Negrais, Burma (22nd February 1909). Andamans  $\frac{(9059)}{6}$ .

### **Discodermia japonica** Döderlein.

1884. *Discodermia japonica*, Döderlein, *Zeit. Wiss. Zool.*, XL, p. 62, pls. v-vii.

1888. *Discodermia japonica*, Sollas, *Challenger Rep. Tetractinellida*, XXV, p. 329.

1903. *Discodermia japonica*, Lendenfeld, *Das Tierreich*, XIX, p. 129.

The history of this species may be described as a series of mistakes. Döderlein, in his original description, diagnoses the species almost entirely on external form and treats later of the skeleton in a generalized way, together with the skeletons of two other species. Consequently, it is almost impossible to say to which species his illustrations belong. Sollas was able to elucidate many of the obscurities caused by Döderlein's methods, but there is no proof that the diagnosis Sollas built up is correct. Later, Lendenfeld speaks of the presence of smooth microxea although Sollas has attributed spiny microxea to the species. Under the circumstances the only safe way of dealing with the species is to re-examine the holotype. Unfortunately this cannot be done at the moment. There is, however, a specimen in this collection bearing so strong a resemblance in external form to the sponge figured by Döderlein (pl. v, fig. 1) and possessing a skeleton so like that described for the species by Sollas (*l. c.*) that there is no alternative but to regard it as possibly identical with Döderlein's species. At all events, it is so closely related as to render it quite unnecessary to give it a new name.

The desmas of this specimen are almost identical with those figured by Döderlein (on pl. vi, fig. 7; pl. vii, fig. 38), and the phyllotriaenes with those figured (on pl. vi, figs. 20-24). No discotriaenes were seen. The microscleres are minutely-roughened microxea  $0.06 \times 0.003$  mm. and roughened microrhabds 0.008 mm. long.

The agreement between the present specimen and the holotype of *D. japonica* is extremely close, but the identification is based on Döderlein's figure of the external form and Sollas's description of the skeleton.

*Locality.*—(M. S. Sta. 384) off C. Negrais, Burma (22nd February 1909).

One or two developing desmas are found in a preparation from the specimen from Mar. Surv. Sta. 384. They lie in the position occupied by the axial lines of a disc that they are apt to be overlooked. If they actually represent axial lines they should indeed be very curious.

### ***Discodermia sceptrellifera* Carter.**

1881. *Discodermia sceptrellifera*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, VII, p. 372, pl. xviii, fig. 2.

The species is represented by two irregularly massive sponges growing in close association with shells of *Vermetus* sp. The spiculation agrees closely with that described by Carter except that the "circular form of the disk" (*l. c.* fig. 2*a*) whose existence was "inferred" does not appear to be present.

*Locality.*—Ganjam Coast, Madras Precy. 20-30 fms. ("Golden Crown" Coll.) April 1909.

### ***Theonella swinhoei* Gray.**

1868. *Theonella swinhoei*, Gray, *Proc. Zool. Soc. London*, p. 565.

1873. *Theonella swinhoei*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 4, XII, p. 437.

1878. *Theonella swinhoei*, Zittel, *Abh. K. Baier. Akad. Wiss.*, I., pp. 103, 151, pl. i, fig. 9.

1888. *Theonella swinhoei*, Sollas, *op. cit.* p. 284, pls. xxix, xxx.

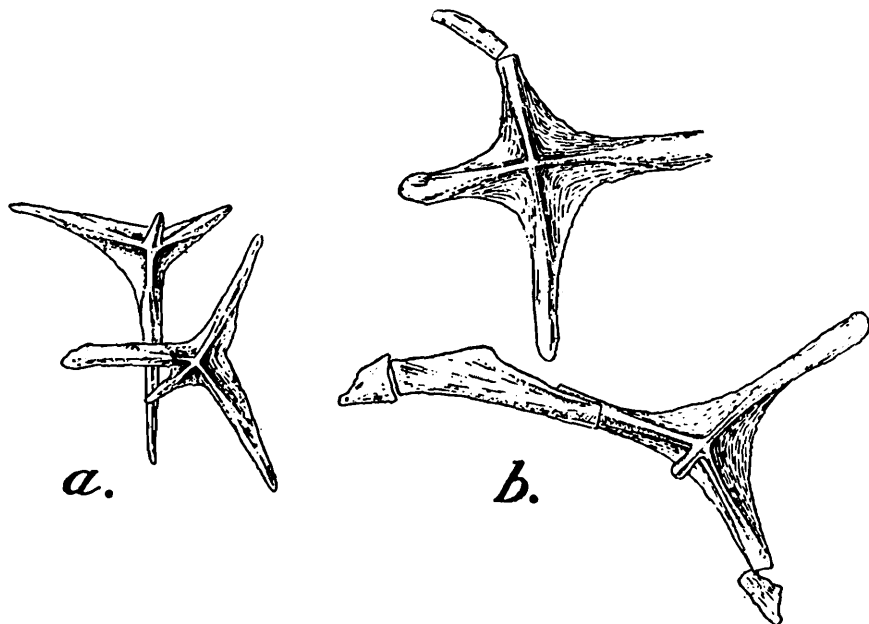
1897. *Theonella swinhoei*, Topsent, *Rev. Suisse Zool.*, IV, p. 431.

1899. *Theonella swinhoei*, Thiele, *Zoologica*, XXIV, p. 6.

1900. *Theonella swinhoei*, Thiele, *Abh. Senckenb. Naturf. Ges.*, XXV, p. 52, pl. iii, figs. 3.

1903. *Theonella swinhoei* Lendenfeld *op. cit.*, p. 126.

An interesting feature of this species is the unusual appearance of the developing desmas (fig. 2). The silica, instead of being deposited



TEXT-FIG. 2.—*Theonella swinhoei*. *a.* developing desmas; *b.* slightly abnormal form of developing desmas (both  $\times 146$ ).

uniformly, in regular concentric layers, around the axial canals appears to be deposited in irregular, granular masses.

*Localities*.—(M. S. Sta. 631) Nankauri Harbour, Nicobars (Dec. 19, 1922); Krusadai I., Gulf of Manaar, (B. N. C. & H. S. R., Feb., 1925).

### **Theonella pulchrifolia** Dendy.

1921. *Theonella pulchrifolia*, Dendy, *op. cit.*, p. 5, pl. ix, fig. 1.

The single specimen, agreeing very closely with the holotype in spiculation, is a cup-shaped sponge, 50 mm. high and 70 mm. across the mouth of the cup. Evenly distributed over the inner surface of the cup are a number of incipiently-papillate oscules, each papilla about 0.05 mm. high and 1 mm. in diameter. The colour, in spirit, is a light brown on the outer and purplish brown on the inner surface.

*Locality*.—(M. S. Sta. 535) Mergui Archipelago (17th April 1913).

### **Azorica pfeifferae** Carter.

1928. *Azorica pfeifferae*, Burton, *Rec. Ind. Mus.*, XXX, p. 112.

A large typical specimen of this well known species is present.

*Locality*.—(M. S. Sta. 535) Mergui Archipelago, May 1913.

There are several specimens of Lithistida whose skeletons show signs of considerable maceration. Although the external form is well-preserved the skeleton contains only desmas, the other spicules having been lost. This is a common feature of collections of Lithistida, the interlocking of the desmas having served to preserve the form of the sponge, but no more. We have purposely refrained from attempting a description of these incomplete skeletons, and desire here to emphasise the desirability of such action. In the past, new species have been founded on such incomplete forms, an action calculated to lead to confusion and involve considerable loss of time to those endeavouring, subsequently, to place the species on a sound basis. Such a species is *Theonella annulata* Lendenfeld (1906). Others are *Corallistes aculeata*, *C. verrucosa* and *C. elegantissima* Carter (1880) of which the only information we possess is the form of the surface desmas. From this it is obvious that all the three species are synonymous, but apart from that they are quite unrecognisable.

### **Seliscothon chonelleides** Döderlein.

1883. *Seliscothon chonelleides*, Döderlein, *Zeit. Wiss. Zool.*, XI, p. 66, pl. v, fig. 8, pl. vii, fig. 44-49.

1888. *Azorica chonelleides*, Sollas, *op. cit.* p. 349.

1903. *Leiodermatium chonelleides*, Lendenfeld, *Das Tierreich*, XIX, p. 147.

The species ranges from ear-shaped to flabellate or sub-infundibular, the smallest specimen present being slightly smaller than the holotype, and very like it in appearance, the largest 240 mm. high and the same across.

The desmas are monocrepid with shaft smooth, or bearing a few tuberculations, but markedly tuberculate at the extremities. The appearance of the skeleton, as seen in a cross section of the wall of the sponge is so striking that provisionally we propose to retain the genus *Seliscothon*. The interlocking skeleton of desmas is traversed by numerous radial bundles of oxea which pierce the dermis and project beyond.

The arrangement of these bundles recalls so strongly the radial bundles of the Stellettidae or Tetillidae that an instinctive search is made for the heads of triaenes projecting at the surface. In every case, however, the projecting ends of the spicules were broken. Here and there are bundles of fine hair-like spicules, recalling the bundles of trichotriaenes occurring occasionally, in addition to the radial bundles, in the Tetillidae. Again no cladomes were seen, perhaps because the ends of the spicules were, in every case, broken. Altogether, the appearance of the skeleton of this species, apart from the desmas, is so strongly reminiscent of that of a *Tetilla* that there is ample justification for suggesting that *Seliscothon* finds its closest allies in the Tetillidae. (Cf. Burton 1929, p. 4).

*Locality.*—(M. S. Sta. 549) 12° 48' N. 98° 16' E. (21st October 1913).

#### Order TETRAXONIDA.

#### Sub-order HOMOSCLEROPHORA.

#### Genus *Dercitus* Gray.

1867. *Dercitus*, Gray, *Proc. Zool. Soc. London*, p. 542.

1874. *Battersbyia*, Bowerbank, *Mon. Brit. Spong.*, III, p. 347.

1888. *Calcabrina*, Sollas, *op. cit.*, p. 280.

1888. *Stoeba*, Sollas, *op. cit.*, p. 102.

According to Dendy (1905, p. 70) the distinguishing feature between *Dercitus* and *Stoeba* is the presence of toxae in the former and their absence in the latter. Annandale (1915, *Rec. Ind. Mus.*, XI, p. 458) has shown *Stoeba simplex* to be a variety of *S. plicata* (Schmidt) and since the European forms of the latter are so very like *Dercitus bucklandi* (Bow.), the genotype of *Dercitus*, in all respects but the absence of toxae it seems hardly necessary to maintain the two genera on so slender a difference. Dendy's *Stoeba extensa* is probably a distinct variety of *Dercitus plicatus*, as the microxea show.

#### *Dercitus plicatus* var. *simplex* (Carter).

1915. *Stoeba plicata* var. *simplex*, Annandale, *Rec. Ind. Mus.*, XI, p. 458.

Represented by a single specimen from the Invisible Bank, Andaman Seas. In external form and colour it agrees more nearly with the description of Dendy's var. *extensa*. The microxea are 0.018-0.022 mm. long, 0.003-0.007 mm. broad. The brown cells are relatively few and confined to the ectosome.

#### Sub-order STREPTASTROSCLEROPHORA.

#### *Poecillastra tenuilaminaris* Sollas.

1926. *Poecillastra tenuilaminaris*, Dendy and Burton, *Rec. Ind. Mus.*, xxviii, p. 238.

Several examples are present of varying thickness and extent collected at various places in the Indian Ocean.

*Locality.*—Mergui Archipelago (65 fms., April 1913); off Cape Negrais, Burma (40-49 fms., Feb. and Nov. 1909); Table I, Cocos group, Andamans (10 fms., Dec. 1888); W Andamans. (Mar. Surv. Carpenter Coll.)

## Sub-order ASTROSCLEROPHORA.

## Family STELLETTIDAE.

Genus **Stelletta** Schmidt.

1862. *Stelletta*, Schmidt, *Spongien Adriat. Meer.*, p. 64, pl. iv.

*Genotype*.—*S. grubii* Schmidt.

Although Vosmaer (1887, Bronn's Klassen und Ordnung der Spongien, p. 319) at first accepted as his "Beispiel" of *Stelletta* the species *S. dorsigera*, he agreed later with Marenzeller's identification of *S. dorsigera* with *S. grubii* and *S. boglicii* (Vosmaer in *Tyds. Nederl. Dier. Vereen.* (2) III, p. 36, 1890). *S. grubii*, the first-named species of Schmidt described two years earlier than *S. dorsigera*, is, therefore, here accepted as the genotype.

**Stelletta validissima** Thiele.

1898. *Stelletta validissima*, Thiele, *Zoologica*, XXIV, p. 13, pl. i, fig. 5, pl. vii, fig. 1.

1926. *Stelletta trichotriaena*, Dendy and Burton, *Rec. Ind. Mus.*, XXVIII, p. 241.

The probable identity of their species with *S. validissima* was suggested by Dendy and Burton. The present specimens, also from the Indian Seas, agree in all respects with the holotype of Thiele's species, and show quite clearly the identity of *S. trichotriaena* therewith.

*Locality*.—Invisible Bank, Andaman Islands.

**Stelletta purpurea** Ridley.

1884. *Stelletta purpurea*, Ridley, *Rep. Zool. Coll. Voy. H. M. S. 'Alert'*, p. 473, pl. xl, fig. e, pl. xliii, figs. j-g.

1926. *Stelletta purpurea*, Burton, *Ann. Mag. Nat. Hist.*, Ser. 9, XVIII, p. 44.

The number of specimens in the collection assigned to this species is approximately 60. Of these, the majority have the typical form, small, spherical, with centrally placed circular vent at the apex. The spiculation of these specimens, too, calls for little comment. There are, on the other hand, several specimens worthy of more detailed consideration. Some others are subspherical or even irregularly massive, often with the vent excentrically placed. The colour varies, often in a single lot of sponges from the same station from yellow to a purplish brown.

The lot from (M. S. Sta. 622) Camorta I., Nicobars, comprises some 6 sponges, of various sizes, from 5 to 15 mm. in diameter, characterized by a greenish-yellow tinge marking the contour of the surface reticulation and forming radiating streaks around the vents. The vents are velate.

In the examples from Kilakarai, Ramnad Dt., the microscleres vary from strongylasters to oxyasters, tylasters being only occasionally present. Otherwise, the specimens are quite typical for the species.

The specimen from (M. S. Sta. 61) E. N. E. of Prepara I., Bay of Bengal, has the typical external form and megascleres, but the microscleres comprise strongylasters in addition to the tylasters. The strongylasters usually have 8 rays, which may be reduced to 4, 3, 2, or even 1,

and measure, on an average, 0.024 mm. in diameter. The one-rayed forms of the strongylasters are club-shaped, and are composed of a single ray bearing at one end the vestige of a centrum. The rays of the larger of these strongylasters are roughened.

It is a matter for debate whether the foregoing specimen belongs to *S. purpurea* or not, or whether the unusual nature of the microscleres may not furnish evidence for including in that species other closely-allied forms, whose microscleres are not necessarily tylasters. The next two specimens to be discussed provide support for the second alternative.

Those from the Tuticōrin Pearl Oyster banks are large, irregularly-massive sponges, each bearing a single apical oscule. They have the external form of *S. pachyderma*, and the spiculation of *S. purpurea*. Had they strongylasters instead of tylasters they would have been referred without hesitation to *S. pachyderma*. As it is, the fact that they combine the characteristics of *S. pachyderma* and *S. purpurea* makes it probable that these two species should be regarded as synonymous.

One of the examples from the Peal Oyster bank, Tuticorin, is of interest in that the outer layers of the ectosome are crowded with embryos. These are arranged in a single layer just beneath the surface. They appear to be of the asexual type.

### **Stelletta orientalis** Thiele.

1898. *Stelletta orientalis*, Thiele, *Zoologica*, XXIV, p. 14, pl. 1, fig. 6; pl. 7, fig. 2 a-f.

An irregularly spherical individual 30-35 mm. in diameter is present in the collection. It has on its surface scattered patches of thick pilosity.

*Locality*.—Andamans (shallow water).

The species was first recorded from Japanese waters; its distribution is not well known.

### **Stelletta clavosa** Ridley.

1884. *Stelletta clavosa*, Ridley, *Rep. Zool. Voy. "Alert,"* p. 474, pl. xliii, figs. i=i".

1888. *Myriastrra clavosa*, Sollas, vars. *quadrata*, *toxo donta*, Sollas, *Rep. Chall. Zool.*, XXV, pp. 116-119, pl. xii, figs. 34-43; pl. xiv, figs. 29-36.

The species is well represented in the collection by specimens from Tana Mura Besar, Singapore I. (Annandale, 22nd December 1915), in small pools between tide marks, Kabusa I., Mergui Archipelago, and the Andamans (surf-line). They are light to dark brown in colour.

### **Stelletta cavernosa** (Dendy).

1916. *Myriastrra cavernosa*, Dendy, *Trans. Linn. Soc. London*, XVII, p. 236, pl. 44, figs. 3, 3a; pl. 46, fig. 1.

A fragment of a sponge belonging to this species, with flat plate-like nullipores attached to its surface, is present in the collection. It agrees closely with the holotype in spiculation.

*Locality*.—Nicobar Is. (J. Woodmason).

**Stelletta aruensis** Hentschel.

1912. *Stelletta aruensis*, Hentschel, *Abhandl. d. Senckenb. Naturf. Gesellsch.*, XXXIV, p. 310, pl. xiii, fig. 3; pl. xvii, fig. 4.

This species is represented in the collection by a very large specimen dredged by the "Golden Crown" in comparatively shallow waters (24-30 fathoms) off the coast of Ganjam, Madras Presidency (Bay of Bengal) in March 1909.

It is much larger than the holotype from the Arafura sea, being subspherical, 160 mm. long, 130 mm. broad, and 100 mm. high. The processes on the surface are not evenly distributed, but confined to a broad ring-shaped area along the circumference. They are flattened, often branched or frayed at the extremity, and are 20-30 mm. long.

*Locality*.—Ganjam Coast, Madras Presidency.

**Stelletta** sp.

There are two dried sponges growing on an Antipatharian coral whose identity must remain a matter of doubt. They are of massive, irregular form and dark brick-red colour. The surface is much worn. The spiculation consists of oxea, a mixture of plagiotriaenes and dichotriaenes, and small strongylasters varying from 0.011 to 0.017 mm. in diameter. This spiculation recalls that of *S. aruensis*, the main difference being the absence of any sign of oxyasters. These are, however, rare in the holotype of Hentschel's species, so that their complete absence need not necessarily have a taxonomic significance. At the same time, there is no sign of the characteristic surface processes of *S. aruensis*. Whether these were originally present and have been rubbed off since the specimen was dried, it is not possible to say. Since the two sponges were obtained from the same locality as that identified above as *S. aruensis*, there is a strong probability that they too belong to the same species.

*Locality*.—Ganjam Coast ("Golden Crown" Coll.), 24-30 fms.

There are in the collection four specimens whose spiculation consists of oxea and small asters only, and, according to the interpretation of that genus implied in the identifications of Dendy (1905, 1916) these should be referred to the genus *Jaspis*. In our opinion, they are nothing more than reduced members of the genus *Stelletta* which have lost their triaenes and are treated accordingly. Unfortunately, it has not been possible to refer them to species already known, but since it is probable that they do not represent new species, and in view of the doubt concerning the interpretation of their spicular characters, we have preferred to dismiss them, *pro-tem.*, with a short diagnosis of their salient characters.

In order to make clear the exact nature of the genus *Jaspis* and to justify the remarks made above, a resumé of the history and characteristics of this genus is given in the following pages.

**Reduced Stelletta.**

Sponge irregularly massive, about 40 × 20 × 30 mm.; surface smooth, minutely hispid, delicately reticulate; pores scattered regularly

over surface, giving rise to surface reticulation ; oscules small, in groups of about 10, at various points on surface ; colour, in spirit, from yellow to pale purple ; megascleres oxea,  $1.05 \times 0.042$  mm., irregularly scattered in interior, radially disposed or irregularly scattered in a dense layer at surface ; microscleres strongylasters to tylasters, with or without centrum, 0.009-0.012 mm. in diameter, forming a conspicuous dermal layer and plentifully scattered in interior.

*Locality.*—(M. S. Sta. 657) N. side of East end of Macpherson Straits, near Chiriyatapur (January 20, 1926), Andamans.

Sponge fragmentary, probably tubular, with exhalant openings on walls of a central cloaca ; colour, in spirit, yellow ; megascleres oxea, 1.8 by 0.042 mm., irregularly arranged in interior, and lying partly radially, partly tangentially at surface ; occasional orthotriaenes, with cladi 0.07 by 0.01 mm.<sup>1</sup>, scattered among oxea in interior but never definitely orientated ; microscleres strongylasters to tylasters, 0.007-0.017 mm., extremely rare, only found after prolonged search.

*Locality.*—Andamans (17 fms.).

Sponge elongate, cylindrical, probably repent (about 30 mm. long and 4 mm. in diameter) ; surface smooth, even, minutely hispid ; oscules not apparent ; colour, in spirit, light purplish brown ; megascleres oxea,  $1.6 \times 0.072$  mm., arranged more or less radially and densely aggregated at surface ; microscleres strongylasters to tylasters, with or without centrum, 0.007-0.012 mm. in diameter, especially associated with dermis, and oxyasters, 0.015 mm. in diameter, found only in choanosome.

*Locality.*—Andamans (9059/6).

Sponge fragmentary, probably irregularly massive ; colour, in spirit, white ; megascleres oxea, 1.1 by 0.049 mm., irregularly radial in arrangement ; microscleres strongylasters to oxyasters, 0.008-0.018 mm. in diameter, very abundant, smaller spicules confined to dermis.

*Locality.*—(M. S. Sta. 593) Paway I., Mergui Archipelago (February-March 1914).

### Genus *Jaspis* Gray.

1867. *Jaspis*, Gray, *Proc. Zool. Soc. London*, p. 526.

1867. *Penares*, Gray, *op. cit.*, p. 542.

1868. *Papyrula*, Schmidt, *Spong. Adriat. Meeres*, Suppl. IV, p. 18.

1888. *Coppatias*, Sollas, *op. cit.*, p. 206.

1888. *Astropeplus*, Sollas, *op. cit.*, p. 422.

1888. *Dorypleres*, Sollas, *op. cit.*, p. 426.

1896. *Spongosorites*, Topsent, *Mem. Soc. Zool. France*, IX, p. 117.

1906. *Pachamphilla*, Lendenfeld, *Deut. Tiefsee Exp. "Valdivia"*, XI, p. 251.

According to Topsent (1900, p. 268) *Vioa johnstonii* Schmidt, the genotype of *Jaspis* Gray, possesses a skeleton composed of oxea of variable size ranging from 0.07-1.0 mm. in length, the larger irregularly arranged, and of asters. The smaller oxea are confined, for the most part, to the dermal layer disposed tangentially to the surface. The larger are chiefly found in the interior, arranged more or less radially. The oxea are commonly centrotylote. Topsent's var. *incrustans* differs from the typical form of this species in that the rays of the asters are usually spined, and the ends of the oxea often so with regard to this

<sup>1</sup> All shafts seen were broken.

variety. *Astropeplus pulcher* Sollas considered by Topsent as a synonym of *J. johnstonii* is really a synonym of var. *incrustans* which must be called var. *pulcher*. His *Jaspis johnstonii* var. *incrustans* (l. c., p. 276) is identical, not with the typical form as Topsent suggested, but with *Astropeplus pulcher* Sollas, although this would hardly be expected from Sollas's description.

The holotype of *Jaspis dendyi* (Sollas), originally placed in the genus *Dorypleres* but removed to *Jaspis* by Topsent (1904, p. 131), does not conform to the typical structure of a *Jaspis*. The skeleton consists of large oxea only irregularly arranged, and asters of two kinds, oxyspheraster from 0.02 mm. in diameter, chiefly confined to the dermal layers, and oxyasters with few rays, up to 0.105 mm. in diameter. The asters are extremely abundant. The shape and dimensions of the spicules of *J. dendyi* recall certain species of *Stelletta* and, were it not for the absence of triaenes, there would be little hesitation in assigning the species to *Stelletta*. The species of *Stelletta* referred to include *S. maxima* Thiele from Japan, *S. brevis* and its varieties *lutea* and *paupera* Hentschel from S. W. Australia, and *S. columna* from New Zealand. These five forms have so much in common, in so far as spiculation is concerned, that there seems no reason for regarding them as separate species. The spicules are oxea, orthotriaenes, large oxyasters and small asters. The differences between them rest largely in the shape of the cladi of the triaenes and the shape of the smaller asters.

The triaenes exhibit an interesting series in spicule-reduction. In *S. columna* they are large and numerous, in *S. maxima* and *S. brevis* var. *paupera* only about half the size of those of *S. columna*. In *S. brevis* var. *lutea* they are smaller still, and in the holotype of *S. brevis* as also in a specimen in the Brit. Mus. coll. (94-7-6-4) from Japan, evidently belonging to *S. maxima*, only a quarter of the size of the corresponding spicules in *S. columna*. In all these forms the triaenes are numerous. In a second specimen from the Brit. Mus. coll. from Port Philip Heads agreeing very closely in other respects with the holotype of *S. brevis*, the triaenes, with shaft similar to those found in *S. maxima* and cladi like those of *S. brevis*, are extremely rare.

From an examination of the original preparations, the smaller asters have been found to be strongylasters in B. M. (94-7-6-4), and in *S. brevis* var. *paupera*, strongylasters and oxyspherasters in *S. brevis* and *S. brevis* var. *lutea*, and oxyspherasters in *S. columna*.

Assuming that all these forms represent a single species, *S. maxima* Thiele, the following variations may be specially noted: (1) the triaenes may become much reduced in size and in numbers, (2) the smaller asters may have truncated or sharply-pointed rays, (3) the larger asters (oxyasters) may be absent (cf. *S. brevis* var. *paupera*).

Comparing *S. maxima*, as here understood, with *Jaspis dendyi* (Sollas) the outstanding differences are seen to be the absence of triaenes and of the smaller asters in the latter. The larger asters (oxyasters) are so extremely abundant in *J. dendyi* that it may be a case of suppression of the smaller asters by the abundant growth of the larger asters, or that the spherasters of 20 $\mu$ . diameter represent the smaller asters which never exceed 0.017 mm. in diameter. In any case, *J. dendyi* is almost certainly a reduced form of *Stelletta maxima*.

It is possible, also that, *S. sphaerica* Burton must be eventually regarded as a synonym of *S. maxima*.

Whatever may be the true interpretation of *Jaspis dendyi*, this much is certain, that it is a true *Stelletta* with reduced spiculation. Moreover, the same may be said of the species of *Jaspis* (including *Coppatias*) so far described.

*Coppatias albescens* Row (1911, p. 299) has an irregular skeleton of large oxea, becoming partly radial at the surface, a few orthotriaenes with shafts 0.009 mm. thick, and distorted cladi 0.04 mm. long, scattered very sparingly among the oxea. The "minute raphide-like" oxea are undoubtedly the developmental forms of the large oxea. The "rather long slender somal oxea" cannot be found, but there are present, long slender spicules which appear to be the shafts of ana- or pro-triaenes whose heads, projecting beyond the surface, have been broken off. The species is undoubtedly a reduced *Stelletta*.

*Stellettinopsis carteri* Ridley (1884, p. 476) (= *Coppatias carteri* Sollas 1888) has a few orthotriaenes and anatriaenes, both with distorted cladomes, and a fair number of larger spherasters. The species is, in fact, a form of the sponge described by Dendy (1916, p. 246) as *Aurora providentiae* in which the triaenes and large spherasters are much reduced. *Coppatias distincta* Thiele, the genotype of *Rhabdastrella*, except for the absence of triaenes, corresponds almost exactly with *A. providentiae*.

*Tisiphonia penetrans* Carter (1880, p. 141) and *Jaspis johnstonii* (Schmidt) Dendy (1916, p. 253) are practically identical with the European forms of *J. johnstonii* and since the range of the species includes the Indian ocean, there is no reason for regarding *Coppatias investigatrix* Annandale (1915, p. 460) as distinct from *J. johnstonii* var. *incrustans*.

*Jaspis serpentinoso* Wilson (1925, p. 330) appears to be a cup-shaped form of *Dorypleres biangulata* Lindgren (1898, p. 34), a typical *Jaspis*.

*Coppatias solidissima* Wilson (1902, p. 387) is a typical *Jaspis* with a few triaenes at the surface, and probably directly comparable to *Penares ochraceta*.

*Hemiassterella affinis* Carter (1879, p. 147), referred by Sollas (1888) to *Dorypleres* appears to be a true *Hemiassterella*.

*Jaspis reptans* (Dendy) (1905, p. 108), although no trace of triaenes can be found in it, resembles a typical *Stelletta* so closely in its skeleton and anatomy as to leave little doubt that it is a lipotriaenous species of that genus. The same may be said of *J. novae-zealandiae* Dendy (1924, p. 305). In both species the sparsely scattered cortical oxea set at right angles to the surface, are present. *Coppatias sansibarensis* Baer (1906, p. 23) appears to be of the same nature.

In a preparation made from the holotype of *Dorypleres topsenti* Thiele, two orthotriaenes were found which may be considered proper to the sponge. For the rest, the species is quite evidently a reduced *Stelletta*.

It is doubtful how far *C. baculifer* Kirkpatrick (1903, p. 239) may be considered a true *Jaspis*, but for the moment we propose to leave it.

Other genera, having the same essential structure as *Jaspis johnstonii*, must also be considered. *Penares* Gray (1867, p. 542), with *Stelletta*

*helleri* Schmidt as genotype, differs from *Jaspis* only in the presence of short-shafted triaenes situated just beneath the ectosome. In some examples of *Penares*, the triaenes are so few in number that it does not seem possible, or necessary, to use their presence or absence for purposes of generic diagnosis. Moreover, the genotype of *Papyrula* Schmidt (1868, p. 18) *P. candidata*, is so like *Stelletta helleri*, that there can be no question but that *Papyrula* like *Penares* is also a synonym of *Jaspis*.

*Pachamphilla alata* Lendenfeld from the Agulhas Bay, S. Africa, the genotype of *Pachamphilla* is a typical *Penares* but for the absence of asters, closely allied to *Penares orthotriaena* Burton from Natal. *P. dendyi* Hentschel from the Aru Is. closely resembles *Penares ochracea* Carter, and differs only in the substitution of irregular spheres for asters.

Just as *Pachamphilla* is a typical *Penares* without asters, so *Spongisorites placenta*, the genotype of *Spongisorites*, and *S. salomonensis* Dendy, and *S. suluensis* Wilson differ from *Jaspis* only in the absence of asters. The remaining species of *Spongisorites*, *S. topsenti* Dendy, *S. lamellata* Dendy, and *S. lapidiformis* Dendy are all Axinellidae.

The following table shows that *Penares*, *Pachamphilla*, *Jaspis*, and *Spongisorites* are not only very closely related but represent merely stages in the reduction of spiculation. In all the four the arrangement of the large and small oxea is the same, the only differences between them being the presence or absence of triaenes and, of asters.

*Penares*—oxea, microxea, triaenes, asters.

*Pachamphilla*—oxea, microxea, triaenes.

*Jaspis*—oxea, microxea, asters.

*Spongisorites*—oxea, microxea.

The distinguishing features of the genus *Jaspis* are, therefore, a dermal tangential layer of microxea and an irregularly radial somal skeleton of large oxea with microxea intermingled.

Sollas (1888, p. 206) established the genus *Coppatias* for *Stellettinopsis coriacea* Carter (= *Jaspis stellifera* (Carter) Shaw, 1927, p. 422) here accepted as the genotype of *Coppatias*, having apparently overlooked Gray's genus since the characters of *C. coriacea* are essentially the same as those of the typical form of *Jaspis johnstonii*. It is necessary to deal with these four genera concurrently. A number of species have since been added to both *Jaspis* and *Coppatias*, but analysis of these shows that very few of them conform to the typical structure and are, in reality, reduced *Stelletta*. An example of this is seen in *Jaspis dendyi*.

### **Cryptotethya agglutinans** Dendy.

1905. *Cryptotethya agglutinans*, Dendy, *Rep. Ceylon Pearl Oys. Fish.*, p. 111, pl. v, figs. 4-5.

The single specimen is about 30-40 mm. in diameter, and although covered with large pieces of foreign matter bears none of the finger-like processes found in the holotype.

The skeleton differs from that of the holotype in that the asters measure only 0.005-0.007 mm. in diameter and are extremely rare, so much so that only the conviction that they should be present leads to their being found.

*Locality.*—N. side of Fehendu I., Goifurfehendu Atoll, Maldive group, Arabian Sea.

### ***Aurora globostellata* (Carter).**

1883. *Stelletta globostellata*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, XI, p. 353, pl. xiv, fig. 5.  
 1888. *Aurora globostellata*, Sollas, *op. cit.*, p. 187.  
 1916. *Aurora providentiae*, Dendy, *Trans. Linn. Soc. London*, xvii (2), p. 246, pl. xlvi, fig. 2.

The only representative present is a dried fragment of what was evidently a large, possibly sub-caliculate sponge. The outer surface shows the same characteristic reticulation of the holotype, and the inner surface shows the sieve-like groups of vents. The colour is a light brown. The skeleton resembles that of the holotype tolerably well, the chief difference being that the oxyasters range in size from 0.04 to 0.06 mm. in total diameter. This condition is intermediate between that found in the holotype of Carter's species and that of *A. providentiae*.

Dendy (*l. c.*, p. 247) has suggested a certain number of small details wherein *A. globostellata* and *A. providentiae* differ. Comparison of the holotypes of these two species leave little doubt as to the identity of the two species. Such small differences as exist are purely those which might be expected in any two individuals of a species.

*Locality.*—Aberdeen Reef, Andamans (S. W. Kemp Coll., February, 24-25, 1921).

### ***Aurora rowi* Dendy.**

(Pl. XVIII, Fig. 3.)

1916. *Aurora rowi*, Dendy, *Trans. Linn. Soc. London*, XVII, p. 249, pl. 44, fig. 5 pl. 46, fig. 4.  
 1924. *Aurora rowi*, Dendy & Frederick, *Journ. Linn. Soc. London*, XXXV, p. 494.

The single specimen is a large dried, cup-shaped sponge measuring 240 mm. in height. In its present condition it is not possible to be sure whether the lateral compression is natural or due to pressure since the animal was removed from the sea. The opening of the cup measures 220 mm. by 80 mm. The walls are thick and, on the outer surface, are thrown into a number of irregular grooves and low, rounded prominences. The colour is a light brown. The small and irregular shape of the holotype makes it impossible to draw any comparison between the two specimens so far as external form is concerned. As regards the spiculation, there is little to choose between them, the main, and probably the only difference being that the irregular spheres of the holotype are replaced in the present specimen by spherasters, 0.014 mm. in diameter, with short, stout, 'nubbly' rays.

*Locality.*—Ganjam Coast, Madras Presidency, ("Golden Crown" coll.).

**Ecionemia carteri** Dendy.

1905. *Ecionemi carteri*, Dendy, *Ceylon Pearl Oyster Fish. Suppl. Rep.*, XVIII, p. 79, pl. i, fig. 5, pl. iii, fig. 1.

1916. *Ecionemia carteri*, Dendy, *Trans. Linn. Soc. London*, xvii (2), p. 242.

The spiculation of this species, as represented in the holotype, consists of oxea, orthotriaenes, prototriaenes, anatriaenes of two sizes, microrhabds and asters. The specimens in the present collection show certain variations on this which seem worthy of note. All agree well with the holotype in external form and in the salient features of the spiculation but the minor differences are as follows :—

In specimens from Kilakarai prototriaenes absent: small cortical oxea present, measuring  $0.24 \times 0.004$  mm., disposed at right angles to surface; microrhabds often have a third ray. The cortical oxea are present also in the holotype, although they were not recorded by Dendy.

In the examples from the Andamans (9309/6) asters typical but measuring only 0.008-0.02 mm. in diameter.

In another lot from the Andamans (9114/6) prototriaenes not seen; cortical oxea rare.

In examples from the Andamans, Galle (Ceylon), Moscos I., and M. S. Sta. 655 prototriaenes and small anatriaenes not seen.

In a third lot from the Andamans, asters comparatively rare; microrhabds 3- or even 4-rayed, occasionally centrotylote.

In examples from Nankauri (Nicobars), Kilakarai, and (M. S. Sta. 629) N. W. side of Spiteful Bay near Leander Pt., Nicobars, prototriaenes present in small numbers only; small anatriaenes not seen.

In another lot from Kilakarai and from (M. S. Sta. 630) Burleigh Rock, Nicobars, neither prototriaenes nor small anatriaenes seen.

In addition to these variations, there are also quite noticeable differences in the size and shape of the cladi of the various triaenes.

Genus **Amphius** Sollas.

1888. *Amphius*, Sollas, *op. cit.*, p. 177.

*Diagnosis* (emend.).—Stellettidae with one form of megasclere, an oxeote, and microscleres in the form of euasters or some modification thereof.

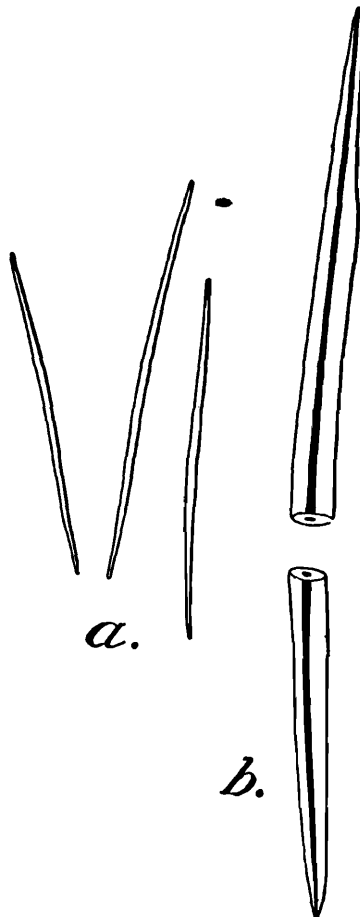
**Amphius sollasi**, sp. nov.

*Diagnosis*.—Sponge elongate, obovate; surface even, minutely hispid; texture firm, compressible; oscules few, small, colour, in spirit, yellowish white to dull grey or purple; skeleton composed of irregularly scattered oxea, more numerous immediately below surface than elsewhere, and a dermal layer of asters; choanosome containing few asters; oxea variable in size, slightly curved, average size of fully-grown spicule  $0.72 \times 0.012$  mm.; asters, with strongylote rays, 0.006-0.009 mm. in diameter.

*Holotype*.—P. 783/1 Zool. Surv. Ind. (*Ind. Mus.*).

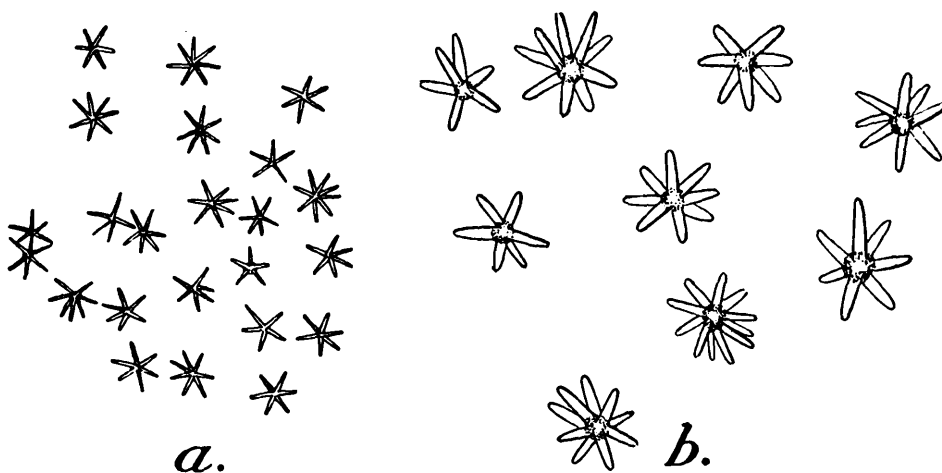
*Remarks*.—The species resembles *A. huxleyi* Sollas but differs from it not only in the size of the spicules but in the shape of the asters. In

the latter, the microscleres are amphiasters with an elongated centrum; In the present species the centrum is much reduced and the spicul



TEXT-FIG. 3.—*Amphius sollasi*. a. oxea ( $\times 30.6$ ); b. one of the oxea enlarged to show the two extremities only ( $\times 146$ ).

has the appearance of a euaster. With the 1/12th oil immersion, however, it becomes evident that the asters of the two species are but modifications of the same spicule-form.



TEXT-FIG. 4.—*Amphius sollasi*. a. a group of dermal asters ( $\times 146$ ); b. the same highly magnified (1/12 oil immersion).

*Locality.*—'Ain Musa, Gulf of Suez. (Col. R. B. Seymour Sewell, 8th January 1917).

## Family ERYLIDAE.

**Erylus ledenfeldi** Sollas.

1880. *Stelletta euastrum*, Carter nec Schmidt, *Ann. Mag. Nat. Hist.*, VI, p. 136 pl. vii, fig. 42.  
 1888. *Erylus ledenfeldi*, Sollas, *op cit.*, p. 239.  
 1916. *Erylus ledenfeldi*, Dendy, *Trans. Linn. Soc. London*, XVII (2), p. 257, pl. xlvii, fig. 4.

The single specimen resembles very closely indeed the one described by Dendy as *Erylus proximus* (*l. c.*, p. 258) that no remarks concerning the external form of the sponge are necessary. The spiculation, on the other hand, is sufficiently like that of the specimen described by the same author as *E. ledenfeldi* to leave no possible doubt as to its correct identification.

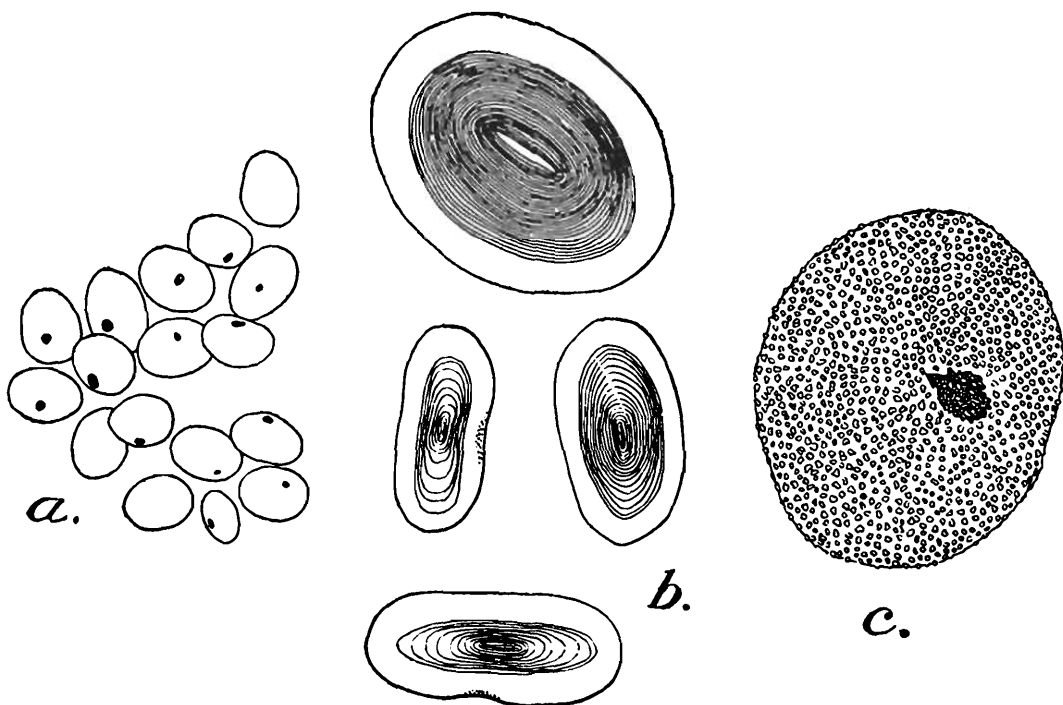
*Locality*.—Andamans.

**Erylus geodioides**, sp. nov.

*Diagnosis*.—Sponge irregularly massive, inextricably associated with the shell of *Siliquaria*; surface smooth, even; pores evenly distributed over surface; vents inconspicuous; colour, in spirit, yellow faintly tinged, in places, with light brown; skeleton composed of oxea, orthotriaenes, more or less globular aspidasters, large oxyasters, with minutely spined rays, and small oxyspherasters.

*Holotype*.—P 784/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Remarks*.—The species differs from all known species of *Erylus* in the character of the aspidasters which, although somewhat flattened in the early stages, are more or less globular when mature. In this



TEXT-FIG. 5.—*Erylus geodioides*. a. a group of aspidasters ( $\times 30.6$ ); b. the early stages of developing aspidasters ( $\times 146$ ); c. one of the mature aspidasters ( $\times 146$ ).

respect, it makes a close approach to the genus *Geodia*. For the rest, both external characters, and the arrangement of the skeleton, the species is a typical *Erylus*.

The form and dimensions of the spicules are as follows:—Oxea, smooth, slightly curved, not sharply pointed,  $1.228 \times 0.033$  mm.; orthotriaenes, with shaft straight,  $0.825 \times 0.05$  mm. and cladi gently curved, occasionally bifurcate,  $0.495 \times 0.05$  mm., aspidasters, resembling the sterrasters of *Geodia*,  $0.06 \times 0.045 \times 0.045$  mm.; large oxyasters, usually with 4-6 rays, but varying in number from 2-12, each ray about  $0.028$  mm. long  $\times$   $0.003$  mm. thick, forming the most conspicuous spicular element of the choanosome; polyactinose oxyspherasters, comparatively few in number,  $0.024$  mm. in diameter; centrotylote microstrongyla, gently curved,  $0.053 \times 0.004$  mm.

Apart from the shape of the aspidasters, this species appears to resemble *E. rotundus* Lendenfeld, from the Galapagos Islands, more closely than any other known species of the genus.

*Locality.*—Mergui Archipelago (17th April 1913)—65 fms.

### Family GEODIIDAE.

#### Genus *Geodia* Lamarck.

Among the numerous species of Geodiidae recorded from the Indian Ocean and the Indo-Pacific is a group of species so closely allied that their separation depends exclusively on the differences in the size of their spicules and on slight differences in the shape of their microscleres. The spiculation of this group consists of somal oxea, orthotriaenes, anatriaenes, protriaenes, including promesotriaenes, cortical styli, sterrasters, and two sorts of smaller asters. In separating the members of this group into species, considerable importance seems to have been attached to the shape of the microscleres, yet a cursory examination suffices to show that these spicules are essentially the same in all cases, the superficial differences depending on whether or not a centrum is present, and whether the rays are smooth and sharply pointed or truncate and roughened. This group includes *G. picteti* (Topsent), *G. lindgreni* Lendenfeld, *G. alba* (Kieschnick), *G. alba* var. *minor* (Hentschel), *G. micraster* (Lendenfeld), and their resemblance to one another is so strong that we propose to regard them as synonymous species without further comment.

In addition to these, there are several other closely allied species which must be considered here. *G. jousseaumi* (Topsent), and *G. micropunctata* (Row), both from the Red Sea, appear to differ only in the presence of anatriaenes and protriaenes in the former and their absence in the latter. Considerable evidence is available from the study of material in the British Museum collection that one or both of these two spicule forms may be absent in individuals of the species of *Geodia* normally possessing them, and it seems to be a matter of no taxonomic value whether they are present or absent. There is no reason, therefore, why *G. micropunctata* and *G. jousseaumi* should not be regarded as synonymous, especially as re-examination of Row's preparations suggests that the centrotylote oxea of the choanosome are foreign spicules, that cortical oxea such as are found in *G. jousseaumi* are present, and that the oxyasters vary from  $0.015$ - $0.021$  mm. in diameter (not  $0.008$  mm. as stated by Row).

*G. inconspicua* Bowerbank from the South Seas (*sic*) differs again from the *G. picteti* group mainly in the absence of pro-and anatriaenes, but Bowerbank's preparations contain numerous long, slender, rod-like spicules which traverse the choanosome and pierce the cortex, and which may possibly be the headless shafts of one or both of these forms of spicules. Similarly, *G. contorta* Bow., from the Fiji Is., with rare orthotriaenes and no pro-or anatriaenes, is probably only a very much reduced form of *G. inconspicua*. These two species, together with *G. jousseaumi* and *G. micropunctata* differ from the *G. picteti* group in having cortical oxea instead of cortical styli.

Before proceeding further, it may be of advantage to examine the taxonomic significance of the cortical styli and cortical oxea. In our opinion there is none. Both styli and oxea are but expressions of a single spicule-form and, in many cases, it is extremely difficult to decide whether the cortical spicules of a given individual are styli or oxea. The best comment on this matter is found in Lendenfeld (1906, pl. xxxv, fig. 17) who speaks of styli and figures oxea. There appears to be no adequate reason, then, why *G. inconspicua* and its allies should not also be regarded as synonymous with the *G. picteti* group.

Two more species, closely allied to each other and two of the species already discussed, are *G. areolata* Carter and *G. ramodigitata* Carter. Again the measurements of their spicules, when compared with those of allied species, are seen to have little or no significance. So far as *G. areolata* is concerned, the distinctive feature of the species hitherto accepted has been the areolation of the surface by the cortical oxea. In no specimen so far recorded is this areolation found to be complete, but appears in patches, the intervening spaces between, being perfectly plain as in any other species of *Geodia*. Moreover, in some specimens, at first identified by us as *G. ramodigitata*, the surface also bears areolated patches, similar to those of *G. areolata* but less well marked. Assuming that the areolation of the surface is a variable feature which may or may not be present, there is no purpose in maintaining these two species distinct from those already regarded above as synonymous. We propose, therefore, to regard these ten species as synonyms of a single species, by priority, *G. inconspicua* Bowerbank.

It is of interest to note that what has been said of the Indian Ocean and Indo-Pacific groups of species, might almost have been said of a group of species centred round the West Indies and Central America. This group which includes *G. media*, *G. tuberculosa*, *G. tumulosa*, etc., is more or less very similar indeed to *G. inconspicua*, and it is extremely probable that they may all be ultimately recognised as belonging to a single species, the differences between them representing nothing more than geographical variations.

### ***Geodia inconspicua* (Bowerbank).**

1873. *Pachymatisma inconspicua*, Bowerbank, *Proc. Zool. Soc. London*, p. 326, pl. xxxi, figs. 1-6.

The present collection contains some 14 specimens of varying size, and external form which agree closely with one another in a general way, but exhibit slight differences in the size and shape of the spicules.

They conform closely to, and show the same range of general variations as, the various specimens hitherto recorded under different specific names, but now regarded as synonyms of *G. inconspicua*. We, therefore, refrain from recapitulating these details with reference to the specimens in the Indian Museum collection.

*Localities.*—Kilakarai, Ramnad Dist. (Coral reefs, Feb. 1923, S. W. K.); Ganjam Coast, Madras Pres. ("Golden Crown" coll.); (Mar. Surv. Sta. 649) marginal reef of Horsburgh Atoll, N. of Fehendu I. (Oct. 22, 1923); (Mar. Surv. Sta. 346), Persian Gulf, Oct. 1904; Krusadai I., Gulf of Manaar (B. N. C. & H. S. R. Feb. Mar. 1925); E. N. E., Preparis I., Bay of Bengal (41 fathoms, 30th November 1889); Galle, Ceylon; Point Pedro, entrance to Palk Straits (6-8 fathoms, 1893-94).

### ***Geodia perarmata* Bowerbank.**

1905. *Geodia perarmata*, Dendy, *op. cit.*, p. 83.

*Geodia peruncinata*, Dendy, *op. cit.*, p. 85, pl. iii, fig. 3.

1925. *Geodia perarmata*, Burton, *Rep. Fish. Mar. Biol. Surv. South Africa* No. 4 (for 1925), p. 15.

There are two specimens, 8 mm. and 16 mm. in diameter respectively in the collection. Their colour in spirit is chocolate brown, and yellow internally. In spiculation they are typical except that the sterrasters are 0.06, 0.07 mm. in length and breadth respectively.

*G. peruncinata*, which bears a strong likeness to the present species, was separated therefrom by Dendy (*l. c.*, p. 86) because of the absence of brown pigment-cells in the cortex, of the form of the spheraster, and of the presence of cortical anatriaenes. Re-examination of Dendy's specimens of *G. perarmata* has shown that cortical anatriaenes may often be present. Because of this, and because we consider the significance of the pigment-cells and the form of the spherasters to have been exaggerated, *G. peruncinata* is here regarded as synonymous with *G. perarmata*. On a careful study of the descriptions of *G. arripiens* and *G. sphaeroides* given by Thiele and Hentschel, we feel that there is no valid reason for regarding them as other than synonyms of the present species.

*Locality.*—E. N. E. Preparis I., Bay of Bengal (41 fms., 30th November 1889).

### Family CHONDROSIIDAE.

#### Genus ***Chondrosia*** Nardo.

1847. *Chondrosia*, Nardo, *Atti delle Adri. dell'I. R. Inst. Veneto*, pp. 267-276.

Of the various species of this genus hitherto described most, if not all, have been established on slight differences in the structure of the cortex, or on the nature of the surface. To a lesser extent, the form and position of the vents and the habit, whether encrusting, free, or attached, have been used also as characters for specific differentiation. After careful study of *C. reniformis*, the genotype, *C. corticata* and *C. debilis* of Thiele, *C. plebeja* Schmidt, *C. ramsayi* Lendenfeld, and *C. spurca* Carter, we have come to the conclusion that there is no reason for regarding them as different species. All agree closely in internal structure, and the differences between them are due to such variations

as might be expected normally to exist. As Carter has said, in describing *C. spurca* (*Ann. Mag. Nat. Hist.*, p. 286, 1887) and comparing it with *C. reniformis* and *C. ramsayi*, "all these species appear to me to be so nearly allied that it is difficult to say how far their differences are of any real specific value." If any difference between them need be recognised at all, it should be in regarding them as "metamps" (Bidder)<sup>1</sup> or "tropi" (Vosmaer)<sup>2</sup> of a single species.

So far as can be seen, there appears to be but one species of *Chondrosia*, *C. reinformis* Nardo, and this can be divided into forms:—(a) free or attached, with definite shape, globular, oval or reniform; with well-developed cortex, giving a tough, leathery texture; with one or more raised vents; with smooth surface, or with pores so arranged, at least in preserved specimens, as to give a stellate or reticulate appearance: (b) encrusting, spreading over foreign objects; with one or more vents, level with the surface, smooth and even, with a reticulation of fibrillar structure. Both frequently accumulate sand or other foreign particles on the surface. The former may be known as the forma *typica*, to include *C. corticata*, *C. debilis*, *C. plebeja* and *C. ramsayi*, and the latter may be known as the forma *spurca*, to include Carter's species of that name.

### **Chondrosia reniformis** Nardo.

1877. *C. reniformis*, Schulze, *Zeitschr. Wiss. Zool.*, XXIX, p. 13, pl. viii.

1887. *C. spurca*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, XIX, p. 286.

Both forms of this species are represented in the collection. The form *typica* is represented by two small kidney-shaped individuals, purplish-grey in colour, attached to a calcareous substratum. The surface in both is conspicuously reticulated. The form *spurca* is represented by four specimens. The first, from Galle, Ceylon, is encrusting a calcareous nodule, with surface smooth in some places and reticulated in others, and is pale grey in colour. The second is found on the terminal branches of a young Madreporarian coral and is pale brown in colour. The third is a thin cream-white incrustation on the stem of a disintegrated Gorgonid.

The refringent bodies, or "glary bodies" of Carter, which have been described by Schulze (*l. c.*) are not at all distinct in the present specimens, though granules comparable to them, but much smaller and of no regular shape, are found scattered all over them. In addition to these, there are in the Ceylon specimen certain minute rod-like structures abundantly scattered over the surface of the sponge and forming a rough reticulation. These are about 0.003 to 0.004 × 0.0005 mm. and their exact nature is obscure.

*Localities*.—Pearl Oyster Banks, Tuticorin (H. S. R., Feb. 1926); Galle, Ceylon.

### Genus **Chondrilla** Schmidt.

1862. *Chondrilla*, Schmidt, *Die Spongien Adriatischen Meeres*, Leipzig, p. 383 pl. iii.

<sup>1</sup> *Journ. Mar. Biol. Assn. Plymouth*, VI, p. 381 (1902).

<sup>2</sup> *Siboga Expedite, Porifera*, p. 26 (1911).

**Chondrilla sacciformis** Carter.

1879. *Chondrilla sacciformis*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, III, p. 299, pl. xxv, figs. 9, 11, 12.  
 1916. *Chondrilla sacciformis*, Dendy, *Trans. Linn. Soc. London*, XVII, p. 268, pl. xlvi, fig. 8.  
 1924. *Chondrilla sacciformis*, Burton, *Ann. Mag. Nat. Hist.*, Ser. 9, XIV, p. 207.

There are two typical specimens in which the asters vary from 0.035 to 0.04 mm. in diameter.

*Locality*.—(Mar. Surv. Sta. 641) "Sam I.," Mulikadu, Maldives (6th March 1923).

**Chondrilla australiensis** Carter.

1873. *Chondrilla australiensis*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 4, XII, p. 23, pl. i, figs. 10-14, 16.  
 1924. *Chondrilla australiensis*, Burton, *Ann. Mag. Nat. Hist.*, Ser. 9, XIV, p. 207.

It should be pointed out here that the diagnosis given under this name by Burton (*l. c.*) should read "spiny-rayed oxyasters," the smooth-rayed oxyasters being characteristic of *C. australiensis* var. *mixta*.

The several specimens present exhibit the usual variations for the species.

*Localities*.—Ganjam Coast ("Golden Crown" Coll.) Madras Presidency ; Madras (sta. 6).

**Chondrilla australiensis** var. **mixta** Schulze.

1887. *Chondrilla mixta*, Schulze, *Zeit. Wiss. Zool.*, XXIX, p. 32.  
 1924. *Chondrilla australiensis* var. *mixta*, Burton, *Ann. Mag. Nat. Hist.*, Ser. 9, XIV, p. 207.

*Locality*.—(M. S. Sta. 648) N. and W end of Fehendu I., Horsburgh Atoll (Oct., 21, 1923).

## Sub-order SIGMATOSCLEROPHORA.

## Family TETILLIDAE.

Genus **Paratetilla** Dendy.

1905. *Paratetilla*, Dendy, *Rep. Ceylon Pearl Oyster Fish.*, p. 97.

**Paratetilla bacca** (Selenka).

1921. *Paratetilla bacca*, Dendy, *Trans. Linn. Soc. London*, XVIII, p. 21.

Several typical specimens of this well-known species are present, the colour varying from a light brown to a chocolate brown.

*Localities*.—Kilakarai, Ramnad Dt., Marble rocks, Mergui Archip., Port Blair, Andamans ; Galle, Ceylon.

Genus **Tetilla** Schmidt.

1862. *Tetilla*, Schmidt, *Spongien der Adriat. Meeres Leipzig*, p. 40.

**Tetilla cranium** (Müller).

1789. *Alcyonium cranium*, Müller, *Zool. Dan.* pl. lxxxv, fig. 1.  
 1888. *Craniella cranium*, Sollas, *op. cit.*, p. 51.

There are several examples of this species which do not appear to differ at all from those found so commonly in the North Atlantic.

*Localities*.—Invisible Bank, Andamans; off C. Negrais, Burma (16th November 1909); 2-3 miles W of C. Comorin (Armstrong) 38 fms.

**Tetilla dactyloidea** (Carter).

1869. *Tethya dactyloidea*, Carter, *Ann. Mag. Nat. Hist.* Ser. 4, III, p. 15.  
 1916. *Tetilla dactyloidea*, Dendy, *Rep. Govt. Baroda Mar. Zool. Okhamandal*, p. 102, pl. ii, fig. 10.

This species, so exhaustively described by Dendy (*l. c.*) and other authors, is represented by several specimens.

*Localities*.—Osaka Market, Japan; Port Blair, Andamans.

Genus **Cinachyra** Sollas.

1888. *Cinachyra*, Sollas, *op. cit.*, p. 23.

**Cinachyra arabica** (Carter).

1869. *Tethea arabica*, Carter, *Ann. Mag. Nat. Hist.* Ser. 4, IV, p. 3, pl. i, figs. 1-8, pl. ii, figs. 19, 20.  
 1888. *Tetilla arabica*, Sollas, *Challenger Rep. Tetractinellida*, p. 42.

This species is represented by some sixteen specimens, all agreeing closely with the type, except that spherules are not always to be found.

*Localities*.—Camorta I., Nicobars (13th December 1921); Krusadai I. (B. N. C. & H. S. R., Feb., 1925); Andaman Is., M. S. Sta. 648.

**Cinachyra australiensis** (Carter).

1886. *Tethya cranium* var. *australiensis*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, XVII, p. 127.  
 1888. *Tetilla* (?) *australiensis*, Sollas, *op. cit.*, p. 43.

The species differs from the foregoing in the presence of long, thin microxea scattered throughout the choanosome. In all other respects they are closely similar.

*Localities*.—Andamans (surf-line); Marble Rocks and Burleigh Rocks, Mergui Archipelago.

**Cinachyra simplex** (Sollas).

1888. *Chrotella simplex*, Sollas, *op. cit.*, p. 17, pl. ii, figs. 1-4.

There is a single small specimen agreeing very closely indeed with the holotype of this species. Both this specimen and the holotype are such obvious members of the genus *Cinachyra* that it is difficult to understand why Sollas failed to recognise it.

*Locality*.—(M. S. station 384) off C. Negrais, Burma (22nd February 1909).

## Family DESMACIDONIDAE.

## Sub-family MYCALEAE.

Genus **Biemna** Gray.

1916. *Biemna*, Hallmann, *Proc. Linn. Soc. N. S. W.*, XLI, pp. 495-503.  
 1921. *Biemna*, Dendy, *Trans. Linn. Soc. London*, XVIII, p. 56.  
 1925. *Biemna*, Wilson, *Bull. U. S. Nat. Mus.*, 100, p. 422-424.

**Biemna fortis** (Topsent).

1897. *Desmacella fortis*, Topsent, *Rev. Suisse Zool.*, IV, p. 463, pl. xxi, fig. 30.  
 1912. *Biemna fortis*, Hentschel, *op. cit.*, p. 350.

The single specimen in the collection agrees closely in external form with those described by Topsent and Hentschel, but the spiculation is slightly different. The megascleres, the large and small sigmata and the long raphides, are present, and are almost identical in shape and size with those described by Henschel (*l. c.*). In addition to these, however, a few intermediates between the large and small sigmata, about 0.04 mm. long, occur, as well as microxea, 0.03-0.04 mm. long.

*Locality*.—East of Puri coast, Bay of Bengal.

**Biemna tubulata** (Dendy).

(Pl. XVIII, Fig. 4.)

1905. *Desmacella tubulata*, Dendy, *Rep. Ceylon Pearl Oyster Fish.*, p. 155, pl. ix, fig. 4.

The individuals of the various species of *Biemna* are not easily differentiated, largely on account of the profusion and variety of microscleres present, and on account of the manner in which these spicules vary in size. It is probable that the several species of *Biemna* from the Indian Ocean area may eventually prove to be synonymous.

The present specimens, though not agreeing exactly with the holotype of *Biemna tubulata* in all respects, appear to be sufficiently closely related to warrant their inclusion in that species.

*Localities*.—(M. S. Sta. 667) N. W side of Neill I., Andamans (Feb. 8, 1924); Rock reef, Naval Point, Nicobars (Oct. 21-22, 1922); Andamans (J. Woodmason); Elphinstone I., Port Maria, Mergui Archip. (6th-12th April 1913); Pearl Oyster Bank, Tuticorin (H. S. R. Feb., 1926).

Genus **Mycale** Gray.

1867. *Mycale*, Gray, *Proc. Zool. Soc. London*, p. 533.  
 1924. *Mycale*, Topsent, *Ann. Inst. Oceanogr.*, I, 3, pp. 77-118.

**Mycale indica** (Carter).

1887. *Esperia indica*, Carter, *J. Linn. Soc. London*, XXI, p. 72, pl. vi, figs. 3-6.

The species is represented by two encrusting specimens of a light yellowish-brown colour. The dimensions of the spicules are:—styli 0.53 × 0.018-0.022 mm.; chelae 0.013-0.015 mm.; sigmata, 0.04-0.06 mm.; trichodragmata 0.074 mm.

The present species is closely allied to *M. grandis* (Gray) Thiele (*Abh. Senckenb. Naturf. Ges.*, XXXIV, p. 337) from the Malay Archipelago. Thiele favours the retention of Gray's name for a sponge which Schmidt called an "Indian *Esperia*" and of which he only figured the chelae. Gray adds no more to our knowledge but gives the name *grandis* to this insufficiently known sponge. To diagnose a species of *Mycale* from the form of one of the chelae seems to us to be introducing unnecessarily an element of ambiguity, and for this reason we propose to abandon Gray's name and to use that proposed by Carter for a sponge in which all the characters are well-known.

*Esperia pellucida* Ridley may possibly be synonymous with *Mycale indica*.

*Localities*.—Mergui (A. Carpenter, 1st April 1886); Ross I., Andamans (12 9' N, 98 73' E, "Investigator" coll.); Snod I., (12 N, 98½ E, Mar. Surv.).

### *Mycale parishii* (Bowerbank).

1875. *Rhaphiodesma parishii*, Bowerbank, *Proc. Zool. Soc. London*, p. 283.  
 1880. *Amphilectus parishii*, Vosmaer, *Notes Leiden Museum*, II, p. 119.  
 1882. *Esperia plumosa*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, IX, p. 299.  
 1884. *Esperia parishii*, Ridley, *Rep. Zool. Coll. H. M. S. 'Alert'* p. 436.  
 1887. *Esperella parishii*, Ridley and Dendy, *op. cit.*, p. 65.  
 1887. *Esperia plumosa*, Carter, *J. Linn. Soc. London*, XXI, p. 72.  
 1888. *Esperella ridleyi* vars. *robusta*, *intermedia*, Lendenfeld, *Sponges Australian Museum*, pp. 211-212, pl. vi.  
 1905. *Esperella parishii*, *plumosa*, Dendy, *op. cit.*, p. 159.  
 1911. *Mycale isochela*, *pectinicola*, Hentschel, *Fauna Südwest Australiens*, III, 10, pp. 297-299, figs. 7-8.  
 1914. *Esperella ridleyi*, Hallmann, *Proc. Linn. Soc. N. S. W.*, XXXIX, 2, p. 402.  
 1916. *Esperella plumosa*, Dendy, *Rep. Govt. Baroda Mar. Zool. Okhamandal*, II, p. 121, pl. i, fig. 4, pl. iii, fig. 19.  
 1924. *Esperella plumosa*, Dendy and Frederick, *J. Linn. Soc. London*, XXXV, p. 503.

That the various species included in the above list of synonyms are closely related is obvious from a mere superficial examination. The only differences between them, in fact, concern the presence or absence of one or more of the categories of microscleres. The differences between *M. plumosa* and *M. isochela*, for example, may be summarised thus: in *M. plumosa* large anisochelae in rosette formation are abundantly present, and the toxae, although sometimes forming toxodragmata, are never modified to form trichodragmata; in *M. isochela*, the large anisochelae and the larger sigmata are absent, and trichodragmata are present in addition to the toxodragmata.

The specimens present in this collection tend to show that such differences as these are unimportant and the two species are synonymous. In the specimen from Pamban for example, a fragmentary sponge with external form very like that of *M. plumosa*, the dermis is crowded with the smaller anisochelae, 0.024 mm. long, scattered toxa and toxodragmata, 0.06 mm. long, toxodragmata and trichodragmata, 0.03 mm. long, and the usual isochelae, 0.012 mm. long. Small sigmata are absent and the rosettes of larger anisochelae occur but rarely. The specimen resembles *M. isochela*, therefore, in the presence of trichodragmata, in the abundance of the smaller anisochelae, and

*M. plumosa* in the external form and in the presence of the large anisochelae. From both species it differs in the absence of the smaller sigmata.

In the specimen from the south portion of Malacca Straits rosettes of large anisochelae, the smaller anisochelae, large sigmata and large toxae occur sparingly. Small sigmata are very rare, and trichodragmata are apparently absent. The external form is similar to that of *M. plumosa*.

From the evidence afforded by these two specimens it is clear that forms intermediate between *M. plumosa* and *M. isochela* may be of common occurrence, and this is exactly what we find in re-examining the specimens described by earlier authors. Of the three specimens described by Dendy (1905) under the name of *M. plumosa*, R. N. 361 differs from *M. isochela* in the presence of large sigmata and occasional large anisochelae. The latter, however, never form rosettes. Trichodragmata are present in considerable quantities. R. N. 298 contains rosettes of large anisochelae, fairly rare small anisochelae and isochelae, abundant large and small sigmata, occasional trichodragmata and no toxae. R. N. 328 has a full complement of microscleres including large and small toxae, and trichodragmata. It is difficult to understand why Dendy should have failed to observe the trichodragmata in these three specimens.

Further, Dendy's specimens from Okhamandal show the same kinds of variation and, without labouring the point, we may assume that any collection of these sponges would show the same individual variations. *M. plumosa* and *M. isochela* represent, therefore, a single species in which the normal spiculation includes large anisochelae, usually in rosettes, small anisochelae, large and small sigmata, large toxae, scattered or in dragmata, small toxodragmata, and trichodragmata, and that from individual specimens one or more of these categories of spicules may be missing.

The little-known *M. parishii* (Bowerbank) possesses the full complement of these spicules and represents the normal, complete state of affairs in the species to which *M. plumosa* and *M. isochela* belong. *M. pectinicola* is an encrusting form of the same species from which the toxae only are missing, and *M. ridleyi* (Lendenfeld), re-described by Hallman (*l. c.*) is also identical with it.

*Localities.*—Pamban, Ramnad Dt. ; South portion of Malacca Straits, (Sherard Osborn, 23rd May 1886).

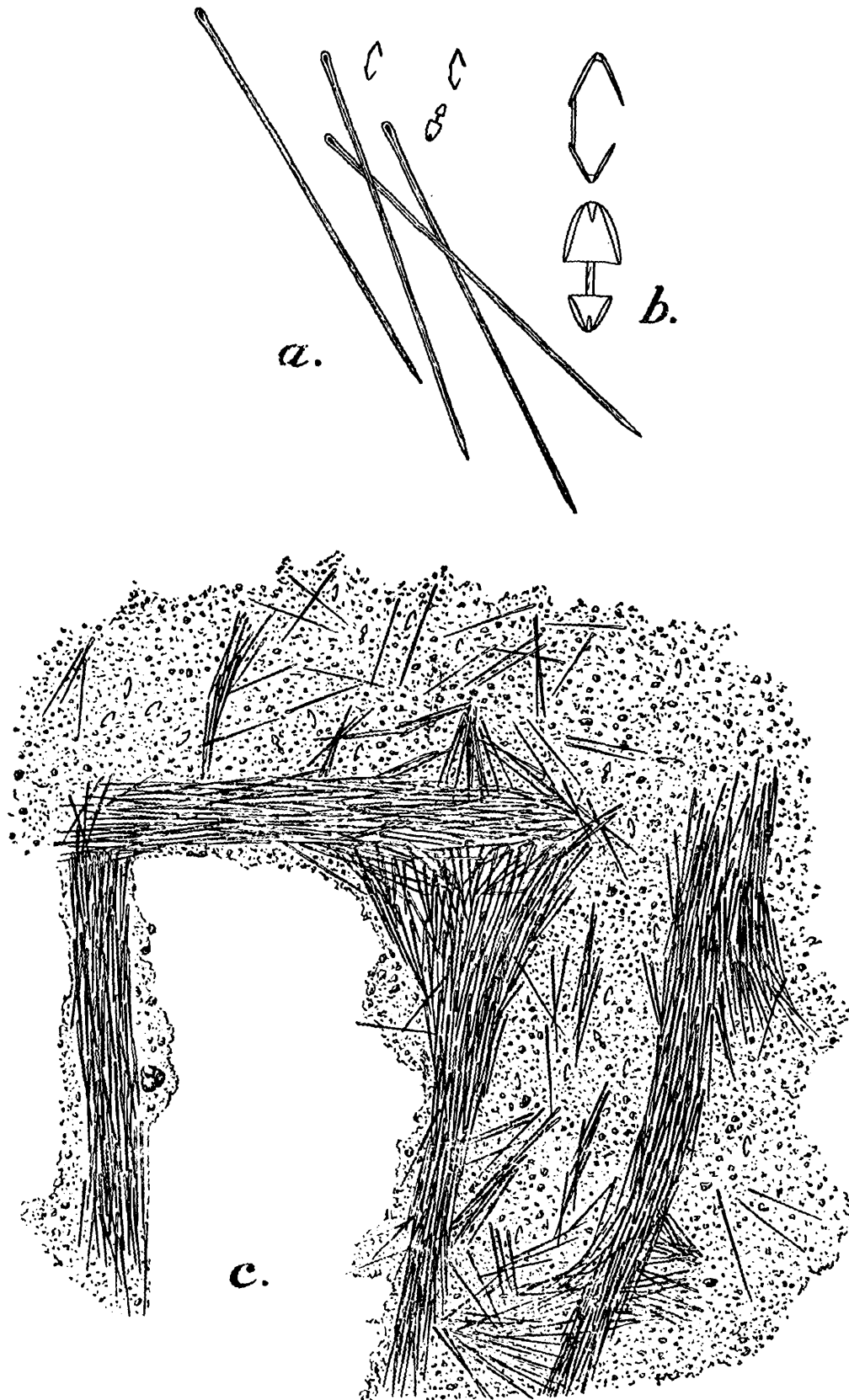
### ***Mycale monanchorata*, sp. nov.**

*Diagnosis.*—Sponge encrusting or massive ; texture soft, compressible ; interior of sponge cavernous ; surface smooth, uneven, bearing spinose processes, representing the projecting ends of the main fibres, about 2 mm. high ; main skeleton a coarse, irregular reticulation of multispicular fibres containing numerous megascleres ; dermal skeleton absent ; megascleres slender subtylostyli,  $0.28 \times 0.004$  mm., microscleres a single sort of anisochela, occasionally occurring in rosettes 0.024-0.036 mm. long.

*Holotype.*—P. 785/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality.*—Kilakarai, Ramnad Dist. (from coral reefs), Madras Presidency.

The holotype is in a most unsatisfactory state consisting as it does of a thin much-damaged crust on a slab of coral. The surface of the sponge is not intact except at one point, a patch of about 20 mm. square. Consequently the characters of the oscules and pores, and of the surface



TEXT-FIG. 6.—*Mycale monanchorata*. a. subtylostyli showing the conspicuous axial canal ( $\times 200$ ); b. anisochela ( $\times 600$ ); c. Skeletal fibres ( $\times 50$ ).

tissues can only be judged with uncertainty. At the same time the species is well-characterised by the possession of a single form of microsclere. The megascleres, too, are of interest. They are very slender, with conspicuous axial canal, and give the impression of being very feebly developed or even vestigial. In the characters of the skeleton fibres and the megascleres the species approaches *Mycale* (*Arenocalina*) *mirabile* (Lendenfeld), a species which is entirely without microscleres, and is distinguished from all other species by the possession of one form of microsclere only.

#### Sub-family MYXILLEAE.

#### Genus *Lissodendoryx* Topsent.

1905. *Lissodendoryx*, Lundbeck, *Danish Ingolf Exped. Porifera*, pt. ii, p. 153.

There is little to add to the remarks of Lundbeck (*l. c.*) concerning this genus, except to draw attention to the fact that *Tedania leptoderma*, the species for which it was originally established, is synonymous with *Halkiondria isodictyalis* Carter. The latter becomes, therefore, the genotype of *Lissodendoryx*.

The question of the value of the shape of the chelae in delimiting genera of the Myxilleae is one on which we do not propose to make any comment, but we accept the genus *Lissodendoryx* in the sense used by Lundbeck.

#### *Lissodendoryx similis* Thiele.

1897. *Lissodendoryx isodictyalis*, Topsent, *Rev. suisse zool.*, IV, p. 456, *nec L. isodictyalis*, Carter, *nec L. isodictyalis*, Dendy, *nec L. leptoderma*, Topsent.

1899. *Lissodendoryx similis*, Thiele, *Zoologica*, XXIV, p. 18, pl. v, fig. 10.

Thiele (*l. c.*) has shown that *L. isodictyalis* as recorded by Topsent and Dendy has no connection with the genotype of that name recorded by Carter from the West Indies. The specimen described by Topsent under this name from Amboina has been referred by Thiele to *L. similis*. This species differs from *L. isodictyalis* Carter chiefly in the dimensions of the spicules, particularly in those of the microscleres.

The four specimens in the present collection belonging to this species are all encrusting, with a thin dermal membrane and scattered vents measuring 1-2 mm. in diameter. The dimensions of the spicules are:—Styli, 0.148-0.164 mm. long, tylota, 0.148-0.177 mm. long; chelae and sigmata, 0.0185-0.022 mm.

*Locality*.—Marble Rocks (11° 33½' N, 98° 20¾' E, 25th December 1886); Jack and Una Is., (Shore collection, Mar. Surv. Stn. 571), Mergui Archipelago.

#### *Lissodendoryx ternatensis* (Thiele).

1882. *Lissodendoryx isodictyalis*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, XVII, p. 52.

1896. *Myxilla isodictyalis*, Dendy, *Proc. Roy. Soc. Victoria*, p. 30.

1899. *Hamigera ternatensis*, Thiele, *Zoologica*, XXIV, p. 18, pl. v, fig. 10.

1929. *Lissodendoryx sinensis*, Brøndsted, *Zool. Anz.*, LXXXI, p. 228, fig. 5.

The specimens described by Carter, and by Dendy from Australia under the names of *Lissodendoryx isodictyalis* and *Myxilla isodictyalis*

respectively are practically identical and agree, moreover, with the sponge described by Thiele from Ternate as *Hamigera ternatensis*. They differ from the holotype of *Lissodendoryx isodictyalis* from the West Indies, in having chelae and sigmata differentiated into two sizes. *Lissodendoryx sinensis* appears to be identical also with these forms.

There is a single representative of this species which differs little from that described by Brøndsted as *L. sinensis*.

*Locality*.—Vizagapatam (12th March 1918), Madras Coast.

### **Kirkpatrickia spiculophila**, sp. nov.

(Pl. XVIII, Figs. 5, 5a.)

*Diagnosis*.—Sponge irregularly massive; surface uneven, sub-meandri form, minutely hispid; large sub-dermal spaces visible beneath a covering of aspiculous ectosome; vents small, scattered; colour, in spirit, greyish yellow; main skeleton an irregular reticulation of long, smooth, slightly curved styli, up to  $0.8 \times 0.021$  mm.; ectosome pierced by stout dermal brushes of oxeote tornota  $0.4 \times 0.008$  mm.

*Holotype*.—P 786/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality*.—Port Blair, Andamans (G. H. Booley, April 1890). W. Andamans, (9945/6)-co-type.

A noteworthy feature of the two specimens, and one which may conceivably prove a specific character, is that they have incorporated the long diactines of Hexactinellida so that one looks, at first, like a *Monorrhaphis*, and the second like a *Rosella* with an incipient root-tuft. The type forms an incrustation,  $55 \times 10 \times 5$  mm. on a spicule 100 mm. long. The co-type is a subspherical mass,  $25 \times 10$  mm., with a number of small diactines at one end.

The present species is closely allied to the only two other species of the genus, *K. coulmani* and *K. variolosa* from the Antarctic, but differs in details of external form and spiculation.

### **Ectyobatzella enigmatica**, sp. nov.

(Pl. XVIII, Fig. 6.)

*Diagnosis*.—Sponge massive with lobose outgrowths, with surface thrown into a number of irregular conulations, or irregularly clathrous, with small digitate processes, and minutely conulose; surface, between conulations, smooth, composed of a thin aspiculous dermis overlying cavernous subdermal spaces; oscules and pores not apparent; colour, in spirit, light brown; skeleton an irregular multispicular reticulation of bundles of tornota, bound together with much spongin and echinated by short smooth styli, with wisp-like columns of tornota running more or less vertically from the outer meshes of the main skeleton to the surface; tornota strongylote or slightly amphitylote, straight, smooth,  $0.175 \times 0.0035$  mm.; styli smooth, thickest at about the lower third of the spicule length,  $0.122 \times 0.006$  mm.

*Holotype*.—P 787/1 Zool. Surv. Ind. (*Ind. Mus.*).

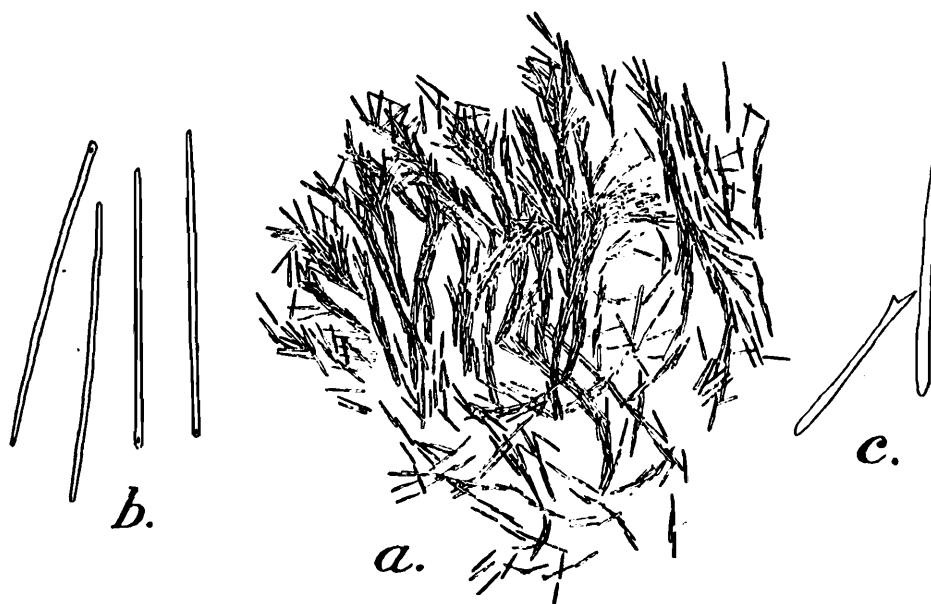
*Locality*.—Nicobar I. (Wood-Mason).

There are two specimens in the collection which are slightly dissimilar in external form, the holotype being massive and the co-type



TEXT-FIG. 7.—*Ectyobatzella enigmatica*. main skeletal fibres consisting of tornota and styles ( $\times 30.6$ ).

clathrous. Both, however, agree in spiculation. The dominant spicule is the strongylote, whose ends may occasionally become tylote, the styli being comparatively scarce. The fact that the ends of the strongyla may become tylote suggests that the spicules may be included



TEXT-FIG. 8.—*Ectyobatzella enigmatica*. a. wisp-like surface columns of tornota from the outer meshes of the main skeleton ( $\times 30$ ); b. tornota; c. echinating styles (both  $\times 146$ ).

in that category known as tornota, and that the genus belongs, therefore, more properly to the Myxillae. The nature and disposition of the echinating styli suggests nothing more than that the genus belongs to the Ectyoninae. Provisionally, therefore, we regard it as a primitive member of the Myxillae.

It is probable that the genus *Batzella*, to which the present genus appears to be related, should also be included in the Myxillae.

### **Psammochela elegans** Dendy.

(Pl. XVIII, Fig. 7.)

1916. *Psammochela elegans*, Dendy, *Rep. Govt. Baroda Mar. Zool. Okhamandal*, p. 126, pl. i, fig. 6, pl. iii, fig. 22.

The present specimen resembles the holotype closely except in the external form. It forms a thin incrustation on the shell of an oyster and a Gorgonian, and associated with a Polyzoan. The spicules are fairly typical, the only difference being in the size of the microscleres which are tridentate chelae, 0.018-0.027 mm., C-shaped chelae 0.005-0.011 mm., and sigmata 0.005-0.033 mm.

*Locality*.—Off the N. coast of Table I., Cocos group (Dec., 1888), Mergui Archipelago (16 fms.).

In Dendy's description of this species there are several fundamental errors. In the first place, the small isochelae have been treated as vestigial when it would be more in conformity with the generally accepted views on the phylogeny of Sponges to regard them as primitive or rudimentary. Secondly, the mere presence of sand has been allowed to outweigh all other characters in considering the affinities of the genus. The ease with which sponges of most families are able to incorporate sand grains or foreign spicules in their skeletons is well-known, and is obviously of little taxonomic significance. Thirdly, it seems fallacious to include *Desmacidon psammodes* Hentschel in the same genus. This species belongs evidently to the Isodictyeae and forms one of the links between that group and the Gelliinae, making a close approximation to *Gellius bidens* Topsent.

*Psammochela elegans* Dendy cannot be placed anywhere but with the Myxillae, and the genus itself differs from *Myxilla* chiefly in the absence of dermal tornota. It is important to notice that *Desmacidon reptans* Ridley and Dendy shows many of the characters of *Psammochela elegans*, differing chiefly in the possession of oxea instead of styli. With our present conceptions of the classification of the Desmacidonidae this is of fundamental importance, and any attempt to include *Desmacidon reptans* and *D. psammodes* in the genus *Psammochela* would result in upsetting the present foundations of the group.

### Sub-family CLATHRIEAE.

#### **Clathria lendenfeldi** Ridley & Dendy.

1886. *Clathria lendenfeldi*, Ridley & Dendy, *Ann. Mag. Nat. Hist.*, Ser. 5, XVIII, p. 474.

1886. *Clathria inanchorata*, *id.*, *op. cit.*, p. 475.

1887. *Clathria lendenfeldi*, *id.*, *Rep. Challenger, Monaxonida*, XX, p. 148, pl. xxviii, fig. 5, pl. xxix, fig. 6, pl. xlvii, fig. 5,

1887. *Clathria inanchorata*, *id.*, *op. cit.*, p. 150, pl. xxviii, fig. 4, pl. xxix, fig. 13.  
 1901. *Echinonema anchoratum* var. *lamellosa*, Whitelegge, *Rec. Austral. Mus.*, IV, p. 82.  
 1907. *Microciona clathrata*, *id.*, *op. cit.*, p. 493, pl. xlvi, fig. 38.  
     *Clathria lendensfeldi*, *id.*, *op. cit.*, p. 494.  
     *Clathria inanchorata*, *id.*, *op. cit.*, p. 495.  
 1912. *Clathria spicata*, Hallmann, *op. cit.*, p. 210.  
     *Clathria coelata*, *id.*, *op. cit.*, p. 212, pl. xxxi, figs. 4-43.  
     *C. costifera*, *id.*, *op. cit.*, p. 215, pl. xxxi, figs. 2-44.  
 1921. *C. spicata*, Dendy, *op. cit.*, p. 65, pl. v, fig. 2, pl. xiii, fig. 4.  
 1921. *C. whiteleggei* *id.* *op. cit.* p. 67, pl. vii, fig. 1, pl. xii, fig. 5.

There are five specimens in the present collection bearing so strong a resemblance in external form and in the arrangement of the skeleton that there can be practically no doubt as to their being conspecific. They are all of low growth, either encrusting or, more commonly, consisting of a basal crust from which arise irregular laminae or clavate branches. The surface in all cases is produced into irregularly-arranged blunt processes. The skeleton consists of an irregular reticulation of horny fibres in which the principal megascleres are arranged in a plumose manner, with their ends frequently protruding at the surface of the fibre, or are actually echinating the surface of the fibre. It is, in fact, the type of skeleton described by Dendy for *C. spicata* and by Hallmann for *C. coelata*, and described by the latter (1912, p. 215) as the *spicata*-group. Despite the similarity between the present specimens in most respects, there are, nevertheless, striking differences in certain details of the spiculation: All the specimens described below are from the Pearl Oyster Banks, Tuticorin:—

1. Styli smooth, occasionally basally spined 0.3 mm. long; subtylostyli 0.24 mm. long; acanthostyli 0.08 mm. long; chelae 0.016-0.02 mm. long; toxa 0.03-0.12 × 0.004 mm.
2. Styli smooth, 0.21 mm. long; subtylostyli 0.24 mm. long; acanthostyli 0.06 mm. long; chelae very rare, 0.016 mm. long; toxa not seen.
3. Has smooth styli, rare chelae and toxa as in No. 1.
4. Has rare hair-like toxa instead of stout toxa.

The example from the Ganjam Coast ("Golden Crown" Coll.) has basally tuberculate styli 0.4 mm. long; subtylostyli 0.4 mm. long; acanthostyli 0.12 mm. long; chelae 0.016 mm. long; toxa hair-like, 0.16 mm. long.

It is clear, therefore, that these five specimens represent a species which may have the principal styli smooth, basally-spined, or basally-tuberculate; that the chelae or the toxae may be rare or absent; and that the toxae may be one of two kinds, stout and bow-shaped, or hair-like and with the arms nearly parallel.

The question next arises as to how such a species compares with the closely related species already described. Here it becomes clear that several apparently well-marked species must be treated as synonymous.

*Microciona clathrata* Whitelegge differs from the present specimens in that the sponge is stipitate and the tubercles of the surface are produced into blunt spinose processes. The spiculation differs little from such a form as our No. 1 from Tuticorin Pearl Oyster Bank, and the

external form, except for the stalk, is practically identical with that of the example from Ganjam.

*Clathria coelata* Hallmann is again stipitate, with the spiculation similar to that of No. 1 from Tuticorin, but the external form is merely a modification of that of *Microciona clathrata* or of any of the present specimens. If, for example, we again imagine one of the lamellae of the present specimens mounted on a short stalk, with the surface processes more numerous and more closely set, we have a form almost exactly identical with that of *C. coelata*.

*Clathria whiteleggei* Dendy has spiculation like that of our example from Ganjam, and an external form whose counterpart is occasionally seen as in No. 2 from Tuticorin, the largest of the present specimens, when the laminae become broken up, anastomosing and clathrous.

In the holotype of *C. spicata* the sponge is flabelliform and the surface tuberculations are replaced by irregular ridges, the whole being obviously a modification of such a form as that of *C. coelata*. The spiculation is similar to that of the specimen from Ganjam.

*Clathria costifera* Hallmann does not appear to differ materially from *C. spicata*.

*Clathria lendenfeldi* has chelae 0.016 mm. long, not 0.005 mm. as stated by Ridley and Dendy, has rare toxae, and is clearly conspecific with our present specimens, while *C. inanchorata* appears to stand in a similar relation, but has a much reduced spiculation as regards the microscleres.

To those unacquainted with the actual specimens representing the species discussed above, it may appear extravagant to regard them all as conspecific, but actually to handle the specimens and compare them leaves little doubt that such is the case. Short of lengthy and tiresome descriptions of details, and numerous illustrations, it is not possible to set forth convincing arguments in favour of such a view, and this is impracticable at the moment. Nevertheless, experience has shown us, that, unless we are to continue to recognise small spicular and morphological differences as of specific significance, which course can only result in greater chaos than at present prevailing, we must, in the genus *Clathria*, at all events, accept a much more liberal conception of the term "species." Particularly is this so, as regards the microscleres. These spicules can so easily disappear, or be modified, that their value in the limitation and diagnosis of species is, in cases, almost negligible. Specific differentiation must, we are convinced, rest more and more on the arrangement of the megascleres and the details of external form.

### ***Clathria indica* Dendy.**

(Pl. XVIII, Figs. 8, 9.)

1889. *Clathria indica*, Dendy, *op. cit.*, p. 73, pl. iv, fig. 10.

1905. *Clathria indica*, Dendy, *op. cit.*, p. 171.

The species is represented by several complete specimens and a number of fragments. All are of essentially the same form, namely erect and flabellate, composed of a number of branching and anastomosing, more or less cylindrical, processes.

*Localities.*—Pearl Oyster banks, 12 miles off Tuticorin, Gulf of Manaar (H. S. R., 1926). 2-3 miles S. W. of Cape Comorin, 38 fms.

The characteristic feature of the species is the absence of coring spicules, the irregular fibres composing the main skeleton being without spicules other than the acanthostyli echinating them. The auxiliary spicules are short, slender styli, peculiarly shaped at the base. Microscleres appear to be invariably absent.

### **Tenacia frondifera** (Bowerbank).

1875. *Halichondria frondifera*, Bowerbank, *Proc. Zool. Soc. London*, p. 288.

1889. *Clathria corallitincta*, Dendy, *Ann. Mag. Nat. Hist.*, Ser. 6, III, p. 85, pl. iv, fig. 8.

1898. *Rhaphidophlus ridleyi*, Lindgren, *Zool. Jahrb.*, XI, p. 310, pl. xvii, fig. 8; pl. xviii, fig. 14; pl. xix, figs. 17a-d.

1899. *Rhaphidophlus seriatus*, *R. erectus*, *R. topsenti*, Thiele, *Zoologica*, XXIV, pp. 14 & 15, pl. i, fig. 6; pl. v, fig. 7; pl. ii, figs. 2, 3.

*Diagnosis.*—Sponge massive and clathrous, sub-ramose, irregularly ramose, or erect and tree-like; surface may be smooth, meandrine or irregularly tuberculate; vents not apparent; skeleton composed of irregularly isodictyal network of spongin fibres cored by several lines of smooth styli and echinated by acanthostyli, auxiliary spicules subtylostyli of two sizes, larger occurring interstitially, smaller as dermal skeleton; microscleres chelae and toxae, one or both of which may be more or less completely divided into two categories.

Coring styli 185-300  $\mu$  long, 10-15  $\mu$  thick.

Interstitial subtylostyli 200-300  $\mu$  long, 6-10  $\mu$  thick.

Dermal subtylostyli 68-200  $\mu$  long, 3-8  $\mu$  thick.

Acanthostyli 70-75  $\mu$  long, 7-8  $\mu$  thick.

Chelae 13-16  $\mu$  long.

Toxae 200  $\mu$  long.

In his report on the "Sealark" sponges, Dendy has suggested that he is "not at all sure that the distinction between this species (*Clathria corallitincta*) and *Clathria procera* can be maintained, and both may be merely varieties of *C. frondifera*." This is not the case. While *T. frondifera* and *C. corallitincta* are obviously synonymous, *C. procera* differs in an important respect from both. While the rest of the spiculation is the same in both cases, the coring spicules of *Tenacia frondifera*, as it should be called, are short, stout, slightly curved styli, those of *T. procera* are comparatively long, slender subtylostyli, often bearing a crown of spines at the base, resembling very closely the auxiliary spicules, both interstitial and dermal. This difference is so striking and constant as to give an unmistakable means of distinguishing the two species even from hand-sections of individuals belonging to them.

*T. frondifera*, as exemplified by the present specimens, is very variable in external form. The spiculation varies little except in so far as the dimensions of the spicules are concerned, and even this variation is shown to a striking degree only in the microscleres. The chelae, for example, may be, in one individual, of a tolerably constant length,

(as in the example from Tuticorin where they are 0.01 mm.) or they may vary between differing limits of size (from 0.012-0.016 mm., to 0.009-0.016 mm. as in the example from Pt. Pedro, Palk Straits). In the specimen from M. S. Sta. 593 the chelae measure up to 0.02 mm. long. In some individuals they are so rare as to be virtually absent. The toxae show even more striking variations. In the specimen from Pt. Pedro there are short toxae, 0.037 mm. long, and long hair-like toxae 0.014 mm. in length often associated in bundles with occasional intermediate forms. In the example from Tuticorin the only toxae present, and these are very rare, measure 0.04 mm. in length. In general, it may be said of the toxae that they normally vary between 0.04 and 0.14 mm. in length; that they occasionally appear to be divisible into two distinct categories, that in one individual the short toxae only may be present, and in another, mainly long toxae are present.

The external form varies between irregularly clathrous and bushily ramose, with long cylindrical branches. But a more detailed consideration of the external form will be given in correlation with the following comparison between *T frondifera* and other closely related species described from the Indo-Pacifico-Australian area.

The spiculation consists, typically, of smooth, slight curved styli, coring the fibres, measuring 0.24 mm. long; auxiliary interstitial subtylostyli 0.23 mm. long; auxiliary dermal subtylostyli 0.16 mm. long; acanthostyli, spined more particularly at the base, and in the upper half (Cf. Dendy 1889, pl. iv, fig. 8d) 0.07 mm. long; chelae varying between 0.008 and 0.02 mm. long; toxa varying between 0.04 and 0.14 mm. long.

*Rhaphidophlus ridleyi* Lindgren differs from the type species in the apparent absence of toxa and in the shape of the acanthostyli (Cf. Lindgren 1898, pl. xix, fig. 17c). These latter have blunt apices instead of the typical sharply pointed apices. At the same time, the example from Cinque I., Andamans with external form and the rest of the spiculation almost identical with the holotype of *T. frondifera*, has acanthostyli identical with those of *Rhaphidophlus ridleyi*. Moreover, although the toxae may be very rare, it is doubtful whether they are entirely absent. In this respect, Lindgren's species is like the specimen from M. S. Stn. 655 in which neither chelae nor toxae could be found, although in all other respects the sponge is typical of *T. frondifera*. In external form, *R. ridleyi* makes a near approach to our specimens from Tuticorin.

*Rhaphidophlus seriatus*, *R. erectus* and *R. topsenti*, all three erected by Thiele must be regarded as representing a single species. All agree closely in spiculation with one another and with *T. frondifera*. *R. erectus* and *R. topsenti*, like *R. ridleyi* Lindgren represent the ramose form, and *R. seriatus* resembles strongly the clathrous form of *T. frondifera*.

*R. filifer* var. *spinifera*, in which Lindgren failed to record the dermal subtylostyli, agrees closely with the typical form of *T. frondifera* in spiculation, and with our specimens from Cinque I. and Pt. Pedro in external form.

*R. reinwardti* var. *subcylindrica* Ridley agrees with *R. erectus* Thiele in representing, almost certainly, a "metamp (Bidder)<sup>1</sup> or "tropus" (Vosmaer)<sup>2</sup> of *T. frondifera*.

*Clathria nuda* Hentschel agrees in spiculation with the typical form of *T. frondifera* and with our Tuticorin specimen in external form.

*Clathria frondifera* var. *dichela* Hentschel agrees so closely with the holotype, except in the matter of the chela, that one must assume that it represents merely a slightly unusual form in which the chelae have become differentiated into two categories, with possible intermediates. Similar cases have been found among the present specimens, so that this division of the chelae into categories implies probably no more than that it is the result of a slightly unusual variation, at the most.

*C. frondifera* and *C. frondifera* var. *major* Hentschel differ only in the dimensions of their spicules, a totally negligible feature in the light of the present studies. In external form they resemble closely our specimens from M. S. Stas. 655 and 528.

Although Whitelegge's species are but inadequately known it is possible that *Clathria tenuifibra*, *C. calopora* and *C. multipora* are also synonyms of *T. frondifera*. In external form the first and third of these resemble to a remarkable degree the dry specimen included in our collection (282.i.). According to Hallmann *C. multipora* is a *Tenacia*, although Whitelegge only described one form of auxiliary subtylostyle. Assuming that he erred in the same way with the other two species of Whitelegge, there is no reason to believe that all the three species should not be regarded as synonyms of *C. frondifera*.

It is also probable that *Rhaphidophlus* (*Spongia*) *cratitius*<sup>3</sup> and *Clathria ulmus*<sup>4</sup> Vosmaer, species very imperfectly known, may represent examples of the clathrous and ramose forms of *T. frondifera* respectively.

*Localities.*—Pearl Oyster Banks, Tuticorin (H. S. R., Feb., 1926); Kilakarai, Ramnad Dt., Madras Presidency; Pt. Pedro, Palk Straits; (M. S. Sta. 655) N. side of Fuladu I., Goifurfehendu atoll (on reef, 10th December 1923); Paway I., 11° 25' N., 98° 31' E. (Feb.-March 1914); Elphinstone I., Port Maria, Mergui Archipelago (6-12th April 1913), Surf line off Rutland I., Andamans (Dr. Giles Coll., 1887); Mergui Archipelago (16 fms.); Andamans (J. Woodmason).

### **Tenacia robusta** (Dendy).

1921. *Microciona strepsitoxa*, Hope var. *robusta*, Dendy, *op. cit.*, p. 60.

The single specimen is practically identical with Dendy's specimen in all respects, and it is tolerably certain that neither of them has any relation to Hope's species from the British Isles.

In its basal portions, the main skeleton of this species has the appearance of a typical *Hymedesmia*, but in the upper portions it shows clear indications of the arrangement found in *Tenacia*. The dermal skeleton, the interstitial auxiliary spicules, and the microscleres, too, are those

<sup>1</sup> *Journ. Mar. Biol. Assn., Plymouth*, VI, p. 381 (1902).

<sup>2</sup> *Siboga Expeditie, Ponfera*, p. 26 (1911).

<sup>3</sup> Esper, *Forts. d. Pflanzenhier.*, I, p. 195, pl. liii (1797).

Ehlers, *Die Espers. Spong. Zool. Samml. K. Univers. Erlangen*, p. 18 (1870).

<sup>4</sup> Vosmaer, *Notes from the Leyden Museum*, 11, p. 151 (1880).

of *Tenacia*. Moreover, the spiculation, as a whole, is practically identical with that of *Clathria whiteleggei* Dendy (= *C. lendenfeldi*) which suggests that the species is the juvenile form of *C. lendenfeldi* and that the dermal skeleton, and other features characteristic of *Tenacia*, are primitive characters which all species of *Clathria* may possess at some time or other in their life, but which in those species we refer to *Tenacia* remain throughout life. Should this prove to be the case, and this can only be proved by a closer study of the young forms, it would be necessary to merge *Tenacia* in *Clathria*.

That the species should ever have been referred to *Microciona* shows the inadvisability of laying stress on the encrusting habit as a generic character.

*Locality*.—Tana Murah Besar, Singapore I., (Annandale, 22nd December 1915).

### ***Tenacia procera* (Ridley).**

1921. *Clathria procera*, Dendy, *op. cit.*, p. 64, pl. ii, figs. 6.

The difference between the present species and *T. frondifera* has already been pointed out in dealing with the latter. The present specimens show both the clathrous and the ramose forms, with a few forms intermediate between the two.

In addition to those synonymous with this species, given by Dendy (1921, p. 64), there are others which may be justifiably included. *Rhaphidophylus arborescens* differs in no important respect from the holotype of *T. procera*, although Ridley's description of the former suggests otherwise, nor does *Clathria reinwardti* var. *palmata* Ridley.

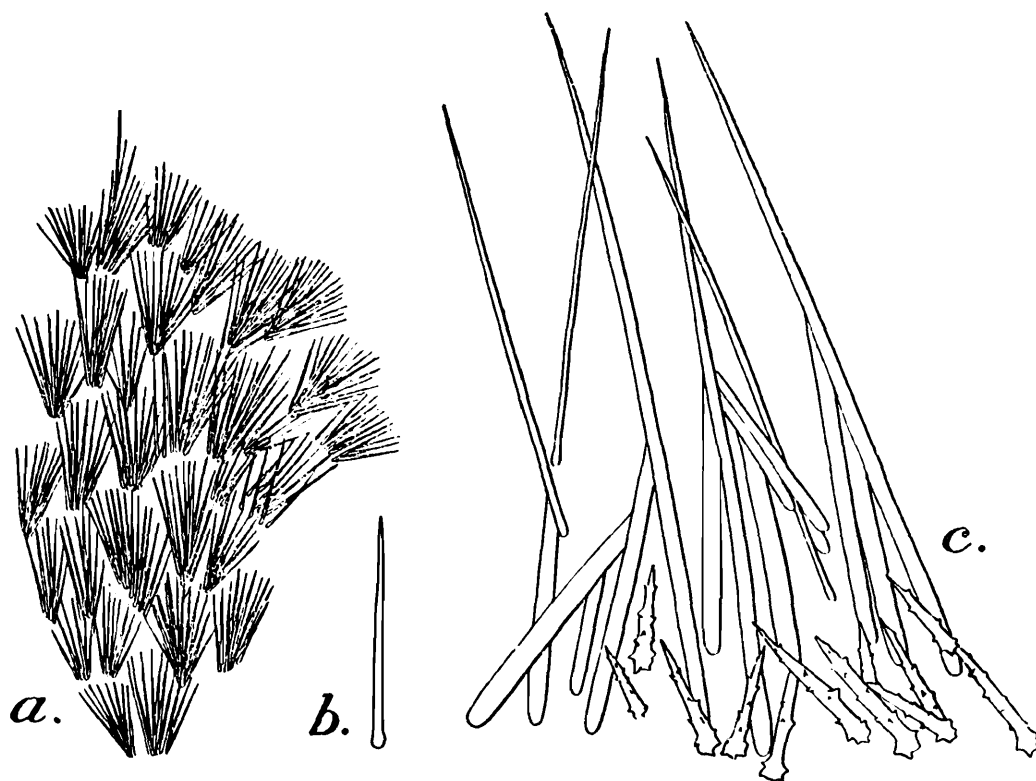
*Spongia cactiformis* Lamarck is probably identical with the clathrous form of the species, but of this we cannot yet be certain. Should this prove to be identical, it would be necessary to change the specific name but, at present, it is extremely doubtful that *T. procera* and Lamarck's species are conspecific, and consequently no change in the name is admissible.

*Localities*.—Pearl Oyster Banks, Tuticorin (H. S. Rao, Feb.-March 1926); Tholayiram Par, Tuticorin (J. Hornell); 2-3 miles S. W. of Cape Comorin (38 fms., Armstrong Coll., 13th January 1884); Pt. Pedro, Entrance to Palk Straits (Mar. Surv. 1893-94); Arabian Sea (13° 44' N., 72° 6' E., 15th January 1895—28 fms.).

### ***Tenacia micropunctata*, sp. nov.**

*Diagnosis*.—Sponge thinly encrusting, about 2 mm. thick; surface smooth, minutely punctate; vents probably represented by occasional rounded apertures; colour, in spirit, white; choanosome cavernous, traversed by numerous, compressed, transverse canals; skeleton composed of a basal layer of acanthostyli from which columns of spicules extend upwards to surface to end in a dense layer of brushes of small subtylostyli set at right angles to surface; columns formed in basal half of smooth, comparatively stout styli and in upper half of slender subtylostyli; microscleres absent.

*Remarks.*—The dimensions of the spicules are:—acanthostyli,  $0.074 \times 0.005$  mm.; styli,  $0.015$  to  $0.024 \times 0.008$  mm.; long subtylostyli of main columns,  $0.026 \times 0.008$  mm.; short subtylostyli of dermal brushes,  $0.074 \times 0.004$  mm.



TEXT-FIG. 9.—*Tenacia micropunctata*. a. surface brushes of tylostyles ( $\times 30.6$ ); b. a single tylostyle from the surface brush ( $\times 146$ ); c. basal layer of acanthostyles from which columns of stout styli and slender subtylostyli arise ( $\times 146$ ).

The types of spicules present show this sponge to be a fairly typical *Tenacia*, although the arrangement of the skeleton is that of a *Hymedesmia*. This is but one instance of the many which tend to show that both the genus *Hymedesmia* and the group Hymedesmieae are founded on a false assumption. We shall probably find, eventually, that all species of Ectyoninae have the habit and form of a typical *Hymedesmia* during the stage immediately following the metamorphosis.

*Holotype.*—P 788/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality.*—Pearl Oyster Banks, 12 miles off Tuticorin (9-10 fms., H. S. R. Feb.-Mar. 1926).

### ***Isociona tuberosa* (Hentschel).**

1909. *Lissodendoryx tuberosa*, Hentschel, *Fauna Südwest-Australiens*, Jena, III, p. 326.

1911. ? *Clathria hartmeyeri*, *id.*, *op. cit.*, p. 379.

1919. *Isociona tuberosa*, Hallmann, *Proc. Linn. Soc. N. S. Wales*, XLIV, p. 768.

The single specimen is clathrous, composed of a number of irregular, anastomosing lamellae. The arrangement of the skeleton is practically the same as that of *Isociona tuberosa* but there are, in addition, occasional smooth subtylostyli such as are found in *Clathria hartmeyeri*.

It is extremely probable that *Lissodendoryx tuberosa* is an encrusting form of *Clathria hartmeyeri*. The main differences between them, apart from differences in external form, are that there is more spongin in the latter, and that the former does not appear to possess the smooth

subtylostyli (fig. 50*b*, Henstchel, *l. c.*, p. 379). The first point is negligible and as regards the second, it may be said that these spicules are not numerous and appear to be modified forms of acanthostyli.

*Locality*.—Ganjam Coast, Madras Pres. ("Golden Crown" coll., March, 1909.)

### Genus *Raspailia* Schmidt.

1862. *Raspailia*, Schmidt, *Spongien. Adriat. Meer.*, p. 59, pl. v, figs. 11-13.  
 1905. *Raspailia*, Pick, *Arch. Naturg.*, i, pp. 1-46, 4 pls.  
 1911. *Raspailia*, Hentschel, *Faun. Südwest-Austral.*, III, p. 381.  
 1921. *Raspailia*, Wilson, *Elisha Mitchell Sci. Soc. Chapel Hill*, XXXVII, pp. 54-60.

The position of the genus among the Ectyoninae and its history, with a bibliography and a list of species, are given by Pick (*l. c.*). An emended definition of the genus, making it more comprehensive than before, is suggested by Wilson (*l. c.*).

### *Raspailia viminalis* Schmidt.

1862. *Raspailia viminalis, freyeri, stelligera*, Schmidt, *op. cit.*, p. 59.  
 1905. *Raspailia viminalis, freyeri*, Pick, *op. cit.*, pp. 7, 30, pls. i-iv.

The two specimens are both from the Bay of Bengal, the one from Cinque I., and the other from the coast off Puri. The former consists of a branched anastomosing colony, at present somewhat broken into fragments, with a strongly hispid surface. The latter is entire and consists of an elaborately branching and anastomosing stock, 230 mm. high and about as broad, surmounting a stalk about 20 mm. in diameter. The surface is less hispid and there are several minute circular openings on the surface.

*R. stelligera* Schmidt is based on an incrustation of a foreign sponge on *R. viminalis*. We consider *R. freyeri* to be identical with the present species, although Pick regarded it as a separate species.

### *Raspailia tenuis* Ridley and Dendy.

1887. *Raspailia tenuis*, Ridley and Dendy, *op. cit.*, p. 189, pl. xxxix, fig. 2, pl. xl, fig. 8.

The single specimen forms a thin incrustation on the shell of a *Nassa*, spreading over the greater part of the convex side of the shell, from the centre of which arise the erect columns. These columns divide into three branches, and these again repeatedly branch and anastomose. The extremities of the branches are pointed. The height of the whole specimen is 50 mm., and the colour, in spirit, pale yellow. The structure of the skeleton agrees closely with that of the holotype, and the spiculation differs only in the comparative rarity of the slender strongyla.

*Locality*.—Indian Seas—Details of the locality are wanting.

### *Protoraspailia*, gen. nov.

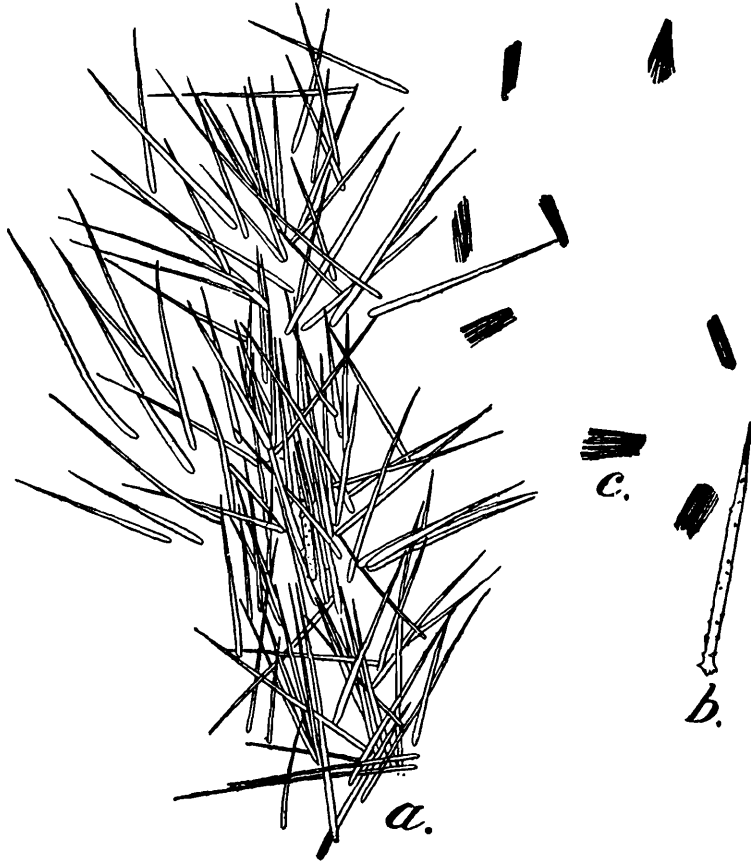
*Genotype*.—*Protoraspailia cactoides* sp. nov.

Ectyoninae in which the main skeleton consists of plumose columns of long smooth styli passing vertically towards the surface, echinated by sparingly spined acanthostyli; no special dermal skeleton; microscleres trichodragmata.

**Protoraspailia cactoides**, sp. nov.

(Pl. XVIII, Fig. 10.)

*Diagnosis.*—Sponge erect, cactiform, consisting of a stout stem from which springs a number of slender cylindrical branches which frequently coalesce; surface coarsely hispid; oscules and pores not apparent; colour, in spirit, brown; skeleton composed of plumose



TEXT-FIG. 10.—*Protoraspailia cactoides*. a. one of the plumose columns of the main skeleton ( $\times 23$ ); b. echinating acanthostyle; c. trichodragmata ( $\times 110$ ).

columns of long smooth styli, passing on occasionally into tylostyles, variable in size upto  $0.85 \times 0.016$  mm., passing vertically to the surface, and sparsely echinated by sparingly spined acanthostyli  $0.140$  mm. long; microscleres abundant trichodragmata measuring  $0.048$  mm. long, and  $0.008-0.020$  mm. thick.

*Holotype.*—P 789/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality.*—Round I., ("Investigator" coll. Col. R. B. S. Sewell).

While this genus is regarded as belonging to the Ectyoninae, it has much in common with the members of the Axinellinae and it must be regarded as constituting a link between these two groups.

**Acanthostylotella**, gen. nov.

Genotype—*Stylotella cornuta* Topsent.

Ectyoninae in which the skeleton is composed of a mixture of smooth styli, or sparingly spined acanthostyli, arranged in an irregular or sub-isodictyal reticulation.

**Acanthostylotella cornuta** (Topsent).

1897. *Stylotella cornuta*, Topsent, *Rev. Suisse Zool.*, IV, p. 464, pl. xxi, fig. 32.

The single specimen is a large massive sponge, with irregularly conulose surface, without visible oscules. The colour of the interior, in spirit, is light brown, the surface almost black. The details of the skeleton are almost obscured by abundant, large deeply-pigmented cells. In boiled out preparations, it is seen that the only spicules present are smooth styli, or styli bearing one or a few spines near the base, and some with a few spines near the apex also. According to Topsent these styli "peuvent difficilement passer pour des acanthostyles", but if we regard them as styli and retain the species in *Stylotella*, the chief character will tend to be obscured. The better course seems to be to regard them as incipient acanthostyles, and to regard the genus as a member of the Ectyoninae, with affinities to the Axinellinae.

The spicules in the present specimen measure only  $0.280 \times 0.008$  mm. as against  $0.320 \times 0.018$  mm. in the holotype. Despite this, however, there can be little doubt as to the accuracy of our determination, since the two specimens agree so well in all details but the dimensions of the spicules.

*Locality*.—(Mar. Surv. Sta. 640.) Bay between Huludu and Heratera Is., Maldives (shore of reef-flat, 6th March 1923).

A second very fragmentary specimen from Galle, off Ceylon appears to be very like the holotype in external form, while the spicules, measuring  $0.350 \times 0.014$  mm., are mostly smooth styli, with which are associated styli, bearing one or, at the most, two spines at the base.

**Microciona prolifera** Verrill.

1919. *Microciona prolifera*, George and Wilson, *Bull. Bureau Fish.*, XXXVI (1917-18), p. 157, pl. LXII, figs. 31, 33; pl. LXIII, figs. 35, 36; pl. LXVI, fig. 57a-e.

There are two specimens in the collection. The first agrees almost exactly with the description of George and Wilson in external form and spiculation. The second specimen is associated with a calcareous alga, on whose branches it appears to be encrusting. In this specimen, correlated no doubt with its habit, the skeleton differs from that of the first specimen in that the main fibres are more regular, running vertically to the surface and the secondary fibres are completely aspiculous.

*Locality*.—21 miles S. W. W. of Mangalore, Arabian Sea (31 fms.). Off Karwar, Arabian Sea (Carpenter, Oct. 1885, 29 fms.).

**Microciona atrosanguinea** Bowerbank.

1864. *Microciona atrosanguinea*, Bowerbank, *op. cit.*, p. 188, pls. xxxiii, fig. 368, xxxiv, fig. 369.

1921. *Microciona atrosanguinea*, Dendy, *op. cit.*, p. 60, pl. 13, fig. 1 a-e.

In the series of specimens before us from various localities on the Indian and Burmese coasts we have a complete range of variation in external form and spiculation occurring in the genus. It is doubtful whether the numerous species ascribed to this genus are distinct from one another. The spicular categories seem to vary so much in the

degree and extent to which spines are developed on the styli and in the size and form of the toxa and chela that it is extremely difficult to distinguish the different species.

*Localities.*—Kilakarai, Ramnad Dist. (Coral reefs, S. W. K., Feb., 1913) (Colour in life "bright vermilion"); Puri coast, Bay of Bengal ("Golden Crown"); Off Cape Negrais, Burma (Mar. Surv. Sta. 384, 40 fms., Feb., 1909); Varkalay sea-shore, Travancore (Arabian sea, Nov. 1908), from living shell of *Melongenella bucephala*; Off Karwar, Arabian sea (Carpenter, Oct. 1885, 29 fms.); 26 miles W. S. W. of Honnavar, Arabian sea (May 1888, 29 fms.).

### **Aulenella**, gen. nov.

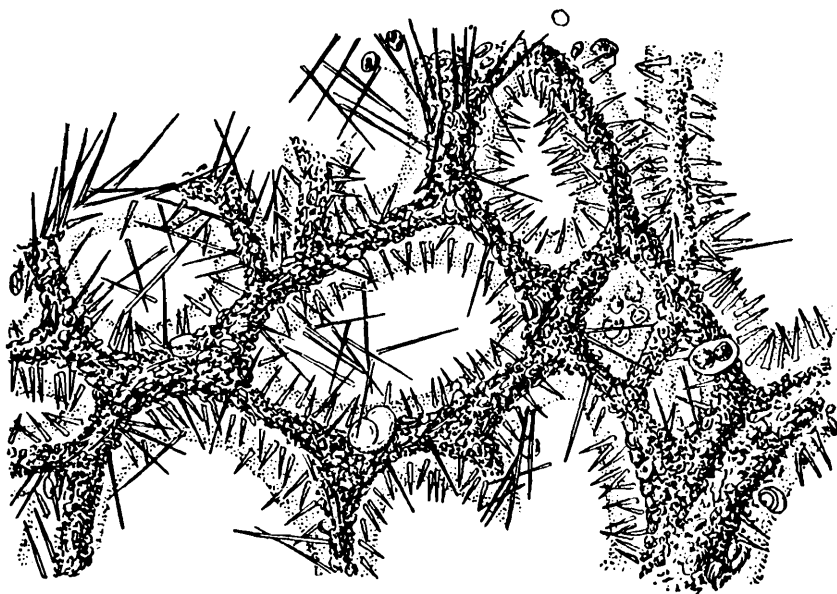
Genotype-*Aulenella foraminifera* sp. nov.

Clathriæ in which the body of the sponge is composed of a mass of anastomosing trabeculae; main skeleton an irregular reticulation of spongin fibre, cored by animal or mineral debris and echinated by acanthostyli and basally tuberculate styli; auxiliary spicules slender subtylostyli; special dermal skeleton absent; microscleres palmate isochelae.

### **Aulenella foraminifera**, sp. nov.

(Pl. XVIII, Fig. 11.)

*Diagnosis.*—Sponge flabello-digitate, formed of a mass of small honey-comb trabeculae; surface minutely hispid; vents few, scattered, 1-1.5 mm. in diameter; colour, in spirit, greyish-yellow; skeleton an irregular reticulation of spongin-fibres cored by a more or less continuous axis of foreign particles, chiefly the tests of Foraminifera, and



TEXT-FIG. 11.—*Aulenella foraminifera*. A portion of the main skeleton ( $\times 30.6$ ).

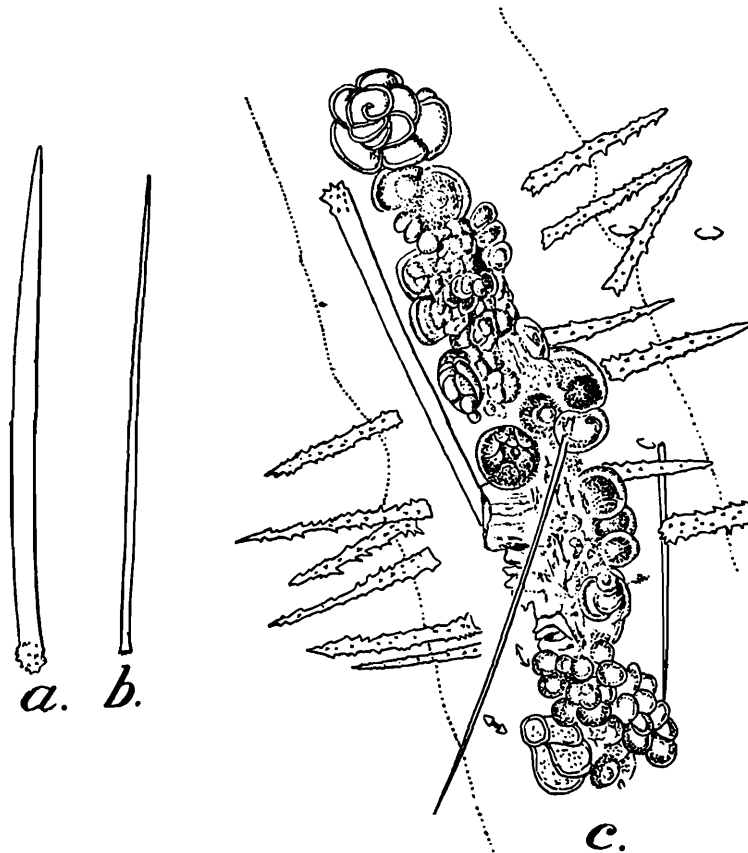
echinated by numerous acanthostyli and by occasional, basally tuberculate tylostyli; auxiliary spicules straight, smooth subtylostyli; special

dermal skeleton absent, though the surface, in places, appears to be echinated by acanthostyli where the fibres are close to the surface.

*Holotype*.—P 790/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality*.—Gaspar Straits (T. S. Gardiner).

The form and size of the spicules are : (1) basally tuberculate tylostyli,  $0.3 \times 0.014$  mm. with well-marked globular base covered with rounded tubercles; only of rare occurrence compared with the acanthostyli, but responsible for the surface hispidation, (2) acanthostyli variable in size up to  $0.12 \times 0.012$  mm., abundantly echinating the fibres, spined throughout, with a slight concentration of the spines at the base of the spicules, (3) auxiliary subtylostyli,  $0.24 \times 0.004$  mm. straight, slender, with slightly marked oval head and with the apical end sometimes rounded instead of sharply pointed, (4) chelae of usual *Clathria*-type, 0.016 mm.



TEXT-FIG. 12.—*Aulenella foraminifera*. a. echinating style; b. auxiliary subtylostyle; c. one of the skeleton-fibres enlarged to show the axial core, the echinating acanthostyli and basally tuberculate styli, and chelae (all  $\times 146$ ).

The species bears a resemblance in external form to the species of such genera as *Aulena*, *Echinoclathria*, and *Echinochalina*, and suggesting, as a consequence, that this type of external form may have little or no significance from a taxonomic point of view. The shape of the spicules in general recalls the species *Clathria lendenfeldi*, and the presence of foreign debris in the sponge is reminiscent of *Clathria spongodes* Dendy, although in the latter the debris does not constitute a regular core in the axis of the fibre. The species seems to be therefore clearly related to *Clathria*, but since its spicules show a decidedly different arrangement from that obtaining in that genus, it seems best to make it the type of a new genus.

Genus **Hemectyon** Topsent.

1920. *Hemectyon*, Topsent, *Bull. Inst. Oceanogr. Monaco*, No. 381, p. 25.

**Hemectyon thurstoni** (Dendy).

1887. *Raspailia thurstoni*, Dendy, *Ann. Mag. Nat. Hist.*, Ser. 5, XX, p. 161, pl. xii, fig. i.

*Raspailia thurstoni* and *R. fruticosa* Dendy, from the same locality, bear a strong resemblance to each other and may prove to be merely varieties of a single species. Moreover, there is a striking resemblance between them both and *Hemectyon hamatum* (Schmidt) from the West Indies, the chief difference being the greater length of the dermal styli in Dendy's species.

The acanthostyli in the holotype of *H. thurstoni* measure 0.15 mm. long, not 0.025 mm. as recorded by Dendy.

*Localities*.—2-3 miles W of Cape Comorin (38 fathoms, Armstrong) ; Pearl Oyster Banks, Tuticorin (H. S. Rao, Feb., 1926).

Genus **Aulospongos** Norman.

1878. *Aulospongos*, Norman, *Ann. Mag. Nat. Hist.*, Ser. 5, I, p. 266.

**Aulospongos tubulatus** (Bowerbank).

1889. *Axinella tubulata*, Dendy, *Ann. Mag. Nat. Hist.*, Ser. 6, III, p. 89, pl. v, fig. ii.

1921. *Aulospongos tubulatus*, Dendy, *op. cit.*, p. 61.

There are five specimens in this collection, of which the largest is stipitate and measures 60-65 mm. in diameter. In life, their colour was an orange red, but this is entirely lost in spirit. In the dried condition, however, the original colour is retained, though to some extent faded. The vents are conspicuous among the surface conuli as irregularly stellate openings, 2-3 mm. in diameter, leading into moderately deep cloacae. There are also smaller openings all over the surface, apart from those caused by the worm-tubes characteristically present. One of the smaller specimens has no worm-tubes associated with it, but has instead a number of barnacles embedded in cavities in the sponge tissue.

The dermal membrane is charged with brownish masses composed of an aggregation of the vesicles mentioned by Dendy (1921, p. 62), to which the colour of the sponge is obviously due. The nature of these bodies is still obscure, but they may be some sort of symbiotic organism.

*Locality*.—Pearl Oyster Banks, Tuticorin (H. S. R., Feb., 1926). Tuticorin Harbour, Shore-collecting (H. S. R., March, 1926).

Genus **Echinodictyum** Ridley.

1881. *Echinodictyum*, Ridley, *J. Linn. Soc. London*, XV, p. 493.

1887. *Echinodictyum*, Ridley and Dendy, *op. cit.*, p. 164.

1921. *Echinodictyum*, Dendy, *op. cit.*, p. 73.

**Echinodictyum nervosum** (Lamarck) Ridley.

1881. *Echinodictyum nervosum*, Ridley, *op. cit.*, p. 496, pl. xxviii, figs. 7-10.

The single specimen agrees with that described by Ridley (*l. c.*). It is a branching, stipitate sponge, with the branches arranged in several

planes. There is little anastomosis. The surface is rather hirsute, and the colour, in the dried state, pale brown. The oxea measure  $0.5-0.7 \times 0.034$  mm., the styli  $0.7 \times 0.02$  mm., and the acanthostyli  $0.11 \times 0.007$  mm.

*Locality*.—Ganjam Coast, Madras Presidency ('Golden Crown' Coll., 24-30 fms., 8-16 March, 1909).

### **Echinodictyum asperum** Ridley and Dendy.

1887. *Echinodictyum asperum*, Ridley and Dendy, *op. cit.*, p. 165, pl. xxxii, fig. 2.

The single specimen resembles the holotype in external form and spiculation, but is only 40 mm. high and 50 mm. broad. The colour is dark brown. The spiculation includes a few long thin styli, also present in the holotype but not mentioned in the original description.

*Locality*.—Ross I., Andamans..

### **Echinodictyum gorgonoides** Dendy.

1916. *Echinodictyum gorgonoides*, Dendy, *op. cit.*, p. 129, pl. I, fig. 7, pl. IV, fig. 23.

The single specimen, growing on an oyster shell, differs little in external form or spiculation from the holotype. It consists of a thin lamella, 50 mm. long and 40 mm. broad, and bears a number of flattened erect processes varying in height from 5 to 40 mm. two of which are branched. The colour is pale brown.

Spongin is well-developed in this example, and, apparently correlated with this, the spicules are reduced in number and in size. Many of the acanthostyli are faintly spiny. In other respects it agrees with the holotype.

*Locality*.—Pearl Oyster Banks, Tuticorin (H. S. R. Feb., 1926).

### **Dendrocia antyaja\***, sp. nov.

(Pl. XVIII, Fig. 12.)

*Diagnosis*.—Sponge clathrous, massive, flabello-digitate, composed of a main central, rounded, fan-shaped lobe surrounded by a number of smaller fan-shaped or digitate processes; surface minutely hispid; vents not seen; colour, in spirit, pale brown; skeleton an irregular reticulation of stout spongin fibres, in which primary and secondary fibres may be distinguished; main fibres cored by slender smooth styli and echinated by acanthostyli; secondary fibres often completely aspiculous; occasionally they may bear sparingly-scattered acanthostyli or, in rare cases, tufts of smooth styli, similar to the coring spicules but slightly larger, echinating the nodes of the mesh; smooth styli identical with those coring main fibres rarely occur interstitially; microscleres palmate chelae.

*Holotype*.—P 791/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality*.—Pearl Oyster Banks, 12 miles off Tuticorin, Gulf of Manaar (H. S. R. Feb., 1926).

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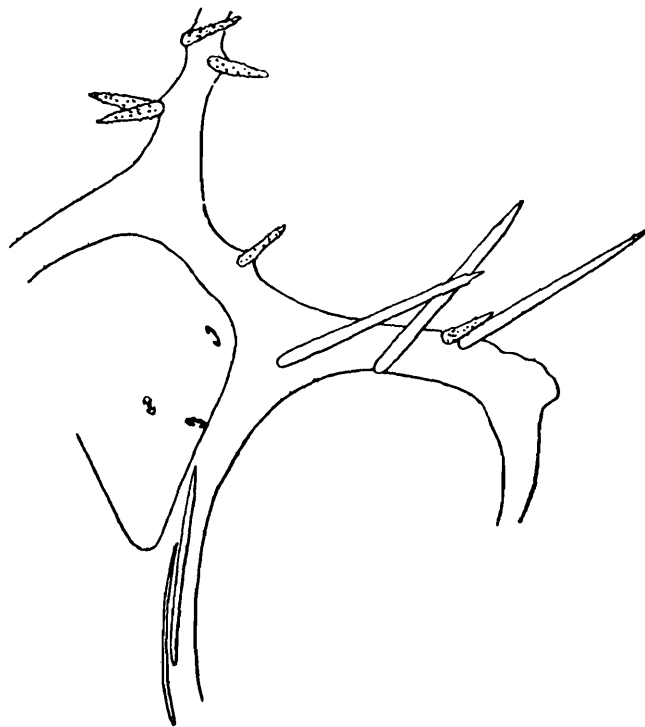
\* The specific name is derived from a Sanskrit word which means "last-born" and is associated with a class of people depressed in society due to social upheavals.

The smooth styli coring the main fibres are straight or slightly curved and measure  $0.15 \times 0.004$  mm. The acanthostyli measure  $0.042 \times$



TEXT-FIG. 13.—*Dendrocia antyaja*. skeleton showing the main and the secondary fibres ( $\times 23$ ).

$0.006$  mm. and are spined throughout their length, the spines being more or less concentrated at both base and apex, sparingly but evenly distributed over the rest of the spicule. The chelae are  $0.014$  mm. long.



TEXT-FIG. 14.—*Dendrocia antyaja*. one of the main fibres showing the coring spicules, the echinating acanthostyles and smooth styles, and chelae ( $\times 110$ ).

There are two specimens in the collection both of which appear to be devoid of much of the protoplasmic tissues suggesting that they may have been dead long before they were collected. On this account it is always possible that some parts of the spiculation, not enclosed in the horny fibres, may have been lost, and it is to be hoped that better

preserved material may soon be forthcoming. Moreover, the general paucity of the spiculation suggests that these two individuals may be representatives of a species in which, normally, the spiculation is more abundant.

### Sub-family HYMEDESMIEAE.

#### Genus *Hymedesmia* Bowerbank.

1910. *Hymedesmia*, Lundbeck, *Porifera, Danish Ingolf Exped.*, VI, 3, p. 39.  
 1921. *Hymedesmia*, Dendy, *op. cit.*, p. 81.  
 1928. *Hymedesmia*, Topsent, *Res. Camp. Sci. Albert Monaco*, LXXIV, p. 258.

#### *Hymedesmia dendyi* Burton.

1921. *Hymedesmia radiata*, Dendy, *op. cit.*, p. 84.  
 1930. *Hymedesmia dendyi*, Burton, *J. Mar. Biol. Ass. Plymouth*, XVI, p. 496.

The species is represented by a small massive incrustation on a shell of *Arca*. Its surface is sparsely hispid and bears a number of small openings varying up to 1.0 mm. in diameter. The texture is soft and compressible, and the dermal membrane is filled with oval granular bodies, brown in colour. These bodies invade the interior of the sponge and give rise to a pseudo-cortical layer between the dermal membrane and the choanosome.

The skeleton of the holotype of this species consists of three elements:—(a) Large smooth tylostyli, 2.0 mm. long, 0.03 mm. thick; (b) Acanthostyli, entirely and evenly spined, with spines slightly recurved, varying in size from 0.12 to 0.24 mm.; (c) oxeote tornota, smooth, straight, sharply and gradually pointed,  $0.7 \times 0.16$  mm. The acanthostyli form an even layer echinating the substratum, the large tylostyli extend upwards from the substratum to project at the surface, and the oxeote tornota are arranged in bundles around the shafts of the large tylostyli at the point where they pierce the ectosome. The types of spicules present, and more particularly their arrangement, suggest that this species may prove to be no more than the immediate post-fixation stage of one of the Indian species of *Raspailia*.

*Locality*.—2-3 miles W. of C. Comorin, Indian Ocean (38 fms., Armstrong).

#### *Hymedesmia crelloides*, sp. nov.

*Diagnosis*.—Sponge thinly encrusting (on *Cryptotethya agglutinans*), surface smooth, marked by faint branching and anastomosing lines where subdermal canals run immediately beneath the dermis, colour in spirit yellow; skeleton composed of tornota running in vertical fibres from base to surface of the sponge, and of small acanthostyli, scattered throughout the tissues without apparent order; tornota strongylote,  $0.21 \times 0.0035$  mm., acanthostyli slender,  $0.09 \times 0.0035$  mm.; microscleres chelae arcuatae 0.017 mm., and sigmata 0.024 mm.

*Holotype*.—P 792/1 Zool. Surv. Ind. (*Ind. Mus.*).

*Locality*.—N. side of Fehendu I., Goifurfehendu Atoll, Maldive group, Arabian Sea.

The general habit of this species is that of a *Hymedesmia*, but the spiculation suggests, to some extent, a *Crella* and were it not for the

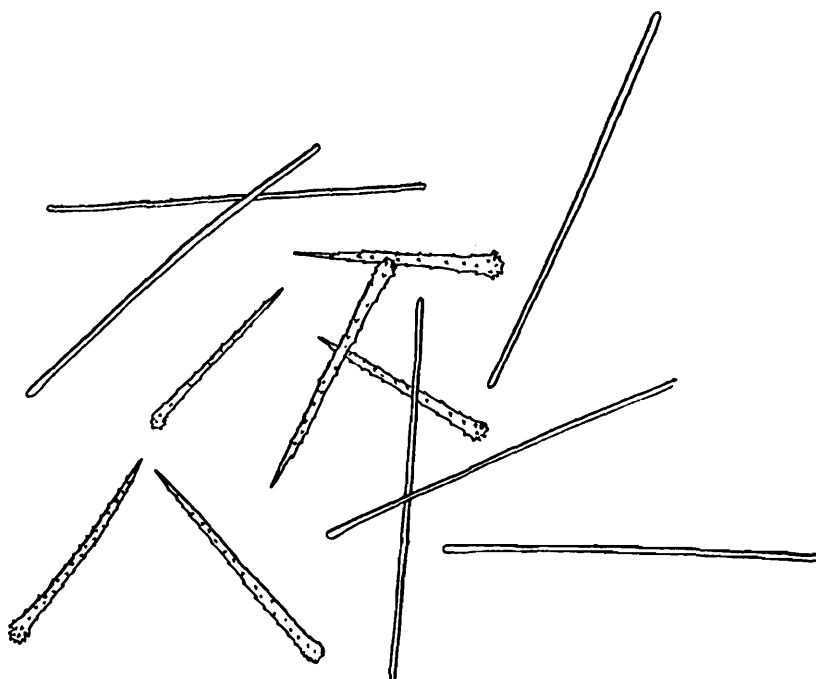


TEXT-FIG. 15.—*Hymedesmia crelloides*. Skeletal elements consisting of tornota, thin acanthostyli, chelae and sigmata (all  $\times 146$ ).

fact that the acanthostyli are scattered throughout the tissues generally and do not form a dermal layer, the species would have been placed in the latter genus without hesitation. The dermis is crowded with isochelae.

#### ***Hymedesmia parvispicula*, sp. nov.**

*Diagnosis.*—Sponge forming a thin but extensive crust on a fragment of coral ; surface smooth ; pores and oscules not visible ; colour, in spirit, yellow ; skeleton composed of small acanthostyli and slender tornota ; acanthostyli forming a basal layer echinating the substratum, 0.105-



TEXT-FIG. 16.—*Hymedesmia parvispiculata*. Skeletal elements consisting of tornota (strongylote to amphitylote) and acanthostyli (all  $\times 146$ ).

0.130 × 0.004 mm.; tornota strongylote to amphitylote, usually with ends not equal, 0.21 × 0.003 mm., scattered sparsely and without order in the upper tissues of the sponge.

*Holotype*.—P  $\frac{793}{1}$  Zool. Surv. Ind. (*Ind. Mus.*).

*Locality*.—Mergui Archipelago ("Investigator" coll.).

The sponge is about 0.5 mm. thick.

### Sub-family ACARNEAE.

#### Genus *Acarus* Gray.

1867. *Acarus*, Gray, *Proc. Zool. Soc. London*, p. 544.

1884. *Acarus*, Ridley, *Rep. Zool. H. M. S. 'Alert'*, p. 453.

This genus was originally founded on a drawing by Bowerbank, and this is all we have to guide us as to what may constitute the characteristics of the species *A. innominatus*, the genotype. Nevertheless, the spicules figured in this drawing, the cladotyli, are so distinctive that we may accept Gray's genus as valid, at least until such time as we know of two perfectly distinct genera with cladotyli common to both. The species *A. innominatus* is, however, unrecognisable and the holotype, so far as we are aware, non-existent. Carter's *A. innominatus*, from the West Indies has already been made the type of a new species (*vide* Ridley *Rep. Zool. Coll. Voy. H. M. S. 'Alert'* 1884, p. 454, footnote), *A. carteri*. In the Australasian area, for example, there are two quite distinct species of *Acarus*, *A. tenuis* Dendy and *A. ternatus* Ridley, both possessing smooth cladotyli and styli for megascleres, and the spicules figured by Bowerbank and used by Gray to represent *A. innominatus* might equally well have belonged to a representative of either of these two species.

#### *Acarus ternatus* Ridley.

1884. *Acarus ternatus*, Ridley, *op. cit.*, p. 453, pl. xlii, fig. b.

1889. *Acarus wolfgangi*, Keller, *Zeitschr. wiss. Zool.*, XLVIII, p. 399, pl. xxiv, fig. 53.

1905. *Acarus ternatus*, Dendy, *op. cit.*, p. 177, pl. viii, fig. 4.

The four specimens present in the collection agree closely in spiculation with the holotypes of *A. ternatus* and *A. wolfgangi* in all respects but the size of the chelae. Three of them are encrusting, and the fourth is massive and almost identical in external form with the holotype of *A. ternatus*. With regard to the chelae, there is no reason why their small size, 0.011 mm., should render the erection of a new species necessary since those of Ridley's specimen measure 0.024 mm., those of Dendy's specimen, 0.02 mm., and those of *A. wolfgangi*, 0.016 mm. It is evident, therefore, in view of the similarity between these various specimens in all other respects, that we are dealing with a species characterized by chelae of variable size.

*Locality*.—Galle, Ceylon.

#### Genus *Iotrochota* Ridley.

1884. *Iotrochota*, Ridley, *Rep. Zool. Coll. H. M. S. 'Alert'*, p. 433.

**Iotrochota baculifera** Ridley.

1884. *Iotrochota baculifera*, Ridley, *op. cit.*, p. 435, pl. xxxix, fig. M, pl. xlii, fig. f.  
 1905. *Iotrochota baculifera*, Dendy, *Rep. Ceylon Pearl Oyster Fish.*, p. 165.

A single small, flabellate specimen growing on a shell of *Pinna nigra* is present. Its colour, in life, was black, but in spirit it is a deep crimson red, and in this respect it resembles the holotype. The dimensions of the spicules are as follows:—strongyla, 0.19-0.23 × 0.003 mm.; styli, 0.14-0.16 × 0.003-0.005 mm.; birotulae, 0.011-0.015 mm. long. Short stout strongyla, measuring 0.08 × 0.007 mm., occasionally occur.

*Locality.*—(Mar. Surv. Sta. 629.) N. W side of Spiteful Bay near Leader Pt., Nicobars (Nov. 7, 1922).

## Sub-family TEDANIEAE.

**Tedania nigrescens** (Schmidt).

1862. *Renicra nigrescens*, Schmidt, *Spong. des. Adriat. Meeres*, p. 74.  
 1862. *Reniera digitata*, *id.*, *ibid.*, p. 75, pl. vii, fig. 11.  
 1864. *Reniera ambigua*, Schmidt, *Suppl. Spongien d. Adriat. Meeres*, p. 39, pl. iv, fig. 8.  
 1867. *Tedania digitata*, Gray, *Proc. Zool. Soc. London*, p. 520.  
 1867. *Tedania ambigua*, *id.*, *ibid.*, p. 520.  
 1868. *Reniera muggiana*, Schmidt, *Spong. der Küste Algier*, p. 28.  
 1884. *Tedania digitata*, Ridley, *Rep. Zool. Coll. H. M. S. "Alert"*, p. 417.  
 1886. *Tedania digitata*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, XVII, p. 52.  
 1887. *Tedania digitata*, Ridley and Dendy, *op. cit.*, p. 51, pl. ix, fig. 3.  
 1887. *Tedania digitata* var. *fibrosa*, *id.*, *ibid.*, p. 51.  
     *Tedania digitata* var. *bermudensis*, *id.*, *ibid.*, p. 51.  
 1887. *Tedania nigrescens*, Vosmaer, *Spongien in Bronn's Klassen und Ordnung*, p. 338.  
 1887. *Tedania digitata*, Dendy, *Ann. Mag. Nat. Hist.*, Ser. 5, XX, p. 157.  
 1888. *Tedania rubicunda*, Lendenfeld, *Catalog. Austr. Mus. Sydney*, p. 190.  
     *Tedania rubra*, *id.*, *ibid.*, p. 191.  
 1891. *Tedania chevreuxi*, Topsent, *Mem. Soc. Zool. France*, IV, p. 3, pl. ii, figs. 1, 2.  
 1891. *Tedania assabensis*, Keller, *Zeit. Wiss. Zool.*, LII, p. 313, pl. xvi, figs. 11, 12.  
 1894. *Tedania fragilis*, Lambe, *Trans. Roy. Soc. Canada*, p. 116, pl. ii, fig. 3.  
 1894. *Tedania brucei*, Wilson, *Journ. Morph.*, IX, p. 320, pls. xix, xx.  
 1895. *Tedania digitata*, Dendy, *Proc. Roy. Soc. Victoria*, VII, p. 258.  
 1897. *Tedania digitata*, Lindgren, *Zool. Anz.*, XX, p. 481.  
 1897. *Tedania digitata* var. *vulcani*, Lendenfeld, *Abh. Senck. Natur. Ges.*, XXI, p. 112, pl. x, figs. 117-119.  
 1898. *Tedania digitata*, Lindgren, *Zool. Jahrb.*, XX, p. 17, pl. xix, fig. 10.  
 1902. *Tedania digitata*, Wilson, *Bull. U. S. Fish. Comm.*, II, p. 395.  
 1906. *Tedania digitata* var. *sansibarensis*, Baer, *Arch. Naturges.*, I, p. 17, pl. i, fig. 2.  
 1907. *Tedania ignis*, Verrill, *Newhaven Conn. Trans. Acad. Arts Sci.*, XII, p. 339.  
 1911. *Tedania assabensis*, Row, *Journ. Linn. Soc. London*, XXXI, p. 353.  
 1911. *Tedania digitata*, Hentschel, *op. cit.*, p. 332.  
     *Tedania digitata* var. *inermis*, *id.*, *op. cit.*, p. 333.  
     *Tedania digitata* var. *polytyla*, *id.*, *op. cit.*, p. 333.  
     *Tedania rubicunda*, *id.*, *op. cit.*, p. 334.  
 1912. *Tedania digitata*, Hentschel, *Abh. Senckenb. Naturf. Ges.*, XXXIV, p. 348.

Examination of a large number of specimens in the British and the Indian Museum collections has shown that *Tedania nigrescens* is a very variable species. It is essentially polymorphic in form. Its spicules

are variable in size and in the manner in which they are disposed in the skeleton: the main skeleton may be isodictyal, sub-isodictyal or irregularly confused, and the tornota may be disposed in brushes at the surface, irregularly scattered in the dermis, or forming a tolerably uniform tangential layer. The ends of the tornota may be strongylote or tylote and smooth, or strongylote or tylote and spined, and the spines may be few in number forming a crown, or may be numerous and besetting a fairly wide area of the end of the spicule. In this connection it appears that in one specimen all these forms may be present, as in the type of the species, or one or more forms may predominate. The usual form is that bearing oval heads with a crown of a few spines. Polytyloty is comparatively rare and, when it occurs, may affect all the three types of spicules.

The onychaeta may or may not bear a slight swelling near one end, and we regard this feature as of no systematic importance at all. So far as we can see, it is impossible to correlate any of the variations of the spicules with external form, or with ecological or geographical distribution.

In view of the variability of the species, it seems unnecessary to make use of the many varietal names which have been proposed, especially as the majority of them are based on very minor details of spicule-size or external form.

The specimens in the present collection exhibit most of the variations noted above, and range in form from flattened crusts with numerous large oscula, to massive forms with tubular or digitate outgrowths, and large irregularly massive specimens (the *T chevreuxi*-type). *T assabensis*, according to the specimens of Keller, Row, and Burton, shows much the same variations in form, and all the variations in spicule form and size noted above.

*Localities*.—Marble Rock, Mergui Archip. ; Jack and Una Is., Mergui Archip. ; Cinque I., Andamans ; Aden (R. B. S. Sewell, 1st February 1916) ; 'Ain Musa, Gulf of Suez (R. B. S. Sewell) ; (Mar. Surv. Sta. 657) N. side of East end of Macpherson straits, near Chiriyatapu, Andamans (Jan. 20, 1924). Pamban bridge, Gulf of Manaar (B. N. C. & H. S. R., Feb., 1925) ; Cone I., surf rocks (13° 47' N. 98° 33' E., 4th February 1886).

#### Genus **Histoderma** Carter.

1910. *Histoderma*, Lundbeck, *op. cit.*, p. 7.

#### **Histoderma fucoides** Topsent.

1897. *Histoderma verrucosum*, Carter var. *fucoides*, Topsent, *Rev. Suisse Zool.*, IV, p. 452.

The single specimen consists of an irregular mass, 80 mm. long, 50 mm. broad, and 30 mm. high, bearing a number of fistulae. It agrees very closely with Topsent's specimen from Amboina except that the chelae vary between 0.003 and 0.007 mm. instead of between .016 and .04 mm. as in the holotype.

*Locality*.—Off C. Negrais, Burma (M. S. Sta. 387), 40-49 fathoms.

## Sub-family PLOCAMIEAE.

Genus **Plocamia** Schmidt.

1870. *Plocamia*, Schmidt, *Spong. Atlantisch. Gebietes*, p. 62, pl. iv, figs. 17-18.  
 1881. *Dirrhopalium*, Ridley, *J. Linn. Soc.*, XV, p. 476, pls. xxviii, xxix.

Topsent (1928. *Res. Camp. Sci. Albert Monaco*, LXXIV, pp. 303-309) has made many useful suggestions concerning the Plocamiae as a whole.

**Plocamia manaarensis** (Carter).

1880. *Dictyocylindrus manaarensis*, Carter, *Ann. Mag. Nat. Hist.* VI, p. 37, pl. iv, fig. 1.  
 1881. *Dirrhopalium novizealanicum*, *D. manaarensis*, Ridley, *op. cit.*, pp. 482-483.  
 1904. *Heteroclathria hallezi*, Topsent, *Arch. Zool. Exp. Gen.*, II, *Notes et Revue*, 6, pp. xciii-xcviii.

The various specimens are profusely branched. Their colour, in spirit, is a pale gray. In spiculation they agree closely with the specimens described by Carter from the Gulf of Manaar and by Ridley from New Zealand. Moreover, there is no obvious reason why *Heteroclathria hallezi*, from an unknown locality, should not be regarded as identical with Carter's species.

*Locality*.—Laccadive sea, 13° 19' N., 74° 26' E, 22 fms., 16th Nov., 1900; off Mangalore, W. coast of India; 21 miles S. W by W. of Mangalore, 31 fms. (4th May 1888); off Karwar, 14° 37' N, 73° 49' E, 29 fms. (Carpenter Oct. 1885).

## Sub-family CYAMONEAE.

Genus **Cyamon** Gray.

1867. *Cyamon*, Gray, *Proc. Zool. Soc. London*, p. 546.  
 1921. *Cyamon*, Dendy, *op. cit.*, p. 107.

**Cyamon vickersii** (Bowerbank).

1879. *Dictyocylindrus vickersii*, Carter, *Ann. Mag. Nat. Hist.*, Ser. 5, III, p. 292, pl. xxvii, figs. 5-8.  
 1921. *Cyamon vickersii*, Dendy, *op. cit.*, p. 108. pl. xvi, fig. 5.

The single representative is a portion of a dull brown, spherical mass. It agrees with the specimen described by Dendy (*l. c.*) except that the longest ray of the pseudactines bears a few recurved rays on the shaft and a crown of spines at the apex; the basal rays of these spicules have spines at the apex only; and the styli are very scarce.

*Locality*.—21 miles S. W W of Mangalore, S. India (4th May 1888).

## INCERTAE SEDIS.

Genus **Agelas** Duchassaing and Michelotti.

1864. *Agelas*, Duchassaing and Michelotti, *Naturk. Verh. Hollands. Wetensch. Haarlem*, XXI, p. 76.  
 1867. *Ectyon*, Gray, *Proc. Zool. Soc. London*, p. 515.

Although the original specimens of the various species assigned by Duchassaing and Michelotti to this genus are known to be irretrievably

lost, there is no need to abandon the use of the name *Agelas*. In the British Museum collection there is a specimen so like that figured by these authors for *A. dispar* that there seems to be little doubt that the two represent the same species. It is accordingly proposed to regard this specimen in the British Museum as the *neotype* of the species *A. dispar* and to regard that species as the genotype of the genus *Agelas*.