REPORT ON SOME DEEP-SEA SPONGES FROM THE INDIAN MUSEUM COLLECTED BY THE R. I. M. S. "INVESTIGATOR."

PART II. TETRAXONIDA (CONCLUDED) AND EUCERATOSA.

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(Plates I, II.)

Discodermia gorgonoides, sp. n.

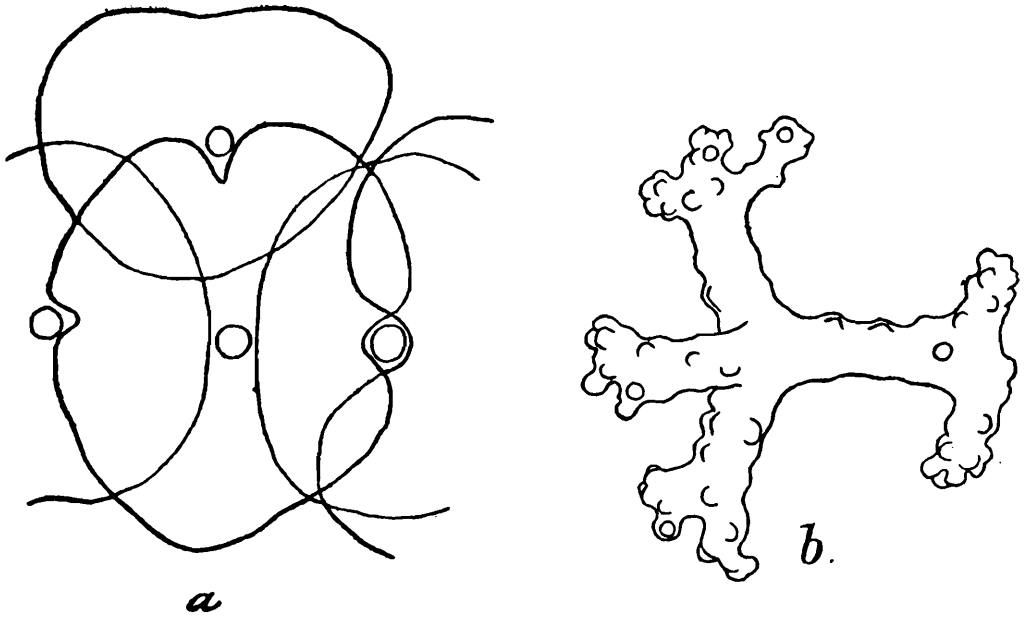
The species is represented by a fragment of what may have been a branching sponge with rounded branches about 2 mm. in diameter. The surface bears a number of small conical protuberances arranged almost in a spiral. No definite oscules are visible. Colour, in spirit, yellow.

The skeleton consists of tetracrepid desmas through which run bundles of oxea which do not pierce the ectosome but stop short just below the surface.

Spicules.—(1) *Oxea*, long, slender, measuring about ·33 by ·005 mm.

(2) *Desmas*, tetracrepid, each epactine being roughly ·1 mm. long and usually smooth for the greater part of their length but become highly tuberculate towards the ends (text-fig. 1*b*).

(3) *Discotriaenes*, of the usual form. Dimensions.—Diameter of cladome, ·18 mm., length of rhabdome, ·09 mm. These spicules form a layer at the surface where they are arranged in such a close manner



TEXT-FIG. 1.—*Discodermia gorgonoides*, sp. n.
a. Discotriaenes, × 200; *b*. Desma, × 200.

that the edges of individual spicules overlap. Many of them have one or more notches in the edge of the disc whose presence is due to a

mechanical hindrance during development from the shafts of adjacent discotriaenes (text-fig. 1*a*).

(4) *Microstrongyles*, with slightly roughened surface, about ·009 mm. long.

The species differs in its cylindrical, possibly branching habit from all other species of the genus, except *D. vermicularis* Döderlein (1884) and *D. ramifera* Topsent (1892D) from which it differs in the absence of microxea.

Lendenfeld (1906, p. 344) suggests that the true distinction between *Discodermia* and *Theonella* should rest rather on the presence or absence of the microxea than on the form of the dermal triaenes, an opinion with which I cannot agree.

Registered No., locality, etc.—P. $\frac{281}{1}$ (XLVI, 6), 8 miles W. of Inte r view I. Andamans, 45-270 faths.

Taprobane herdmani Dendy (1905, 1921B).

Previously recorded from Ceylon and the western Indian Ocean, this species is represented by two dried specimens, both regularly infundibuliform and of a light brown colour. The larger is 9 cms. high and 13 cms. across the mouth of the funnel. The smaller is 2 cms. high and the same across the mouth. The thickness of the walls is 1 cm. and ·5 cm. in the two specimens respectively.

In spiculation the agreement with the holotype is very close and the specimens differ from it only in the more regular external form. Dendy's (1921B) specimens, while agreeing more closely with the holotype in external form, have larger sigmata, ·013 by ·0024 mm. as against ·010 by ·001 mm.

Previously known distribution.—Ceylon ; Indian Ocean.

Registered Nos., localities, etc.—P. $\frac{282}{1}$ (XXXIII), P. $\frac{283}{1}$ (XXXIV), Mergui Archipelago, 13° 4′ 30″ N., 96° 44′ E., 65 faths. Collected, 17th April 1913.

Petromica massalis Dendy (1905, 1921B).

A single massive specimen, brown in colour, 1 cm. high and 1·5 cm. across the base.

The monaxon spicules are very sparse and much more slender than is usual but otherwise the sponge agrees closely with the holotype.

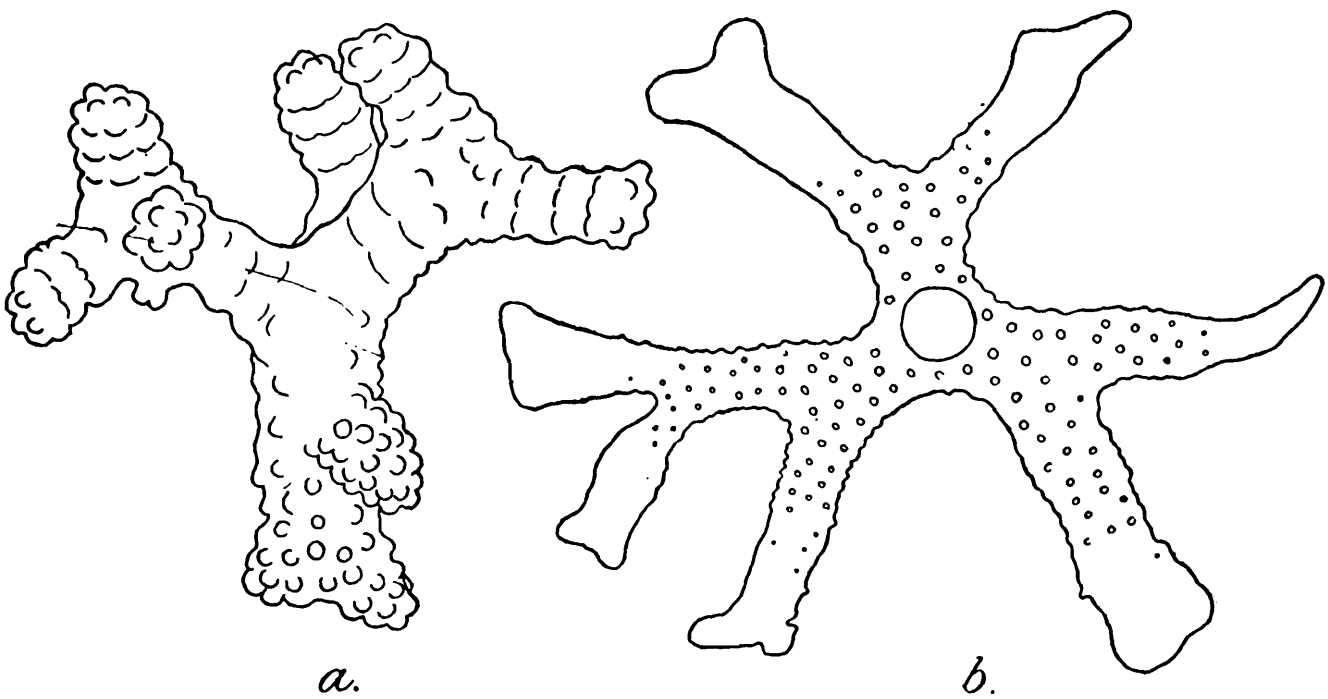
Previously known distribution.—Ceylon ; Indian Ocean.

Registered No., locality, etc.—P. $\frac{284}{1}$ (XLVI, 5), 8 miles W. of Interview I. Andamans, 45-270 faths.

Theonella cupola, sp. n.

The two examples of this species are similar in external form : they are massive with a convex upper surface and resting on a circular base about 2 cms. in diameter. The larger is 8 mm. high. The surface is smooth with a depression placed excentrically on the upper surface containing the single oscule. The latter is 1 mm. in diameter and is surrounded by a thin membranous margin resembling a velum. Just

beneath the opening of the oscule is a cavernous chamber receiving the openings of the numerous exhalant canals, while similar canals can be



Text-fig. 2.—*Theonella cupola*, sp. n.
a. Desma, × 200 ; *b*. Phyllotriaene, × 200.

seen through the transparent ectosome running parallel to it. The pores are distributed generally between the cladi of the surface phyllotriaenes and are about ·05 mm. in diameter. The colour, in spirit, is greyish yellow.

The skeleton is typical, consisting of closely-locking desmas roofed over at the surface by a layer of phyllotriaenes, with the short shafts of the latter directed towards the interior of the sponge. At the surface, also, are bundles of about 6 slender monactinal megascleres which protrude beyond the octosome, while similar bundles are found associated with the desmas of the main skeleton. These are, for the most part, oxea but they appear to vary somewhat in shape, sometimes the ends are blunted (*i.e.*, strongylote), sometimes swollen (*i.e.*, amphitylote). The development of the phyllotriaenes takes place *in situ*.

The only other spicule is a microrhabd abundantly associated with the ectosome, around the pores, and with the linings of the canals.

Spicules.—(1) *Oxea*, straight or curved, variously modified to form strongyla or amphitylota measuring ·44 by ·005 mm.

(2) *Phyllotriaenes* with short conical shafts bearing cladomes composed of three dorso-ventrally flattened dichotomous cladi. The outer surface of these spicules is covered with small tubercles. Total diameter of cladome, ·495 mm., shaft, ·176 mm. long (text-fig. 2*b*).

(3) *Desmas*, tetracrepid, massive, usually covered with numerous rounded tubercles. Total length about ·385 mm. Average thickness of epactines ·077 mm. (text-fig. 2*a*).

(4) *Microrhabds* with well-developed spines, variable in size, measuring on an average ·019 by ·005 mm.

The species makes a near approach to *T lacerata* Lendf. from Sumatra but differs in the smaller details of the spiculation.

Registered No., locality, etc.—P. $\frac{285}{1}$ (XL, I), Laccadive Is., 1 mile off Kiltan I., 20-30 fms.

Azorica pfeifferae Carter (1873D, 1876D).

Azorica marginata, Sollas, 1888A, p. 323, pl. xxxv, figs. 14-22. (For further synonymy *vide* Lendenfeld 1903B and Topsent 1904A).

Two fragmentary specimens, almost identical with the holotype in external form and colour, present certain differences in the skeleton which lead me to regard *A. marginata* as a synonym of this species.

Sollas (*l.c.*, p. 324) says of *A. marginata*, "They might easily be mistaken for a young specimen of *Azorica pfeifferae*; the characters of the desma suffice to distinguish it." Apparently the characters referred to are the dense tuberculations and their bifid nature. In view of the possession by the present forms of these characteristics and of their strong affinity with *A. pfeifferae* on the other hand, I do not feel inclined to accept such small details as evidence of the existence of two distinct species.

Previously known distribution.—North Atlantic; West Indies; Indian Ocean; Indo-Pacific.

Registered Nos., localities, etc.—P. $\frac{286}{1}$ (XIII), "Investigator" Stn. 220, Andaman Sea, Lat. 13° 16′ 30″ N., Long. 93° 8′ E., 79 faths; P. $\frac{287}{1}$ (XXXII, 3), "Investigator" Stn. 535, Mergui Archipelago, Lat. 13° 4′ 30″ N., Long. 96° 44′ E., 65 faths.

Siphonidiella, gen. nov.

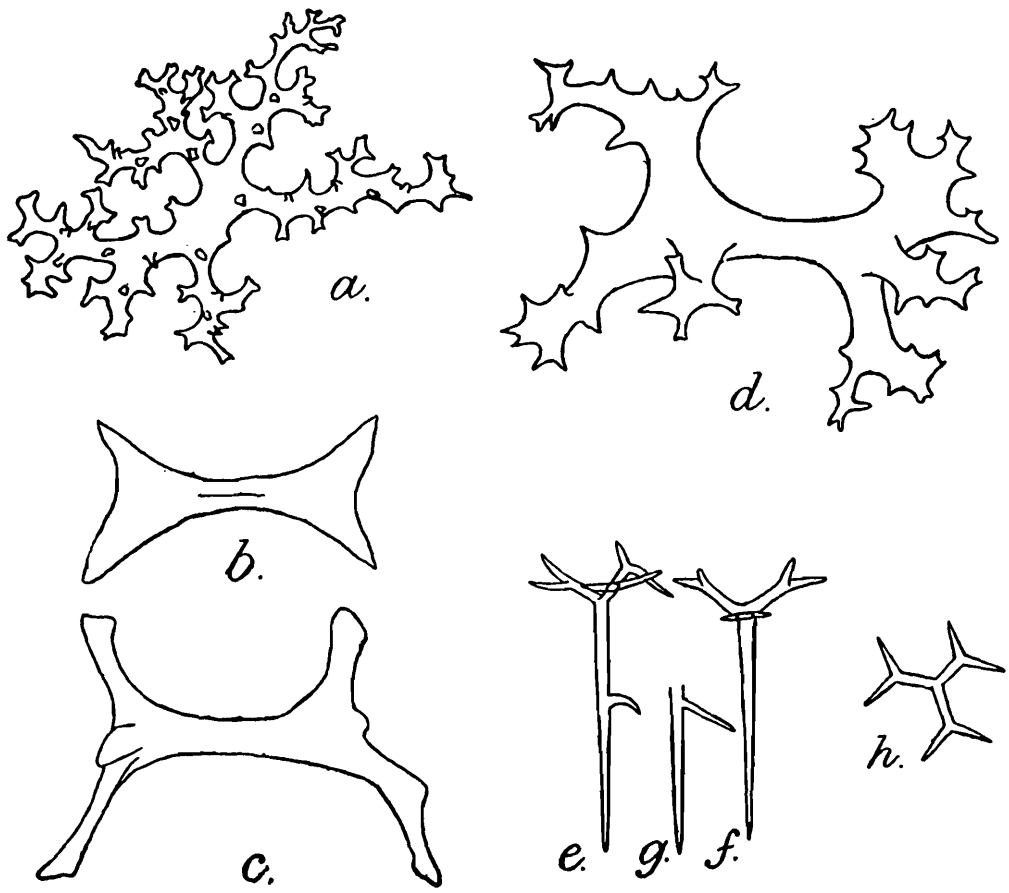
Rhabdosa in which the ectosomal spicule is a desma highly branched in a plane parallel to the surface. The choanosomal desmas are monocrepid. There are no microscleres. The only other spicule present is a small dichotriaene occurring in the choanosome, apparently scattered promiscuously and without any definite arrangement.

This genus is most nearly related to *Siphonidium* Schmidt from which it differs chiefly in the possession of a triaene in the place of a rhabdus as the third category of spicules. Possibly it may be found necessary later on to merge the genera, but on the other hand it is possible that the present genus does not belong to the Rhabdosa at all. The presence of a triaene in the spiculation does suggest an affinity with the Tetracladidae but I feel fairly confident that the desmas are monocrepid and not tetracrepid.

Siphonidiella dendyi, sp. n.

The single specimen is a hard stony sponge consisting of a main irregularly cylindrical portion, about 4 cms. long and 2 cms. in diameter, from the apex of which are given off three small lobes. The whole presumably grew erect with the small lobes uppermost, since the oscular processes are given off evenly all round the specimen and not confined to any one side or pointing in any one direction. The colour varies, in different parts of the sponge, from greyish brown to brownish-yellow. The surface is perfectly smooth but uneven and there is a definite ecto-

somal layer with a special dermal skeleton. With a hand-lens the sub-dermal canals appear as dark meandrine lines beneath the surface. The oscules are situated at the ends of small papillate processes distributed over the general surface. There are roughly about 25 of these



TEXT-FIG. 3.—*Siphonidiella dendyi*, sp. n.

a. Ectosomal desma ; *b*, *c*, *d*. Choanosomal desma in various stages of development ; *e*, *f*, *g*. Dichotriaenes, *e* and *g* with lateral spurs ; *h*. Cladome of dichotriaene. All × 200.

processes in all. Most of them show signs of having been damaged but a typical example is cylindrical, about 3 mm. high and the same in diameter. The diameter does not vary much from the base to the apex. Each process appears to contain one or more exhalant canals which empty their contents to the exterior through a single osculum.

The skeleton consists of very tightly-locking desmas divided into two distinct categories characterised by their position in the sponge and the form and size of the desma. These form the entire skeleton except for the presence of small dichotriaenes which may be seen scattered indiscriminately in the choanosome. The presence of the tetract spicules in a sponge whose only other spicules are, apparently, monocrepid rather obscures the affinities of the genus to which it belongs.

Spicules.—(1) *Ectosomal desmas.* These are so like those of *Siphononidium capitatum* Sollas (1888A) that I cannot do better than quote that author's very able description of them. " A broad undulating epirhabd, giving off branches from the convex sides of the curves, and bifurcating at the ends ; the cladi subdivide and give off lateral branches, and all the branches terminate finally in twig-like processes. The desma is depressed and ramified in a plane parallel to the surface, and the engies between the branches are mostly well rounded off ; the twig-like endings

of one desma are overlapped by those of its neighbours, and thus a close-meshed superficial network is produced without actual zygosis." When viewed from above the dermal skeleton has the same appearance as that figured by Lendenfeld (1906, Pl. XLV, fig. 13) for *Plakidium acutum*. The actual extent of the desma is roughly ·210 by ·150 mm. (text-fig. 3*a*).

(2) *Choanosomal desmas* : monocrepid, with a peculiar thorny or spiny appearance. The shape can be best appreciated by reference to the figure (text-fig. 3 *b*, *c*, *d*). The size is very variable but a single desma is roughly ·200 by ·130 mm. in extent.

(3) *Dichotriaenes*.—These do not appear to be localised in any particular part of the sponge but occur scattered throughout all the tissues. They are variable in size. The cladome may vary from ·072 to ·132 mm. in total diameter, while the shaft varies in length from ·050 to ·150 mm., and in thickness from ·005 to ·013 mm. Very frequently, in about 50 per cent. of cases, a spur may be noted protruding at various angles from the shaft about halfway down (text-fig. 3 *e-g*).

Registered No., locality, etc.—P. $\frac{288}{1}$ (XXXII, 2), " Investigator " Stn. 535, Mergui Archipelago, Lat. 13° 4′ 30″ N., Long, 96° 44′ E., 65 faths.

Gellius flagellifer Ridley and Dendy (1886, 1887).

(For synonymy and distribution *vide* Dendy 1924A.)

I assign two specimens to this species, not without some hesitation. They are sub-spherical, of a loose and cavernous texture, with a single oscule at the apex. The colour in both is a very pale yellow. The disposition of the various spicules in the skeleton approximates very closely to that in the type. The characteristic flagellate sigmata are fairly rare and measure from ·08 to ·09 mm. The second type of sigmata are, on an average, ·06 mm. long. The oxea in P. $\frac{289}{1}$ (XVI) measure ·36 by ·014 mm., in P. $\frac{290}{1}$ (XVII) ·28 by ·012 mm.

Previously known distribution.—Almost cosmopolitan.

Registered Nos., localities, etc.—P. $\frac{289}{1}$ (XVI), " Investigator " Stn. 234, Andaman Sea, 13° 15′ 30″ N., 93° 25′ E., 498 faths ; P $\frac{290}{1}$ (XVII), " Investigator " Stn. 236, Andaman Sea, 13° 59′ N., 93° E., 172-303 faths.

Gellius canaliculata (Dendy).

Gellius ang latus (Bwk.) var. *canaliculata* Dendy (1905.)

There is a single specimen agreeing with the type in all respects, but for the slight differences in size of the spicules. These are, in the present specimen :—Oxea, 168 by ·006 mm., sigmata, ·028 mm. long, toxa, ·053 mm. long.

On comparing the Kurrachee (Karachi) and Torres Strait specimens mentioned by Ridley (*l. c.*), I find that they agree with the present species in all respects except that in one of them there are no toxa. It is curious that Ridley should have missed this form of spicule, but

it is present in abundance in the Torres Strait sponge and sparingly present in one of the Kurrachee (Karachi) specimens.

Previously known distribution.—Kurrachee (Karachi); Torres Strait Ridley); Ceylon (Dendy).

Registered No., locality, etc.—P. $\frac{291}{1}$ (XXVIII), "Investigator" Stn. 385, Arabian Sea, 16° 40′ N., 71° 53′ E., 630 faths.

Gellius megastoma, sp. n.

(Pl. I, fig. 1.)

The single specimen is composed of two sub-spherical lobes almost completely fused together, the whole standing about 1·25 cm. high on a base 2 cms. by 1·5 cm. At the apex of each lobe is a single large oscule leading into a deep cloacal tube running vertically downwards to the base of the sponge. The diameters of the oscules are 4 and 5 mm. respectively. The colour, in spirit, is a greenish-yellow. The surface is glabrous but slightly uneven. The very delicate, transparent dermal membrane appears to be supported by an inconspicuous dermal skeleton composed of an irregular network of bands of spicules. Whether this is actually a special dermal skeleton or only the outermost portion of the main skeleton it is very difficult to determine accurately. Beneath this are numerous conspicuous sub-dermal cavities, the whole imparting a finely reticulate appearance to the surface. The pores are inconspicuous but probably overlie the sub-dermal cavities. The sponge is soft and friable.

The main skeleton is composed of oxea lying in a very irregular manner throughout the choanosome, sometimes associated in ill-defined bands but often merely grouped together in a most sporadic fashion so that the arrangement may be said to be irregularly Halichondrioid. A special dermal skeleton is present (*vide supra*).

Spicules.—(1) *Oxea*, usually slightly curved, with obtusely pointed ends, often incipiently strongylote, measuring ·504 by ·024 mm.

(2) *Sigmata*, of the usual type, ·02 mm. long.

The large size of the oxea forms, together with the unusual size of the oscules and the external form, the outstanding features of the species. In the size of the megascleres it resembles such species as *G. glacialis*, *G. calyx* and *G. carduus* of Ridley and Dendy, but differs from them all in the external appearance. Like *G. ridleyi* externally, it differs from that species in the size of the spicules.

Registered No., locality, etc.—P. $\frac{292}{1}$ (XLVII, 2), Andamans, 130-290 faths.

Sigmaxynissa fibulata (Ridley).

Gelliodes fibulatus, Ridley, 1884B.
Gelliodes fibulatus, Ridley and Dendy, 1887.
Gelliodes fibulatus, Lendenfeld, 1887E.
Gelliodes fibulatus, Hentschel, 1912A.
Non Gelliodes fibulatus, Babic, 1921, 1922.

Two perfectly typical specimens are present. The spicules in P. $\frac{293}{1}$ (II) are like those of the 'Challenger' specimen in size, *viz.* :—oxea,

173 by ·008 mm., sigmata, ·014 mm. long. In P. $\frac{294}{1}$ (LV. I.) the oxea are slightly longer but the sigmata are only ·011 mm. long.

Previously known distribution.—Torres Strait (Ridley, Ridley and Dendy, Lendenfeld); Arafura Sea (Hentschel).

Registered Nos., localities, etc.—P. $\frac{293}{1}$ (II), "Investigator" Stn. 10, 7½ miles E. of N. Cinque I., Andamans, 490 faths; P. $\frac{294}{1}$ (LV, 1), "Investigator" Sta. 10 C, off Cinque I., Andamans, 120-170 faths.

Protoschmidtia expansa Thiele (1903B).

A few small fragments of this species are present which are sufficiently like the paratype possessed by the British Museum as to admit no doubt as to their identity with Thiele's species. They are yellowish crusts of a stony, *Petrosia*-like texture. The skeleton is composed of a dense almost Halichondrioid network of oxea. There is no special dermal skeleton and the surface is minutely hispid to the touch. The oxea are slightly thicker than those of the holotype but of the same length.

Previously known distribution.—Ternate (Thiele).

Registered No., locality, etc.—P. $\frac{296}{1}$ (LXI), 16° 44′ 45″ N., 93° 34′ 30″ E., 1300 faths.

Protoschmidtia cerebrum, sp. n.

(Pl. I, fig. 2.)

The seven fragmentary representatives of this species are all subspherical with the exception of P. $\frac{296}{1}$ (XLVI, *1c. d.*) which is irregularly cylindrical. There is otherwise little variation in the salient features as we pass from one sponge to another, except for the usual small differences in spicule dimensions. The holotype, P. $\frac{297}{1}$ (LII, *a*), is irregularly subspherical with four comparatively large oscules, about 1·5 mm. in diameter, at various points on the surface. The surface itself is minutely hispid where the spicules from the underlying skeleton project through the delicate dermal membrane. Beneath the dermal membrane are a large number of conspicuous sub-cortical cavities which can be clearly seen through the transparent ectosome. Frequently these cavities coalesce giving the maendrine appearance which suggested the specific name. The pores are apparently situated immediately above the sub-dermal cavities but they are so inconspicuous as to render their exact determination difficult. The oscules lead into deep cloacal tubes, running vertically downwards to the base of the sponge, which receive the openings of the exhalant canals. The colour, in spirit, is pale yellow.

The skeleton consists of stongyla only. These are arranged in a manner usually spoken of as *Petrosia*-like, that is, they build up a very close-meshed network of polyspicular fibres in which the spicules are arranged in a Halichondrioid manner which gives the sponge a hard, stony texture. There is no special dermal skeleton.

Spicules.—The only spicule is the strongyle, straight or slightly curved with evenly rounded ends, ·264 mm. long by ·016 mm. thick.

I have placed this species in the genus *Protoschmidtia* on account of its similarity, so far as the skeleton arrangement goes at all events, to the preceding species, *P. expansa*. Nevertheless, I do not feel content with the determination. According to Czerniawski (1878), its author, the genus occupies a position intermediate between *Reniera grossa* and *R. palmata*. We have no satisfactory description of either of these two species, neither does the bare statement that the genus *Protoschmidtia* is intermediate between these two species give us any indication as to the manner in which it agrees with or differs from either or both. In other words, we are left to give our own interpretation as to the characters of the genus. Since both *Amorphina* and *Reniera* are in an equally confused state, the position becomes rather difficult. In his preliminary sorting of the collection, Dendy had labelled this specimen "*Petrosia.*" The only resemblance it bears to that genus is its hard texture. It has neither the special dermal skeleton nor the two sorts of oxea and two of strongyles of the type-species *P. dura*. The structure of the skeleton is not that of a typical *Reniera*, neither does it possess the special dermal skeleton of the genus *Amorphina*. Until the true characters of the various genera of the Renierinae have been established I feel that the only course is to place the species in its present genus for the reason already mentioned as a provisional measure.

Registered Nos., localities, etc.—P. $\frac{296}{1}$ (XLVI, 1 *c*, *d*), 8 miles W. of Interview I., Andamans, 45-270 faths.; P. $\frac{297}{1}$ (LII, *a*), Andamans, 271 faths.; P. $\frac{298}{1}$ (LV), "Investigator" Sta. 10 C, off Cinque I., Andamans, 120-170 faths.

Calyx clavata, sp. n.

The single broken specimen consists, at the moment, of two portions. The larger is subcylindrical, about 15 mm. long and 2·5 mm. in diameter, the second, 10 mm. long and 1·5 mm. thick. It is difficult to suggest the habit of the sponge except with great uncertainty but it was either ramose and repent or erect, clavate and slightly stipitate. The latter is the more probable. Colour, yellowish-white, in spirit ; surface smooth. Oscules are visible on the larger fragment where they occupy a more or less lateral position. They are about 1 mm. in diameter with the margins level with the general surface of the sponge. The pores are about ·06 mm. in diameter and scattered evenly over the whole of the surface. Beneath the transparent dermal membrane the underlying skeleton may be seen with the naked eye to be composed of stout anastomosing bands of spiculo-fibre whose general course is in a direction from one end of the sponge to the other. These fibres give a distinctly reticulate appearance to the sponge.

The skeleton consists of two distinct parts, a dermal and a main skeleton. The main skeleton consists of a more or less confused reticulation of oxea lying in the choanosome with little or no order, but running through this mass are stout multispicular bands of oxea cemented together with a small amount of spongin. In some places these bands are so diffuse as to be barely distinguishable from the irregular reticulation in which they are embedded but in others they stand out conspi-

cuously. They follow no apparent course or direction but anastomose freely and beneath the surface they appear to pursue a course more or less parallel to the long axis of the sponge, giving the surface the reticulate appearance already noted. The dermal skeleton consists of a very delicate but quite distinct layer of oxea lying in the ectosome parallel to the general surface of the body. The meshes of the network are always triangular and unispicular, the sides being one spicule's length. This regular triangular pattern is broken only at those points where pores pierce the ectosome, when the mesh may be quadrangular or pentagonal. The ends of the spicules are cemented together at the ends by a small but distinct quantity of spongin.

Spicules.—*Oxea*, smooth, straight or slightly curved, measuring on an average ·11 by ·003 mm.

This species bears a strong general resemblance to the genotype, *Calyx nicœensis* (Risso), in that it has the unispicular detachable dermal skeleton and the multispicular main skeleton composed for the most part of anastomosing fibres running through the sponge with little or no apparent order.

Registered No., locality, etc.—P. $\frac{299}{1}$ (LV, 5), "Investigator" Sta. 10 C, off Cinque I., Andamans, 120-170 faths.

Trachyopsis halichondrioides Dendy (1905).

This species is remarkably common in all parts of the Indian Ocean. I have examined many examples from the E. Coast of S. Africa, Mauritius, Red Sea, Persian Gulf, Ceylon, etc. Its most remarkable feature is an extreme variability in external form, colour, size of spicule, disposition of skeleton, etc. That it is more common than one might suppose from the pages of our literature there can be no doubt, and many forms hitherto regarded as distinct may be found on further examination to be indentical with it. I am not at all sure of the systematic position of the species. It is usually placed near the genus *Halichondria* in the Haploscleridae, although its author suggested an affinity between it and the genera *Trachya* and *Spongosorites*. For my own part, I feel that there is good ground for regarding it as a very primitive Axinellid allied to *Axynissa* and *Prostylyssa*. The present collection contains three quite typical examples. All are small, one is spherical and a reddish-brown in colour, while the other two are quite amorphous and a pale yellow in colour.

Registered Nos., localities, etc.—P. $\frac{300}{1}$ (XXXV, 1 *b*), Malay Archipelago, Bally Strait, 160 faths.; P. $\frac{301}{1}$ (XXXVII), off Ceylon, 703 faths.; P $\frac{302}{1}$ (XLVIII), "Investigator" Sta. 9, S. × W of N. Sentinel I., Andamans, 130-250 faths.

Phloeodictyon putridosa (Ridley and Dendy).

Rhizochalina putridosa, Ridley and Dendy, 1886, 1887.
Rhizochalina putridosa, Whitelegge, 1906.

As is not unusual in dealing with members of this genus, the difficulty of determining the species to which a specimen belongs is increased

by the fact that the specimen itself is only fragmentary. In the present instance, four more or less complete fistulae are present but it is impossible to tell with any degree of accuracy whether they have been broken from the main body or whether they represent complete sponges. The former is, I think, the more probable. They are about 5 mm. in diameter and the longest is about 5 cms. in length. The colour, in spirit, is pale yellow.

On comparing these fistulae with the ' Challenger' specimens a very strong similarity is at once evident despite the fact that the spicules are slightly smaller in the former, and I have little hesitation in assigning them to this species.

Previously known distribution.—Australia, Bahia (Ridley and Dandy) : Australia (Whitelegge).

Registered No., locality, etc.—P. $\frac{303}{1}$ (IV), " Investigator " Stn. 32, 16 miles E. of Devi R., Orissa Coast, 68 faths.

Mycale spongiosa (Dendy).

Esperella spongiosa, Dendy, 1896.
Mycale fistulata, Hentschel, 1911A.
Mycale fistulata var. *macrochela*, Hentschel, 1911A.

The single specimen completely encrusts a shell forming a mass about 20 sq. cms. in extent and about 1 cm. thick. The dermal membranes have been, for the most part, worn away, leaving the coarse fibrous network of the main skeleton bare. In certain places, large cavernous openings lead from the surface into the sponge-tissues but whether these are true oscules or only cavities which have contained commensal worms it is impossible to say. The extremely poor state of the surface makes it impossible to study the nature of the pores. The colour, in spirit, is a dark, purple-brown.

The main skeleton consists of an irregular network of spiculo-fibre with well-defined primary fibres running towards the surface connected at very irregular intervals by secondary fibres. The thickness of the fibres varies considerably. The primaries consist of from twenty to fifty spicules, while the secondaries contain from four to twenty. In addition, loose bundles and isolated spicules are found lying between the meshes of the main network. There is apparently no special dermal skeleton, the dermal membranes resting directly on the ends of the ascending primary fibres. In addition to the subtylostyles, the only spicules present are anisochelae and sigmata.

Spicules.—(1) *Subtylostyles* of the usual form, with slightly developed oval head, ·196 by ·004 mm.

(2) *Anisochelae*, usually in rosettes in the choanosome but scattered singly in the ectosome, varying in length from ·036 to ·028 mm.

(3) *Sigmata*, thin, contorted, abundant in the choanosome, ·045 mm. in length.

Despite certain small differences in shape and size of spicules there is, I think, sufficient resemblance between *Esperella spongiosa*, *Mycale fistulata et var.* and the present specimen to justify my regarding them all as belonging to the same species. Assuming such to be the case,

M. spongiosa is yet another example of a species of *Mycale* common to both Australia and the Indian Ocean.

Registered No., locality, etc.—P. $\frac{304}{1}$ (XXXVIII), off Ceylon, 703 faths.

Biemna annexa (Schmidt).

(For synonymy and description *vide* Lundbeck, 1902.)

The two representatives of this species furnishes what is probably the biggest surprise of the whole collection of deep-sea sponges from the Indian Ocean. The first specimen is a yellow, flattened, discoidal cushion-shaped mass about 4-5 mm. thick and covering a circular area of 2·5 cms. diameter. The second, a dried, encrusting sponge, has a skeleton of loosely arranged tylostyles forming an irregular network, which, just below the surface, ends in dermal brushes of spicules. The dermal brushes, like the rest of the skeleton, are very irregular and often very diffuse. The spicules are tylostyli of two, more or less, distinct sizes, sigmata and trichiform toxa whose dimensions correspond exactly with those of the corresponding spicules given by Lundbeck (*l. c.*). It may be said in conclusion, that this sponge from the Indian Ocean is identical with Schmidt's species which has, hitherto, only been found in the N. Atlantic.

Previously known distribution.—Northern Atlantic (*vide* Lundbeck, 1902).

Registered No., locality, etc.—P. $\frac{305}{1}$ (XXII), "Investigator" Stn. 297, Gulf of Oman, 25°11′ 30″ N., 57° 15′ E., 689-700 faths.; P. $\frac{306}{1}$ (LXII), "Investigator" Sta. 232, Laccadive Sea, 7° 17′ 30″ N., 76° 54′ 30″ E., 430 faths.

Biemna liposigma, sp. n.

The spiculation of this species is so characteristic and unusual that the formation of a new species for so small and fragmentary a specimen may, I think, be justified. The holotype is a small fragment, roundly conical in shape, about 10 mm. high and about 8 mm. in diameter at the base. The colour, in spirit, is a pale yellow. Several conspicuous oscules are distributed over the general surface of the sponge whose diameters range from 1-2 mm. The surface has a minutely reticulate appearance but is glabrous to the touch. The texture is firm but compressible.

The skeleton, which is really the only thing about this sponge which can be satisfactorily described, is composed entirely of styli and rhaphides, the latter being divided into three distinct categories. In the choanosome, the larger rhaphides, usually present in bundles of from twenty to forty, form the most conspicuous feature of the skeleton. The rhaphides may occur either singly or in bundles and they are distributed, together with the styli, without apparent order throughout the whole of the choanosome. In the dermal membrane, however, some sort of order can be seen and it is probably the regular arrangement of the styli and the bundles of rhaphides lying parallel to and just beneath

which give the surface its reticulate appearance. It seems almost possible to regard such an arrangement as a special dermal skeleton, and, indeed, the whole skeleton, including the disposition of the dermal spicules, strongly recalls that of *Halichondria panicea.*

Spicules.—(1) Styli, smooth, slightly curved especially in the basal third, ·6 mm. long by ·024 mm. thick.

(2) Rhaphides, ·5 mm. long by ·004 mm. thick. These spicules, in common with the other categories of rhaphides are smooth, slender, and sharply pointed at each end.

(3) Rhaphides, ·084 mm. long by ·004 mm. thick.

(4) Rhaphides, ·03 mm. long by ·0015 mm. thick.

This appears to be a true *Biemna* which is characterised by the complete absence of sigmata, a condition almost unique in the genus.

Registered No., locality, etc.—P. $\frac{307}{1}$ (LI), Andamans, 271 faths.

Sceptrospongia coronata Dendy (1926A).

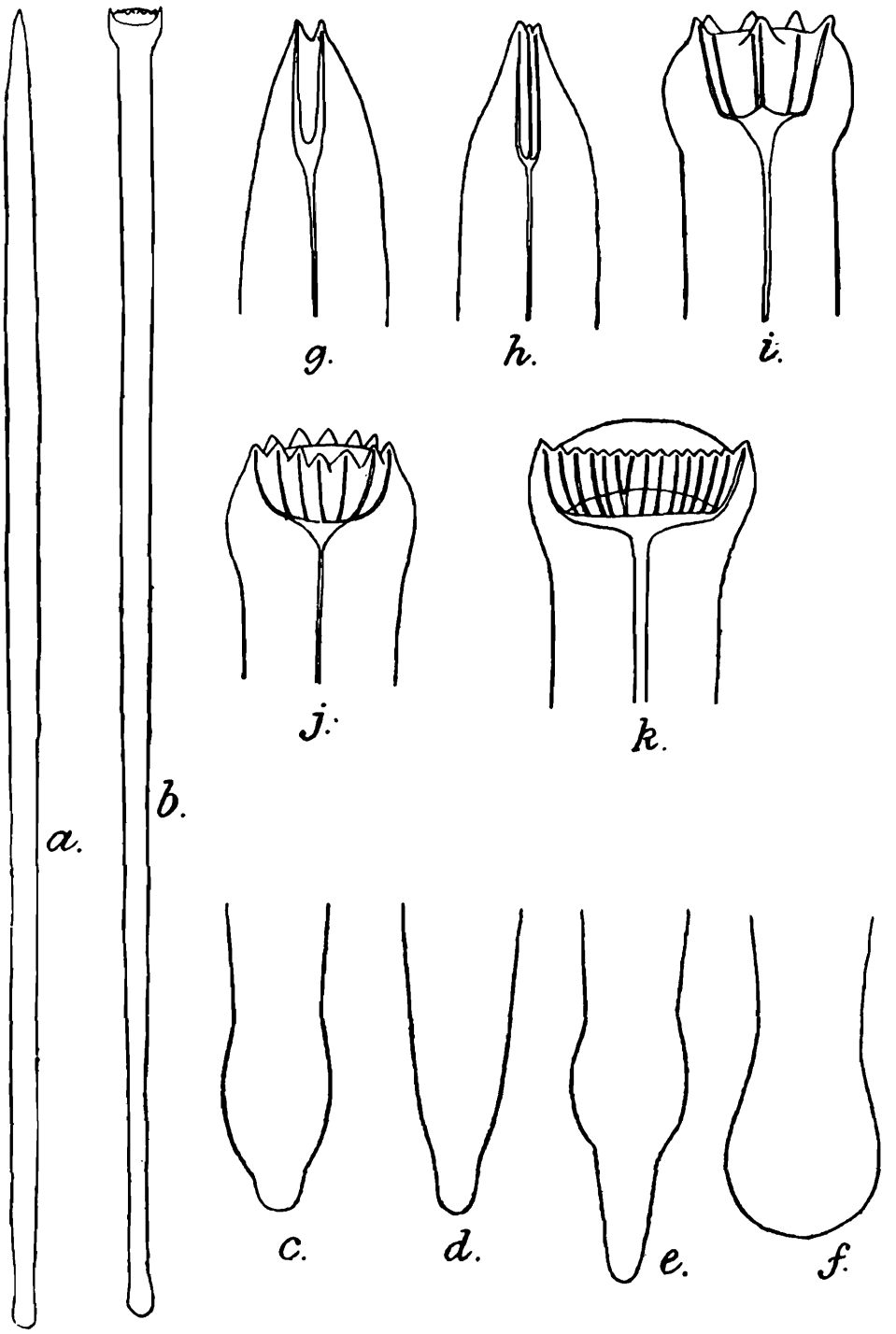
The two sponges described below were first mentioned by Dendy in relation to his study of the origin and growth of the sponge-spicules. Although he did not give a complete description of the sponge in question, he discussed certain points of the skeleton and the following description is written in correlation with that author's remarks.

The two sponges are very similar in all respects so that the description of the holotype will suffice. It is subspherical, about 1·5 cm. in greatest diameter. The colour in spirit is a pale yellowish-grey. In life it appears that the sponge was attached to some sort of coral-mass. The surface is even but minutely hispid. The oscules, of which there are two, are of a peculiar formation, in that each consists of an irregularly branching narrow slit. Directly beneath this is a cavernous subdermal cloacal cavity receiving the openings of the exhalant canals. The pores are inconspicuous and apparently distributed evenly over the general surface of the sponge.

The skeleton may be conveniently divided into main and dermal portions. The main skeleton is composed of monactinal megascleres forming a central irregular mass at the centre of the sponge, from which radial bands of spicules run more or less vertically to the surface, where they spread out into ' brushes ' just beneath the ectosome. The spaces between the radial bundles are occupied by a confused mass of megascleres in a manner similar to that found at the centre of the sponge. The dermal layer is composed of stephanotyles with their bases embedded in the ectosome and their distal ends projecting more or less at right angles. In addition, anisochelae, sigmata and trichodragmata are present. These are confined chiefly, if not wholly, to the choanosome.

Spicules.—(1) *Tylostyles, subtylostyles, styles* and *strongyloxea.* I have included all these forms of spicule under one head because they are obviously derivatives of one spicule-form and may not be separated. They are all monactinal and the most numerous is the strongyloxeote. This is not exactly the same thing as the corresponding spicule of the genus *Donatia,* to which it bears a strong resemblance, but since it is an unusual form of spicule I can see no other way of expressing its form.

Apparently, it is a monactinal spicule which has become secondarily oxeote with bluntly pointed ends. The other three forms are derivatives



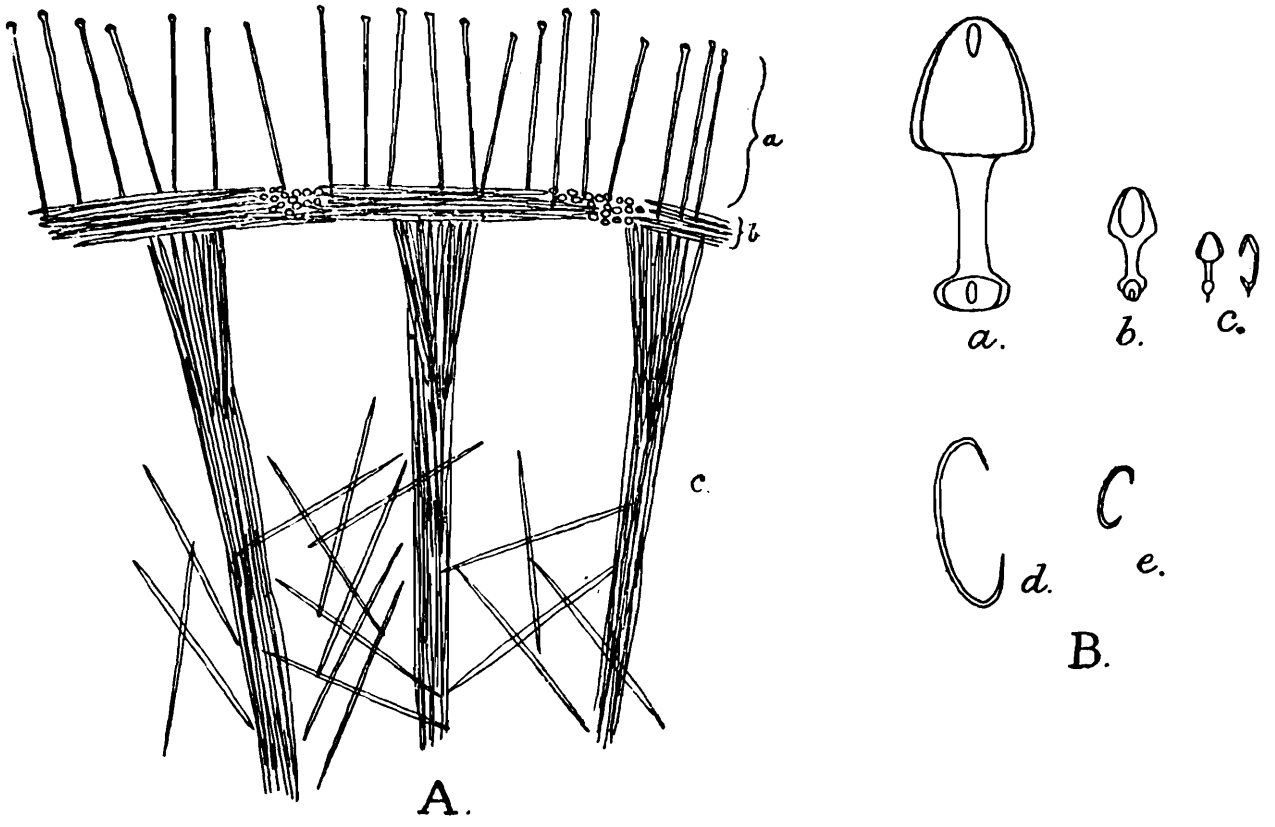
TEXT-FIG. 4.—*Sceptrospongia coronata* Dendy.

a. Style from the choanosome compared with—*b*. Stephanotyle. Both × 200; *c*, *e*. Bases of subtylolostyles of the choanosome, × 1000; *d*. Base of strongyloxeote of choanosome, × 1000; *f*. Base of tylostyle of chanosome, × 1000; *g*—*k*. Various heads of stephanotyles, × 1000.

of this spicule in which the proximal end bears a small head variously developed (text-fig. 4 *a*, *c*, *d*, *e*, *f*). The average size of the spicules is ·36 by ·013 mm.

(2) *Stephanotyles* (text-fig. 4 *b*, *g*, *h*, *i*, *j*, *k*) of the dermal layer. These are of the same proportions as 1, and appear to have been derived from the same form of spicule, *viz.*, the strongyloxeote, as the spicules of the main skeleton. Dendy (*l. c.*) has already referred to the variable character of the stephanotyle and in my opinion a double evolution has taken

place in the skeleton of this one species of sponge. Since they are the most numerous, one naturally takes the strongyloxeote as the more typical and, from its form, the most primitive spicule present. In the main skeleton a series of derivatives may be traced in which the enlarge-



TEXT-FIG. 5.—*Sceptrospongia coronata* Dendy.

A. Diagrammatic representation of a radial section through the type: *a.* Layer of stephanotyles projecting at the surface. *b.* Ectosomal layer of tangentially disposed megascleres; *c.* Choanosome with radial bundles and interstially scattered megascleres; B. Microsclers: *a, b, c.* Anisochelae of three kinds; *d, e.* Sigmata of two sizes. All × 350.

ment of the proximal end into a 'head' is the principal factor in the change of form, while in the stephanotyle the distal end has become modified by the multiplication of the axial canals and the consequent enlargement of the end.

(3) *Anisochelae* (text-fig. 5 B *a*), ·075 mm. long.

(4) *Anisochelae* (text-fig. 5 B *b*), ·027 mm. long.

(5) *Anisochelae* (text-fig. 5 B *c*), ·015 mm. long.

(6) *Sigmata* (text-fig. 5 B *d*), very numerous, often centrotylote, ·045 mm. long by ·0025 mm. thick.

(7) *Sigmata* (text-fig. 5 B *e*), ·018 mm. long.

(8) *Trichodragmata*, numerous, in bundles measuring ·045 by ·009 mm.

(9) *Trichodragmata*, in bundles measuring ·015 by ·009 mm.

This is altogether a remakable species which will repay a studied comparison with the Mycaleae when that group is revised.

Registered Nos., localities, etc.—P. $\frac{308}{1}$ (XXVII, 5), "Investigator" Stn. 385, Arabian Sea, 16° 40′ N., 71° 53′ E., 630 faths.; P. $\frac{309}{1}$ (XLVI, 2), 8 miles W of Interview I., Andamans, 45-270 faths.

Damiriopsis, gen. nov.

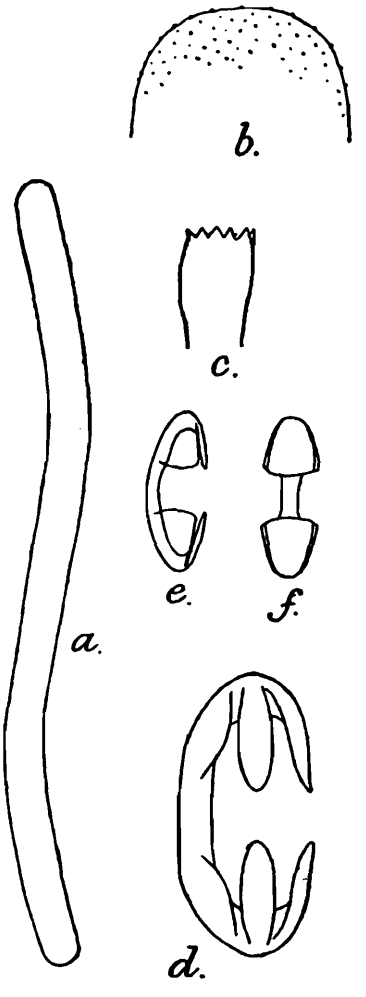
Diagnosis.—Plocamixeae in which the main skeleton consists of an irregular reticulation of amphistrongyles with minutely-roughened heads arranged in a loose manner, not connected with spongin. Auxiliary spicules are present in the form of slender tornota with spined heads. Microscleres are tridentate and palmate isochelae. There is no special dermal skeleton.

The genus approximates very closely to several of the genera of the Plocameae. This section of the Ectyoninae includes the following genera :—*Plocamia* Schmidt, *Damiria* Keller, *Plocamiopsis* Topsent, *Lithoplocamia* Dendy, with *Dirrhopalum* Ridley and *Heteroclathria* Topsent as possible synonyms of *Plocamia* itself. Of these, the present genus is more nearly allied to *Damiria* from which it differs in the presence of tornota and chelae.

Damiriopsis brondstedi, sp. n.

(Pl. I, figs. 3, 4.)

The holotype is one of five specimens, all closely resembling each other, obtained in a single haul of the dredge. They are small irregularly



Text-fig. 6.—*Damiriopsis brondstedi*, sp. n.

a. Strongyle of main skeleton, × 100 ; *b.* End of strongyle magnified to show minute spination, × 500 ; *c.* End of tornote, × 1000 ; *d.* Tridentate isochela, × 500 ; *e. f.* Palmate isochela, × 500.

massive sponges whose dimensions are roughly 2 by 1 cm. by ·5 cm. high, the volume being about 1 cc. In external form they are singularly

like *Protoschmidtia cerebrum*. There is a delicate dermal membrane through which the spicules of the underlying skeleton project rendering the surface minutely hispid. Conspicuous sub-dermal cavities are visible through the dermal membrane. The oscules are about 1·5 mm. in diameter and lead into deep cloacal tubes running vertically downwards to the base of the sponge. The colour is a greyish-yellow.

The main skeleton consists of an irregular reticulation of loosely aggregated amphistrongyles lying singly or in bundles, of 3 to 6 spicules, in the choanosome. Here and there bundles of tornota are mixed with the main skeleton without apparent order, more particularly at the surface.

Spicules.—(1) *Amphistrongyles* (text-fig. 6 *a*, *b*), usually slightly curved, often irregularly angulated, smooth but for the extreme end of the spicule where they are minutely roughened, measuring ·756 by ·036 mm.

(2) *Tornota* (text-fig. 6*c*), straight, slender, smooth, beset at each end with a crown of small spines, measuring ·264 by ·006 mm.

(3) *Isochelae* (text-fig. 6*d*), large, tridentate, ·054 mm. long.

(4) *Isochelae* (text-fig. 6 *e*, *f*), small, palmate, varying somewhat in size but measuring on an average about ·034 mm. long.

Registered No., locality, etc.—P. $\frac{310}{1}$ (XLVII), Andamans, 130-290 faths.

Anchinoe dubia, sp. n.

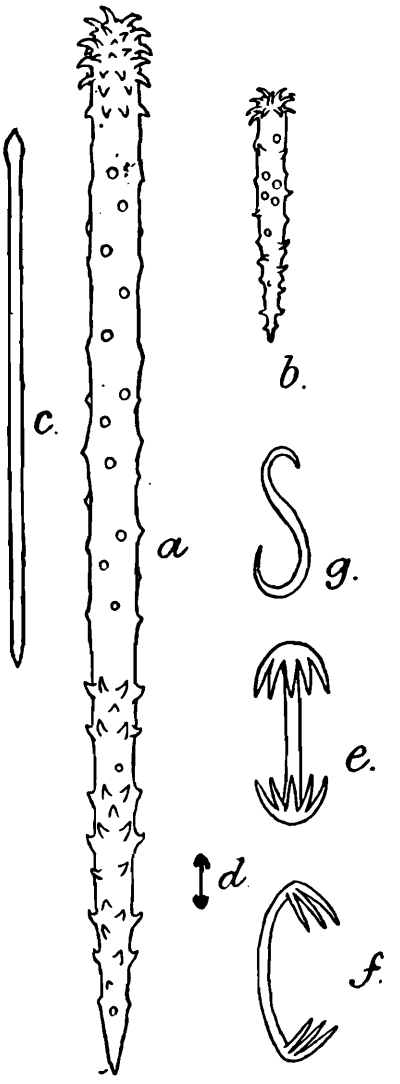
(Pl. I, fig. 5.)

The two specimens referred to this species are sufficiently alike for the description of the holotype, P. $\frac{12}{1}$ (XXX, 2), to suffice for them both. The sponge is clavate, about 11 cms. in height and nearly 3 cms. in diameter at its broadest point, which is near the apex. The tissues are thrown into a large number of minute folds so that the sponge is minutely clathrous. Neither oscules nor pores are discernible. The centre of the sponge is slightly more solid than the rest of the tissues, so that something akin to an axial core is present. The colour, in spirit, is a brownish-yellow.

The skeleton consists of stout plumose columns of acanthostyles and each column is composed of a bundle of acanthostyles lying parallel throughout the whole length of the columns; other, but similar, acanthostyles are set at right angles to the central core. The true echinating spicules are also acanthostyles, considerably smaller than the foregoing, and are found scattered sparsely along the whole length of the columns projecting at all angles. In addition, auxilliary spicules in the form of tornota are found in the dermal membrane, where they often occur in brushes at the apices of the plumose columns, or scattered in the tissues sorrounding the main skeleton. The microscleres are small chelae and contorted sigmata. There is no special dermal skeleton. The tornota, which might at first sight suggest such a thing, cannot be regarded as anything more than auxiliary spicules, since they are equally abundant in the choanosome and ectosome.

Spicules.—*Acanthostyles* (text-fig. 7*a*), of the main skeleton. These vary much in size but measure on an average ·28 mm. long and ·02 mm.

at the thickest point, inclusive of the spines. The spicules are beset with spines along the whole length but more particularly at the base and the apex.



TEXT-FIG. 7.—*Anchinoe dubia*, sp. n.

a. Acanthostyle of main skeleton, × 350; *b*. Echinating acanthostyle, × 350; *c*. Tornote, × 350; *d*. Isochela unguifera, × 350; *e*, *f*. The same greatly enlarged, × 1500; *g*. Sigmata, × 350.

(2) *Acanthostyles* (text-fig. 7*b*), echinating the fibres of the main skeleton. These are ·07 mm. long and ·011 mm. thick at the base, inclusive of the spines. In appearance, they much resemble the larger acanthostyles but form a quite distinct category.

(3) *Tornota* (text-fig. 7*c*), smooth, straight spicules abundantly scattered throughout the skeleton. The ends of these spicules are seen to vary enormously when examined with a $\frac{1}{12}$" immersion. They may be oval and slightly elongated, hastate, mucronate or more or less globular. Length of spicule, ·14 mm., thickness not exceeding ·004 mm. along the major part of the shaft.

(4) *Isochelae unguiferae* (text-fig. 7 *d*, *e*, *f*), with 5 small teeth at each end of the slightly-curved shaft. Total length, ·011 mm.

(5) *Sigmata* (text-fig. 7*g*), contort, numerous. Length from bend to bend, ·042 mm.

The species is by no means a typical *Anchinoë* but for the moment I can see no other genus in which it might conveniently be placed. The

absence of smooth spicules in the centres of the plumose columns of the main skeleton, together with the unusual character of the chela, make it very doubtful whether the species can be included in the genus at all. In view, however, of the numerous controversial points which a discussion of the affinities of the present species would raise I prefer to leave the matter until a more opportune moment.

Registered Nos., localities, etc.—P. $\frac{311}{1}$ (XXIX), "Investigator" Stn. 464, S. of Ceylon, 6° 2′ 30″ N., 81° 29″ E., 52-68 faths.; P. $\frac{312}{1}$ (XXX, 2), "Investigator" Stn. 464, S. of Ceylon, 6° 2′ 30″ N., 81° 29′ E., 52-68 faths.

Leucophloeus fenestratus Ridley.

(For synonymy *vide* Dendy, 1921B, p. 124.)

A single white crust on a shell is the sole representative of this species in the collection.

Previously known distribution.—Australia, Indo-Pacific and Indian Ocean.

Registered No., locality, etc.—P. $\frac{313}{1}$ (XXXV, 1 *b*), Malay Archipelago, Bally Strait, 160 faths.

Phakellia cactoides, sp. n.

(Pl. I, figs. 6, 7, 8.)

The species is interesting since it demonstrates the difficulty of distinguishing between the genera *Axinella*, *Phakellia* and *Auletta*, as we at present understand them. The holotype is sessile and lobose (Pl. I, fig. 6), the body of the sponge being made up of a number of flattened, fleshy lobes which spring from each other in an altogether irregular manner very much in the fashion of a cactus plant. The extremely hispid nature of the surface, due to the projection of the large spicules, only serves to strengthen the similarity to that xerophytic plant. The second specimen, however, is roughly lamellar, consisting of a few thin lamellae springing from the base but remaining closely apposed throughout their length (fig. 7). The third, like the second, consists of lamellae disposed at all angles to each other which frequently coalesce at the edges giving the appearance of a set of tubes. In reality they are no more than longitudinal channels, running vertically through the length of the specimen, formed by the folding of the lamellae and the fusion of their margins. They are in no sense oscula or cloacal tubes. Nevertheless, it suggests a way in which tubular individuals may arise and furnishes one more piece of evidence of the inadequacy of the genus *Auletta*, unless it can be proved that that genus is founded on something more than mere external form. In external form the first two specimens resemble very strongly *Phakellia fusca* Thiele, and *Axinella mariana* R. and D. from which, however, they are separated by the absence of strongyles. The third specimen is very like *Auletta consimilis* Thiele from which it is separated by the size of the spicules. There is, moreover, a strong likeness between the present species and Thiele's *Auletta ? celebensis*. Colour, in spirit, pale-yellow.

The skeleton consists entirely of large styli, measuring 1·2 by ·032 mm., forming a confused layer at the centre of the lamellae from which other styli radiate outwards in all directions. There is no axial condensation of spicules as in the more typical Axinellid skeleton.

Registered No., locality, etc.—P. $\frac{314}{1}$ (VIII), "Investigator" Stn. 141, Bay of Bengal, 14° 11′ 6″ N., 80° 24′ E., 88 faths.

Auletta elongata Dendy (1905, 1921B).

(Pl. I, fig. 9.)

The specimen consists of a single tube about 9 cms. in length from which two short lateral tubes arise, one on either side, about halfway up. The diameter of these tubes is 8 mm. except at the base of the main tube where a certain narrowing takes place. The skeleton is the same as that described by Dendy for the Ceylon specimens but the only spicules present are styli, measuring, on an average, ·9 by ·015 mm. The colour, in spirit, is a yellowish white. I have compared this specimen with the others described by Dendy and am confident of the accuracy of my determination despite the absence of oxea and strongles.

Previously known distribution.—Ceylon, Indian Ocean.

Registered No., locality, etc.—P. $\frac{315}{1}$ (XXX, 1), "Investigator" Stn. 464, S. of Ceylon, 6° 2′ 30″ N., 81° 29′ E., 52-68 faths.

Auletta lyrata (Esper) var. **brevispiculata** Dendy (1905, 1921B).

(Pl. I, fig. 10.)

The single specimen consists of four tubes springing from a common base and rising to a height of about 7 cms. These tubes branch dichotomously, many of the secondary tubes anastomosing, and have a uniform diameter of 3 mm. The walls of the tubes are ·5 mm. thick. The spicules are of the usual size and shape for this variety but are crowded into a dense *Petrosia*-like, reticular network.

Previously known distribution.—Ceylon, Indian Ocean (Dendy).

Registered No., locality, etc.—P. $\frac{316}{1}$ (XXXI, 2), "Investigator" Stn. 352, Mergui Archipelago, 12° 15′ 20″ N., 97° 10′ 10″ E., 62 faths.

Bubaris Grey (1867E).

Genotype :—*Hymeraphia vermiculata* Bowerbank.

We do not know precisely what were the ideas of authors previous to Dendy as to the systematic position of this genus but that author placed it among the Clathrieae, of which group he regarded it as a reduced form. He says (1921B, p. 62), "The subsymmetrical megascleres found in the interior of the sponge must be regarded as derived from the normal styli and the genus seems to be a derivative of *Microciona* and *Aulospongus*." Topsent, on the other hand, has consistently placed the genus in the Axinellidae. For my part, I can see no alternative to accepting Topsent's view. The normal species of the genus have most things in common with the genus *Phakellia*. The two species,

B. conulifera and *B. salomonensis*, by the addition of trichites, make a close approach to *Tragosia*. The presence of angulated oxea in so many species recalls strongly the spiculation of the more typical species of the genus *Axinella*, while the ease with which oxea, styli and strongyla may replace each other in the spiculation is decidedly characteristic of the Axinellidae as a whole and of no other group of sponges.

The presence of trichites in two species of the genus revives the old controversy of the taxonomic value of these spicules. It so frequently happens that the same author at one time regards these spicules as sufficient basis for a generic distinction and at others as of specific importance only, that one is left in doubt as to what line of action should be followed. On the whole, I incline to the view that they are not, *per se*, of generic importance. In the absence of any precise knowledge of their origin, function or significance our opinion must be based on circumstantial evidence. In the genus *Mycale*, for example, the idea of using them as a basis for the further sub-division of the genus would be ludicrous. On the other hand, the genera *Phakellia* and *Tragosia* are separated on this feature alone. In the present genus, *B. conulifera* Dendy is so like *B. columnata* mihi in all other respects save the presence of trichites (*i.e.*, trichodragmata) that they could not be logically placed in separate genera.

REVISION OF THE SPECIES OF *BUBARIS*.

Of the species of *Bubaris* hitherto known to us, five must undoubtedly be removed to other genera. They are :—

1. *Bubaris constellata*, Topsent, 1893F.

Hallmann (1917) has already made this species the genotype of a new genus *Paratimea*.

2. *B. verticillata*, Topsent, 1891 (*non* Bowerbank) is closely allied to certain species of *Grayella* and is accordingly removed, at least provisionally to that genus.

3. *B. gallica*, Topsent (1893F), is a new name for 2.

4. *B. reptans*, Kirkpatrick (1903B) is certainly no *Bubaris* but its affinities are not clear at the moment. I propose a new genus of which this species shall be the genotype, *Gilchristia*, after the late Dr. J. B. F. Gilchrist whose name will always be associated with the pioneer work in connection with the collecting of South African sponges. The genus must be placed provisionally, *incertae sedis*, among the Suberitidae.

5. *B. ornata*, Dendy (1924A) belongs to the genus *Plocamia* rather than to *Bubaris*.

LIST OF VALID SPECIES OF *BUBARIS*.

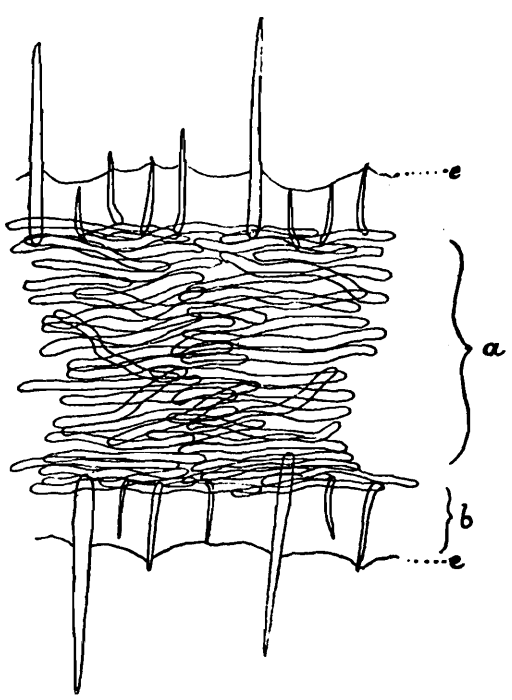
1. *B. vermiculata* (Bowerbank).
2. *B. sosia*, Topsent, 1904A.
3. *B. mastophora* (Schmidt) Topsent, 1904A
4. *B. murrayi*, Topsent, 1913B.
5. *B. aurantiaca* (Lendenfeld) Hallmann, 1914C.
6. *B. radiata*, Dendy, 1916A.
7. *B. salomonensis*, Dendy, 1921B.

8. *B. conulifera*, Dendy, 1921B.
9. *B. oxeata*, Dendy, 1924A.
10. *B. elegans*, Dendy, 1924A.
11. *B. ligulata*, sp. n.
12. *B. durissima*, sp. n.
13. *B. columnata*, sp. n.

Bubaris columnata, sp. n.

(Pl. II, fig. 1.)

This sponge is typically lamellar and sessile. The largest specimen present, taken as the holotype, consists of a single lamella folded on itself in such a way as to give rise to an incompletely-formed cup 4 cms. high. The lamellae themselves are composed of a number of stout columns of vermicular strongyles which rise vertically from the base and end in the upper margin of the sponge. On the way they branch and anastomose to a large extent. The interstices between the network thus formed are filled with loose tissues containing a few sparsely-scattered styli. The surface is strongly hispid and harsh to the touch. Neither pores nor oscules are visible. The colour, in spirit, is a greyish-yellow.



Text-fig. 8.—*Bubaris columnata*, sp. n.

Section through the lamella (semi-diagrammatic). *a.* Axial core of vermiform strongyles; *b.* Region occupied by extra-axial skeleton; *e.* Ectosome.

The skeleton (text-fig. 8) consists of two portions, an axial portion formed by the ascending columns of stronglyles already noted and a radial, or extra-axial, formed of a single layer of styli coating the axial portion, with their bases loosely embedded in the outer layers of the axial skeleton and their apices projecting slightly beyond the ectosome.

Spicules.—(1) *Strongyles*, vermicular, smooth, varying in length from ·5 to ·72 mm. and in thickness from ·016 to ·024 mm.

(2) *Styli* smooth, sometimes straight but usually with an abrupt curve or 'crook' at the base, measuring ·228 to ·48 mm. by ·012 to ·024 mm.

(3) *Styli* long, smooth, straight or at most only gently curved, usually ·96 mm. long or thereabouts and varying in thickness from ·022 to ·04 mm. These styli form a category distinct from the preceding and are responsible for the marked hispidation of the surface.

Probably the only real difference between this species and *B. radiata* Dendy is in the size of the spicules.

Registered Nos., locality, etc.—P. $\frac{317}{1}$ (XLIV, i, ii), Andaman Sea, Lat. 13° 17′ N., Long. 93° 7′ E., 90 faths.

Bubaris durissimma, sp. n.

(Pl. II, fig. 2.)

The single representative is an erect, branching sponge, 7·5 cms. high, consisting of a main stem 1 cm. in diameter which bifurcates at the apex and bears two small lateral branches, one of which is also dichotomously branched. The surface is slightly uneven and minutely hispid, and is marked with an irregularly reticulate pattern, which is produced by the stout columns of spicules which run from the central axial skeleton to the surface at right angles to the long axis of the branches. Both the ends of the spicule-columns and the aspiculous spaces between them are covered by a very fine ectosomal tissue. The texture is hard. The colour, in spirit, a pale yellow. Neither oscules nor pores are visible.

The skeleton consists, as usual, of an axial and a radial portion. The axial skeleton consists of a closely-felted mass of angulated oxea with a small admixture of vermicular strongyles occupying the major portion of the sponge. In a typical transverse section of a branch, the axial skeleton is 8 mm. in diameter and the layer of flesh containing the columns of spicules supporting the outer tissues is no more than 1 mm. thick, so that the axial skeleton comprises a little more than $\frac{3}{5}$ths of the total volume of the sponge. The extra-axial skeleton consists of short plumose columns of styli with a slight admixture of angulated oxea.

Spicules.—(1) *Oxea,* smooth, usually sharply-angulated at the centre but sometimes straight or even, rarely vermicular, composing the axial skeleton and found also in small quantities extra-axially, ·24 to ·372 mm. long and ·011 to ·016 mm. thick.

(2) *Strongyles,* smooth, vermicular, occasionally occurring in the axial skeleton, ·6 by ·013 mm.

(3) *Styli,* smooth, straight, gently curved but more often straight with a decided, abrupt curve at the base, ·18 to ·48 mm. long by ·012 to ·016 mm. thick.

The present species has much in common with *B. conulifera* Dendy but is separated from that species by the absence of trichodragmata.

Registered No., locality, etc.—P. $\frac{318}{1}$ (XXXI, i), "Investigator" Stn. 532, Mergui Archipelago, 12° 15′ 20″ N., 97° 10′ 10″E., 62 faths.

Bubaris ligulata, sp. n.

(Pl. II, fig. 3.)

The two representatives of this species, closely similar to each other in all respects, are erect, leaf-like sponges. The holotype, P. $\frac{319}{1}$ (XXXI, 3, i), consists of a round, pad-like basal attachment from which springs a stout stalk which in turn passes insensibly into a thin, flattened, frond-like portion constituting the body of the sponge. The total height is 14 cms. of which 5 cms. is stalk. The diameter of the latter is, on an average, no more than 4 mm. The upper portion or body does not exceed 1·5 cms. in width or 2 mm. in thickness. The surface is even but very minutely hispid. The colour, in spirit, is a pale yellow. Neither pores nor oscules are visible.

The skeleton consists of two portions, axial and radial. The first is very dense and tightly-packed, but without visible spongin, and in the stalk it takes the form of a dense cylindrical agglomeration of vermicular strongyles. This gradually flattens out and becomes less dense as the tip of the frond is reached. The strongyles in this portion of the skeleton are disposed some in a plane parallel to the long axis of the sponge, others at right angles to them, like the threads in a piece of cloth. The radial skeleton consists of a single layer of radially-arranged styli with their bases loosely embedded in the outer layers of the axial skeleton and their apices projecting slightly beyond the ectosomal tissues.

Spicules.—(1) *Strongyles* of the axial skeleton, smooth, obtusely rounded at each end, the whole spicule gently angulated at the centre so that it resembles a boomerang in shape. The size varies immensely, the length from ·085 to ·35 mm. and the thickness, at the middle of the spicule, from ·0085 to ·017 mm.

(2) *Styli* of the radial skeleton, smooth, with the proximal end gently and obtusely rounded and the distal end sharply pointed, usually gently curved towards the inner end of the spicule. The length varies from ·24 to ·372 mm., the thickness, ·012 mm., is fairly constant.

Registered No., locality, etc.—P. $\frac{319}{1}$ (XXXI, 3, i, ii), "Investigator" Stn. 532, Mergui Archipelago, 12° 15′ 20″ N., 97° 10′ 10″ E., 62 faths.

Suberites perfectus Ridley and Dendy (1886, 1887).

The single specimen consists of a laterally compressed, clavate lobe about 6 cms. high and about 2 cms. across at the widest point. The characteristic dermal reticulation is not so strongly marked as in the holotype, probably because the present specimen is less mature. The oscules are situated on the summit of thin-walled elevations, as in the holotype, but are fewer in number, four only being present. The arrangement of the skeleton and the size and shape of the spicules are quite typical for the species.

Previously known distribution.—Port Jackson, Australia (Ridley and Dendy); New Zealand (Brondsted).

Registered No., locality, etc.—P. $\frac{320}{1}$ (XXXV), Malay Archipelago, Bally Strait, 160 faths.

Pseudosuberites cava Sollas (1902).

(Pl. II, fig. 4.)

The single specimen is encrusting a fragment of shell. It is about 6 cms. by 5 cms. in extent and less than 1 cm. thick at the thickest point. The internal portions are very cavernous and the characteristic feature of the species is that " the sponge consists of two lamellae, one attached to the substratum, the other being the dermal membrane, while columns containing bundles of spicules stretch vertically between them." The surface is very minutely hispid. The colour, in spirit, is yellow. The styli measure, on an average, ·5 mm. by ·012 mm.

Previously known distribution.—Malay Peninsula.

Registered No., locality, etc.—P. $\frac{321}{1}$ (XXXV, 2), Malay Archipelago, Bally Strait, 160 faths.

Cryptospongia, gen. nov.

Euceratosa in which the individual consists of a long slender stalk surmounted by a flattened, discoid head ; the fibres of the stalk are stout, with little pith and are differentiated into two layers, an outer and an inner ; those of the head are strongly pithed and form an irregularly anastomosing network.

Cryptospongia enigmatica, sp. n.

(Pl. II, fig. 5.)

There are a dozen specimens of whose relationships it is dificult to speak with any certainty. A typical example consists of a slender stalk bearing a flattened manubrial or agariciform head, semicircular in outline. The longest stalk found was 11 cms. in length and the same diameter, 1·5 mm., throughout. The texture is tough and cork-like. The surface is usually beset with numerous very slight protuberances which make it harsh to the touch. The head is often 3 cms. in diameter, and 2 mm. thick at the centre. There is no trace of a basal attachment or rooting process on any of the specimens. The form is suggestive of the Hexactinellid genus *Caulophacus.*

In longitudinal section, the stalk consists of an outer cortical layer composed of fibres more densely aggregated and of a darker brown colour than those of the inner, medullary, region. The medullary region is made up of longitudinal fibres, about ·020 mm. in diameter, connected at rare intervals by secondary transverse fibres. There is apparently little pith or core in the fibres of the stalk.

The fibres of the head are much more delicate and pliable than those of the stalk. The head is in the form of a continuous network of branching fibres which anastomose in an irregular manner. The fibres themselves are ·060 mm. in diameter, of which $\frac{9}{10}$ths is occupied by the pith.

No soft tissues are discernible.

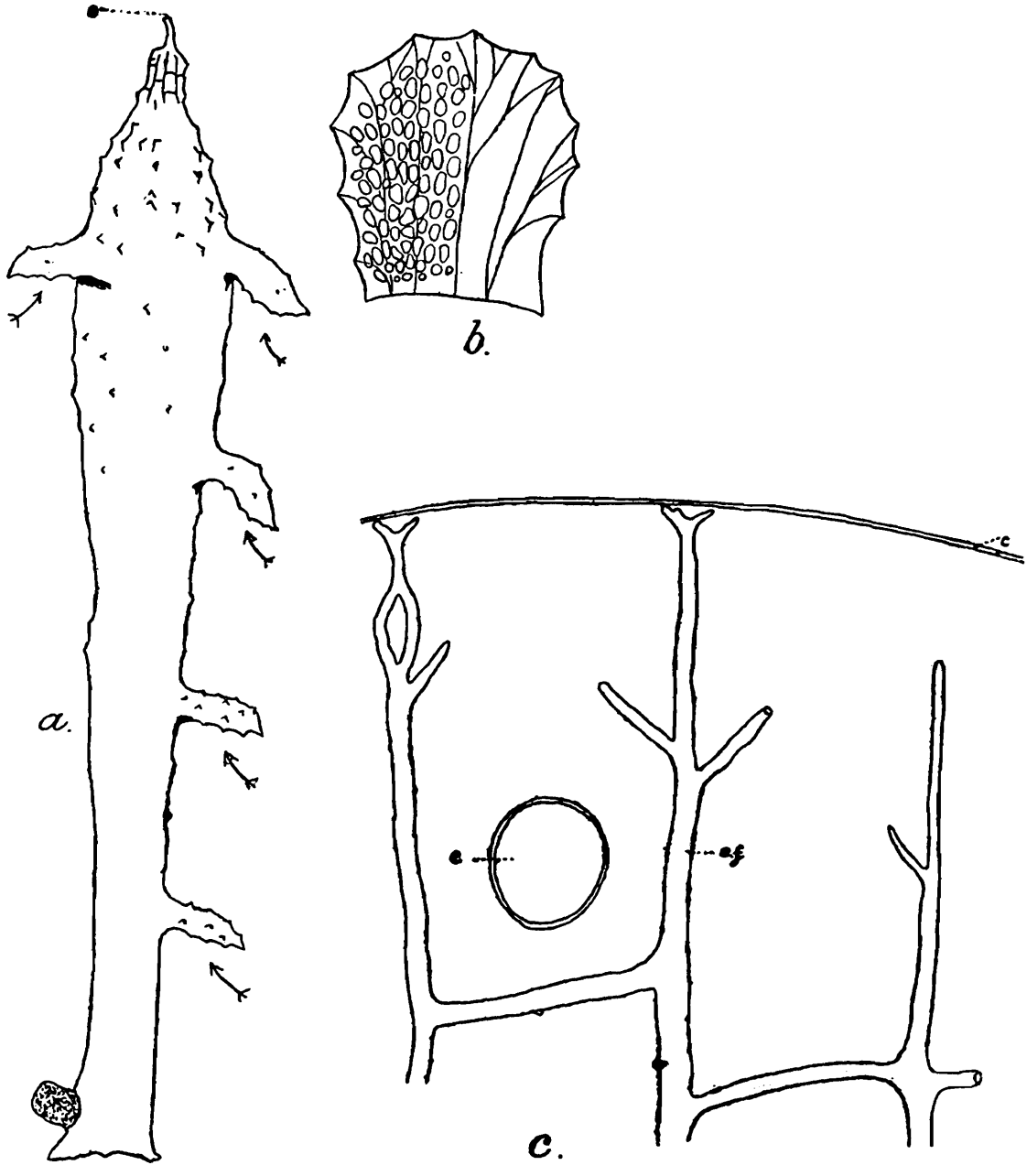
At first sight there is considerable resemblance between these forms and certain Algae but the non-septate, anastomosing nature of the fibres and the depths at which the specimens were obtained disposes of the suspicion that they may be lowly plants.

These organisms are in every way most unusual sponges and I am by no means convinced that they may not ultimately prove to be belong to some other group of organisms. The macerated state in which they were found, however, forbids further speculation and I have been compelled to regard them as sponges, for the moment, at all events.

Registered No., locality, etc.—P. $\frac{322}{1}$ (XLI), "Investigator" Stn. 4, off Ten Degree Channel, S. of Andaman Is., 1045 faths.

Stenospongia, gen. nov.

Spongiidae of symmetrical form with conulated surface and special pore-areas; skeleton consists of non-pithed fibres forming a reticulation in which the primary fibres, running vertically to the surface and barely distinguishable from the secondary fibres, are connected at intervals by the transverse secondary fibres; flagellated chambers small, possibly diplodal.



TEXT-FIG. 9.—*Stenospongia aligera*, sp. n.

a. The whole sponge with terminal osculum (o) and the direction of currents entering the sponge marked by arrows; *b*. The undersurface of one of the lateral pore-bearing porcesses showing the 'veins' of spongin fibre supporting it and the pores (marked on the left hand side only); *c*. Section at right angles to the surface showing the cuticle (*c*), a portion of the skeleton and an embryo (*e*).

Stenospongia aligera, sp. n.

(Pl. II, fig. 6.)

In external form the sponge is clavately cylindrical, about 8 cms. high and 1 cm. in diameter at the thickest point, near the apex, tapering to about ·5 cm. in diameter at the base. There is a single terminal oscule at the apex and the pores are restricted to the undersurfaces of a number of lateral wing-like processes. The whole surface is slightly conulose and covered with a tough cuticle. The dark surface markings seen in Pl. II, fig. 6, are the hydrorhizae of epizoic hydroids. The colour, in spirit, is a pale brown. Attachment to the substratum was by means of a small basal plate.

The skeleton consists of an irregular net-work of pithed fibres, in which primary and secondary fibres may be distinguished, but there is no special dermal skeleton. Both primary and secondary fibres are about ·08 mm. in diameter.

Numerous spherical embryos, about ·8 mm. in diameter, are present in the choanosome.

The most remarkable feature of the species is the restriction of the pores to pore-areas on the lateral processes (text-fig. 9*b*). Here, as is so frequently the case in sponges, pore-specialisation is correlated with the development of a chitinoid cuticle covering the ectosome.

Registered No., locality, etc.—P. $\frac{323}{1}$ (XXXII, 5), "Investigator" Stn. 535, Mergui Archipelago, 13° 4′ 30″ N., 96° 44′ E., 65 faths.

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