REPORT ON SOME TETRAXONID SPONGES IN THE COLLECTION OF THE INDIAN MUSEUM.

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The present paper is a report on a collection of sponges which was sent to me for study by the Zoological Survey of India in 1922. The major part of the work on this collection was done in the Zoological Laboratory of the Government College, Lahore, and I also had the advantage of examining the rich collections of the Indian Museum and consulting the necessary literature in the library of the Zoological Survey of India, Calcutta, during the summer of 1923. Throughout my stay in Calcutta I had the benefit of the friendly criticisms of the late Dr. N. Annandale, who was always ready to help me with his experience and knowledge ; I cannot fully express the debt of gratitude which I owe to him for his help.

The greater part of the collection dealt with in this paper consists of sponges trawled in the Bay of Bengal by the Bengal Fisheries steamer " Golden Crown " in the years 1908-1910. Of the other collections which I also had for examination there were two important ones made by Dr. S. W. Kemp at Killikarai (S. India) and at Waltair on the coast of the Bay of Bengal. A few other miscellaneous specimens from various places along the coasts of India have also been dealt with in this paper.

The specimens from Waltair were specially interesting as they were accompanied by notes regarding the colouration of the living sponges recorded at the time of collection, and as a result I am able to record instances of sponges of the same species growing in the same locality and having different colouration. This was specially remarked in the case of *Gellius fibulatus* (Schmidt).

I have followed Dendy [1] and Hentschel [2] regarding the classification adopted in this paper.

Hentschel divides the order Tetraxonida into three sub-orders :—

Sub-order 1. Homosclerophora.
,, 2. Astrotetraxonida.
,, 3. Sigmatotetraxonida.

No representatives of the first suborder were found among the sponges sent to me. Three genera and three species belong to Astrotetraxonida, and fourteen genera and nineteen species belong to Sigmatotetraxonida. Of these seven species appear to be new to science.

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[1] Dendy, Ceylon *Pearl Oyster Fisheries Report*, III, pp. 59-246 (1905).
[2] Hentschel, *Faun. Südwest-Australiens*, II, pp. 347-402 (1909); *id.* III, pp. 277-393 (1911).

The list of species is as follows :—

Sub-order Astrotetraxonida.
Family Stelletidae.
(1) *Asteropus simplex* (Carter).
(2) *Ancorina simplex* (Lendenfeld).
Family Chondrosiidae.
(3) *Chondrilla killakaria*, sp. nov.
Sub-order Sigmatoteroxonida.
Family Lithistidae.
(4) *Discodermia interspersa*, sp. nov.
Family Tetillidae.
(5) *Cinachyra anomola* (Dendy).
(6) *Paratetilla bacca* (Selenka).
Family Haploscleridae.
(7) *Gellius fibulatus* (Schmidt).
(8) *Gellius toxius* (Topsent).
(9) *Reniera tuberosa* (Dendy).
(10) *Pachychalina fibrosa* (Ridley and Dendy).
Family Desmacidonidae.
Sub-family Mycalinae.
(11) *Histoderma encrusta*, sp. nov.
Sub-family Ectyoninae.
(12) *Clathria encrusta*, sp. nov.
(13) *Raspalia anastomosa*, sp. nov.
(14) *Raspalia fruticosa* (Dendy).
Sub-family Axinallinae.
(15) *Acanthella ramosa*, sp. nov.
(16) *Amorphinopsis excavans* (Carter) var. *digitifera* (Annandale).
(17) *Amorphinopsis kempi*, sp. nov.
Family Clavulidae.
Sub-family Spirastrallinae.
(18) *Spirastrella florida* (Lendenfeld).
(19) *Spirastrella punctulata* (Ridley).
Sub-family Clioninae.
(20) *Cliona viridis* (Schmidt).
Sub-family Suberetinae.
(21) *Suberites cruciatus* (Dendy) var. *d pressa* (Dendy).
(22) *Suberites carnosus* (Topsent).

Sub-order ASTROTETRAXONIDA.

Family STELLETIDAE.

Asteropus simplex (Carter).

1916. *Asteropus simplex*, Dendy, *Trans. Linn. Soc.* (Zool.) XVII, p. 251.

This is represented in the collection, by two large pieces,of approximately the same size, measuring 9 cm. × 7·5 cm. in diameter and 5 cm. high. Both of them have a spherical outer surface and have evidently been cut from a very much larger sponge. The texture of the sponge is hard and the surface is pierced through by large oxea which make it rough and nasty to handle. On the surface a number of oscula are visible. Embedded within the body of the sponge are a number of broken molluscan shells ; also jammed in the exhalant canals are to be found a number of small Crinoids and Crustacea. The colour of the sponge in alcohol is dirty grey. A dermal membrane is present in some portions, but is rubbed off from the greater part of the sponge.

The skeletal frame-work consists of a dense mass of loose oxea lying scattered in all directions. The sanidasters, though present in all parts of the sponge, are found in great abundance in the cortex.

The megascleres consist of smooth, curved, sharp-pointed oxea. The oxea taper down to points rather gradually andare thichest about the middle. In some of them the bend in the middle is rather sharp. The oxea show a great amplitude of variation in length being from 1·2 mm. to 2·54 mm. long and ·08 mm. in thickness.

The microscleres are of two kinds, sanidasters and oxyasters.

The sanidasters consist of a straight axis wi h perfectly erect and blunt spines at right angles to it. The ends of the central axis are bifurcate. They measure from ·013–·023 mm. in length.

The oxyasters, which are rare, measure from tip to tip of rays ·03 –·038 mm. The individual rays measure ·015 mm. where the rays are

equal and ·023–·015 mm. where they are unequal. The rays are perfectly smooth and sharp pointed.

Carter describes the texture as " loose," but the present specimens, like those described by Dendy, are " firm and compact." Both Carter [1] and Sollas [2] describe the osculas as being placed in depressions. They are scattered on the sides in the present case. Besides this the oxea of the present specimen are larger than those of any yet recorded.

Collected by Bengal Fisheries Steamer " Gold Crown," Orissa Coast, 20 fathoms, 24th February 1909.

Ancorina simplex (Lendenfeld).

1897. *Ancorina simplex*, Lendenfeld, *Abhand. Senckenb. Nat. Ges.* XXI, p. 96, pl. ix, figs. 12-34.
1903. *Ecionema bacillifera*, Lendenfeld, *Das Tierreich, Tetraxonia*, p. 66.

The specimen was found growing on a dead coral. It is cream coloured, irregular in shape, hard and incompressible, and measures 4·6 cm. × 3·15 cm. in diameter and 1·9 cm. in height. In the living state the colour of the sponge is pale yellow. The surface is somewhat rough though apparently glossy and is provided with minute pores leading into the inhalant system. On the sides of the sponge there are two groups of oscula. A definite cortex is present with sub-cortical cavities. Spicules are arranged in bundles.

The skeletal frame-work consists of bundles of spicules, the orthotriaenes reaching up to the cortex, and the cladi interlacing with each other give remarkable firmness to the surface. The large oxea also extend up to the surface. The cortex is provided with a dense mass of small roughened microstrongyla, besides possessing a palisade of very thin oxea ; the latter are, however, very long and extend a little beyond the sub-cortical cavities into the choanosome. Just below the cortex there is a second row of orthotriaenes. The protriaenes and the anatriaenes usually end a little below the sub-cortical cavities though occasionally they reach up to the surface with their rhabdomes directed inwards. Some spinous microxea are also found scattered in the choanosome.

The spicules are as follows :—

(*a*) The orthotriaenes are 1·6–1·92 mm. long, and consist of a straight rhabdome tapering gradually to a point from the base of the cladi. The cladi are from ·12–·16 mm. long.

(*b*) The Anatriaenes measure from 1·5 mm. to 2·24 mm. in length, and are much more delicate than the orthotriaenes. Two varieties can be distinguished ; in one the cladi are more curved than in the other.

(*c*) The choanosomal oxea are most abundant. They are 1·36 mm. to 2·04 mm. long, and ·034 thick. These spicules are usually straight but a few slightly curved ones also occur. They are thickest in the middle, tapering gradually to a point on each side.

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[1] Carter, *Ann. Mag. Nat. Hist.* (5) III, p. 349 (1879).
[2] Sollas, *Challenger Reports*, XXV, p. 205 (1888).

(*d*) The cortical oxea, measuring ·13 mm. to ·2 mm. in length, are found in the cortex only, where they form a thin palisade.

(*e*) Protriaenes are present in very small numbers, being 1·72 mm. in length. The rhabdome is thickest in the middle becoming hair-like towards the free end.

Occasionally orthodiaenes and prodiaenes were also seen but these are probably abnormalities.

The only microscleres are roughened or spinous microxea measuring ·012 mm. to ·018 mm. in length.

Lendenfeld (*loc. cit.*) mentions the presence of asters in the "Pulpakanal" of *Ancorina simplex* and subsequently regards *Ancorina simplex* as synonymus with *Ecionema bacillifera.* I failed to find any trace of asters in spicule preparations made from all parts of the sponge. Hence the asters described by Lendenfeld might have been foreign bodies, especially as they were noted only in the "pulpakanals." Is the sponge therefore to be regarded as a Sigmatotetraxonid or as an Astrotetraxonid ? The only microscleres met with are spinous microxea which may be derived by a reduction of the spined sigmata in forms like *Fangophilina hirsuta* [1] or by a reduction of true asters. Owing to the general disposition of spicules and the preponderance of orthotriaenes, this sponge is to be included in the family Stelletidae under its old name of *Ancorina simplex.*

Locality.—Ramnad district, South India, from Coral reefs, 18th February, 1913. Collected by Dr. S. W. Kemp.

Family CHONDROSIIDAE.

Chondrilla kilakaria, sp. nov.

This consists of a very thin film of brown colour in alcohol and bright orange in the living state, much less than 1 mm. in thickness. Sphera-sters, which are the only spicules, are densely crowded together and

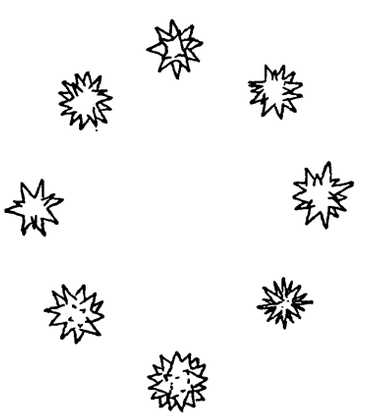

FIG. 1.—*Chondrilla kilakaria,* sp. nov. Spherasters × 35.

even the thinnest piece of the film that might be examined under the microscope contains the tylostyles of *Cliona millepunctata* (Hancock),[2]

[1] Lendenfeld, *Valdivia Expedition Reports,* XI, p. 157 pl. x, figs. 13, *a-e,* (1907).

[2] Hancock, *Ann. Mag. Nat. Hist.* (2) III, p. 341 (1849), and Topsent, *Arch. Zool. Exp. Gen.* (2) IX, p. 574 (1891).

over which the *Chondrilla* seems to be parasitic. The *Cliona* and the *Chondrilla* are both present on 3 small pieces of dead coral.

The spherasters of this specimen measure from ·02–·024 mm. in diameter (text-fig. 1). The rays are very smooth and are long compared with the centrum of the spheraster. This species comes very near the parasitic form *Chondrilla nucula.*[1] This species, however, differs from *C. nucula* in so far that the smallest spherasters of *Chondrilla kilakaria* are bigger than the largest spherasters of *C. nucula.* Besides this there is some difference in the shape of the spherasters which in *C. nucula* possess short and stumpy rays, whereas in the present species the rays are long.

Locality.—Kilakarai, Ramnad district, S. India, from Coral reef collected by Dr. S. W Kemp, 12th February, 1913.

Type.—No. P. 193/1 in the Zool. Surv. Ind. (*Ind. Mus.*).

Sub-order SIGMATOTETRAXONIDA.

Family LITHISTIDAE.

Discodermia interspersa, sp. nov.

This consists of a mass of *Spiroglypha* shells which intertwine with each other and have the sponge growing in the spaces between them.

The entire mass measures 9·5 × 6·5 × 2·9 cm. The colour of the Vermetid molluscan shells in spirit is almost white and that of the sponge is dirty brown.

Most Lithistid sponges, owing to the nature of their skeleton, are rather hard. In a form like the present one the sponge acquires its firmness mostly from the *Spiroglypha* shells around which it grows. The sponge substance itself between the spaces is quite friable, owing largely to the fact that the tetracrepid demas do not fuse in this sponge to form a dense mass. Nor are the epectines of the spicules of such a nature as to interlock with each other with any firmness. Owing to the sponge being immersed in the spaces between *Spiroglypha* shells it was not possible to cut free-hand sections of the material, and it is not possible, therefore, to describe the relative positions of the spicules within the body.

The spicules are as follows:—

(1) Desmas (fig. 2, f, g, h). They are mostly typical tetraclad, and measure from the tip of one ray to the tip of the other opposite ray ·38–·43 mm. in length. The rays themselves are unequal in length.

A few measurements are given below:—

·43 total length, length of rays ·25 and ·18.
·38 total length, length of rays ·22 and ·16.

The spines upon the rays are sharp-pointed and conical; occasionally also the cladi are branched, but this is comparatively rare. The spines on the cladi are mostly confined to the tips, but occasionally these may be found upon the body of the cladi. A series of gradations

[1] Annandale, *Rec. Ind. Mus.* XI, p. 470 (1915).

are met with from highly spined tetracrepid desmas to a nearly smooth tetraclad type approaching a megacalthrop and from such a type variations could be traced to the discontriaene type.

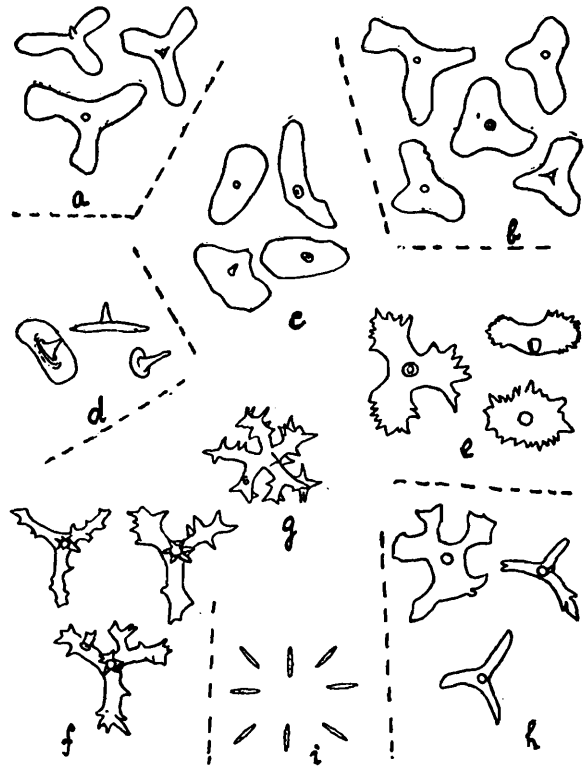

Fig. 2.—*Discodermia interspersa*, sp. nov.
a-e. Various forms of discotriaenes × 35.
f-h. Tetracrepid desmas × 35.
i. Roughened microstrongyles × 35.

(2) The discotriaenes (fig. 2, a, b, c, d, e) are of very varying shapes and sizes, the smallest of the discotriaenes measured ·23 mm. in its maximum diameter, and the largest ·43 mm. In shap ethe discotriaenes vary from oval with smooth margin to oval with a highly denticulate margin, like the edge of a saw. They are usually irregular but a number of these betray their tetracrepid origin not only by their outline but also by the junction of the axial threads at the base of the rhabdome. Such discotriaenes consist of 3 more or less oblong plates joined at an angle of nearly 60° with a denticle in the centre.

The only microscleres are microstrongyles (fig. 2, i) with a roughened surface. They measure from ·016–·02 mm. in length and ·0028 mm. in breadth.

This species comes very close to *Discodermia papillata* (Carter)[1], but it differs from the latter in the size and shape of its spicules, especially of the tetracrepid desmas.

The seas around the east coast of Peninsular India seem to be remarkably rich in the species of *Discodermia*, the present species being the eighth to be described from these regions.

Locality.—Ganjam Coast, Orissa, 24-30 fathoms, S.S. " Golden Crown " collection ; 8th-16th March 1909.

Type. No. P. 194/1 in the Zool. Surv. Ind. (*Ind. Mus.*)

[1] Carter, *Ann. Mag. Nat. Hist.* (5) VI, p. 146 (1880).

Family TETILLIDAE.

Cinachyra anomala (Dendy).

1905. *Tetilla anomala*, Dendy, *Ceylon Pearl Oyster Fisheries Report*, III, p. 91.
1921. *Cinachyra anomala*, Dendy, *Trans. Linn. Soc.* (*Zool.*), XVIII, p. 20.

This is an almost spherical sponge measuring 4·7 cm. in diameter. It is attached to a small piece of dead coral. In texture it is slightly resilient and has a creamy white colour. Its surface is hispidated by innumerable fine spicules sticking out and it possesses a very large number of procalycies with wide openings. The skeleton is of the usual radial type.

The spicules are as follows :—

(*a*) The oxea are by far the most abundant. Of the usual shape, they measure 3·7 mm. in length and are·03–·036 mm. in thickness. The majority of them are straight, a few, however, are slightly curved. A few of the oxea measured 2·4–2·9 mm. in length.

(*b*) Protriaenes though present are rare. The shaft of the protriaenes is straight and comparatively stout.

The shaft measures 1·5 mm. long and ·01 mm. thick, while the cladi are ·06 mm. long.

(*c*) The anatriaenes are identically similar to those described for the type.

The sigmaspires are present in great abundance and measure ·02 mm. in length from bend to bend.

The miscrospheres are also present in great abundance. They have a varying outline, and usually measure ·004 mm. in their maximum diameter.

The sponge agrees very closely with Dendy's *Cinachyra anomala* but differs from it in possessing larger oxea. The maximum length in the case of the type-species being 2·8 mm. The protriaenes in the present instance are also smaller and the anatriones are scarce. The sigmaspires are nearly twice the size of those described by Dendy for the type of the species.

The sponge is rather peculiar in possessing within its substance a number of foreign bodies such as Diatoms and one species of these sticks most regularly to the sides of the large oxea.

Locality.—Cheval Paar ; Ceylon ; 6 fathoms. Collected by T. Southwell. January-February, 1911.

Paratetilla bacca (Selenka).

1921. *Paratetilla bacca*, Dendy, *Trans. Linn. Soc.* (*Zool.*) XVII, p. 21.

This species is represented in the collection by 4 specimens. Three of these are fragments of a spherical or hemispherical shape. The fourth, which is a complete sponge, was found on a piece of dead coral and measures 3·2 cm. at base. The largest of the fragments measures 4·4 cm.

In shape and general appearance these fragments are similar to the type-specimen of *Tethya merguiensis* (Carter), though the present pieces

are firmer and bigger in size. The colour of the sponge in spirit is steely blue but according to the attached labels it was brown outside and dull straw yellow inside.

The skeleton consists, as in the type-specimen of *Tethya merguiensis* (Carter), of radiating bundles of spicules which project out of the surface ; such spicules are all oxea, but an occasional anatriaene or protriaene also protrudes out. The anatriaenes usually end a little short of the ectosomal layer of short shafted triaenes, whereas the protriaenes extend a little beyond this zone of spicules reaching up to the surface. The sigmaspires are abundant and present in every part of the sponge. There are no loose spicules lying between the radial bundles.

The spicules may be dealt with as follows :—

(*a*) Short-shafted orthotriaenes are of two sizes, large and small. In the large ones the cladi measure ·32 mm. in length and in the small ones only ·16 mm.

I have examined Carter's type-specimen of *Tethya merguiensis* and I find that in it the " zone spicules," as Carter calls them, are very much bigger and of equal size. They, however, show irregularities in their shape. For instance a number of them have their cladi bent to one side or the other, and may be bifid or blunt. In the specimen here recorded the short-shafted triaenes are most regular. Each of the cladi being smooth and sharp pointed.

(*b*) Anatriaenes are present in fair numbers, measuring 3·2 mm. in length. The rhabdome gradually tapers down till towards the end it becomes extremely thin and flexible.

(*c*) Protriaenes measure 3·04–3·24 mm. in length and the cladi from ·12–·06 mm. The protriaenes are slightly thicker than the anatriaenes and are straight.

(*d*) Occasionally also prodiaenes are met with ; these are similar to the protriaenes.

(*e*) The oxea are of the usual shape, being 2·2–3·36 mm. in length and ·03 mm. in thickness. They are mostly straight, a few being slightly curved. They are thickest in the middle tapering down to a point on each side.

(*f*) The sigmaspires measure ·016 mm. from bend to bend. They are found in great abundance in all parts of the sponge. This specimen differs from the type in the nature and size of the short-shafted orthotriaenes.

Locality.—Kilakarai, Ramnad District, from Coral reefs. Collected by S. W Kemp. 12th-20th February 1913.

Family HAPLOSCLERIDAE.

Gellius fibulatus (Schmidt).

1905. *Gellius fibulatus,* Dendy, *Ceylon Pearl Oyster Fisheries Report.* III, p. 136.

1916. *Gellius fibulatus* var. *microsigma,* Dendy, *Marine Zool. Okhamandal,* II, p. 107.

This species is represented in the collection by a very large number of specimens in three lots. They are of interest as the colour of two

out of these has been recorded by the collector in the living condition, and as the colour is different in two cases these can be separated as colour varieties. The specimens are extremely variable and amorphous in shape.

The colour varieties, however, differ slightly in the sizes of their spicules.

One kind is pale blue green in the living condition and creamy white in alcohol. The spicules measure as follows :—

Oxea ·175–·2 mm. long × ·0008 broad. Sigmata ·019–·023 from bend to bend.

The second example is a small piece growing upon a sea-weed. In the living condition the sponge is recorded as having been pure white. Its oxea measure ·15–·18 mm. in length and ·008 mm. in thickness. Sigmata measure ·019–·023.

The third lot is similar to the second type. The oxea measures ·15 mm. in most cases. Its colour in the living condition is not recorded.

Although colour varieties in sponges are not uncommon yet I believe that the occurrence of one species with two different colours from the same locality is rather rare.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Gellius toxius (Topsent).

1897. *Gellius toxius*, Topsent, *Rev. Suisse Zool.* IV, p. 470.
1899. *Gellius toxius*, Thiele, *Zoologica* II, p. 21.
1912. *Gellius toxius*, Hentschel, *Abhand. Senckenb. Nat. Ges.* XXXIV, p. 391.
1921. *Gellius toxius*, Dendy, *Trans. Linn. Soc.* (*Zool.*) XVII, p. 28.

This species is represented in the collection by four pieces which have evidently been broken away from a larger specimen growing as a thin cake-like encrustation upon some hard sub-stratum. The largest piece measures 31·5 mm. × 25 mm., with a maximum thickness of 8·5 mm. The sponge is soft and resilient to touch. The colour of the sponge is pale yellow, but, according to the collector's label, its colour in the living state is purplish mauve. The surface is smooth and a delicate dermal membrane is present, through which the superficial canals of the sponge are easily visible. The oscula are large and placed on slightly raised prominences which may run into each other and produce the effect of slightly raised ridges with oscula situated in rows. A number of minute pores are present in the dermal membrane.

The skeleton consists of a reticulation of single oxea cemented by spongin at their ends. The toxa type of spicules are present in small numbers. The megascleres are slightly curved oxea, tapering to a point towards the ends. In their length they vary from ·13–·17 mm. Intermediate sizes between these are stouter than the typical spicules and measure ·005 mm. in thickness. There are also present a number of oxea of about the same length as the other megascleres but considerably thinner. I was at first inclined to regard them as young oxea.[1] Free hand sections of the sponge revealed the presence of young embryos

[1] *See* Dendy, *Trans. Linn. Soc.* (*Zool.*), XVIII, p. 28 (1921).

containing several of these delicate oxea. I am, therefore, of opinion that these delicate oxea are the spicules of the embryos of this sponge.

The microscleres are of the stout toxa type, varying in length from ·038–·065 mm. and are ·002 mm. thick.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Reniera tuberosa (Dendy).

1921. *Reniera tuberosa*, Dendy, *Trans. Linn. Soc. (Zool.)*, XVIII, p. 33.

This species is represented in the collection by four pieces, three of which are small perfectly straight tubes and one is an irregularly tuberous mass measuring 80 mm. in its maximum diameter. A large number of the ramifications of the sponge have evidently been broken away. There is a dermal membrane, which has been rubbed away from the major portion of the sponge, and only persists in the spaces in between. Dendy's description of the type is sufficiently detailed and I have no more remarks to make.

The spicules consist of oxea measuring ·15 mm. in length. The thickness of the oxea is ·007 mm., which is ·001 mm. less than in Dendy's type.

The only other important difference between the present specimen and Dendy's type is that it has a distinctly porous surface.

Locality.—Ganjam Coast, Madras, 24-30 fathoms. Collected by Bengal Fisheries steamer " Golden Crown," 8th-16th February, 1909.

Pachychalina fibrosa (Ridley and Dendy).

1886. *Dasychalina fibrosa*, Ridley and Dendy, *Ann. Mag. Nat. Hist.* (5), XVIII, p. 330.
1887. *Pachychalina fibrosa*, Ridley and Dendy, *Challenger Reports*, XX, p. 21.
1911. *Pachychalina fibrosa*, Hentschel, *Abhand. Senckenb. Nat. Ges.* XXXIV, p. 400.

This is very similar to the ' Challenger ' specimens in shape and appearance. The oscula, however, are rather deep and not situated on one side only, but appear irregularly on all sides of the erect branches.

The colour of the specimen in alcohol is slaty grey.

The thick spiculo-fibres measure up to ·102 mm. in thickness, being slenderer than those of the ' Challenger ' specimens.

The oxea are ·09 × ·004 mm., and consequently a trifle shorter and thicker than in the Challenger specimens.

Locality.—Off Akyab, Arracan Coast, 17 fathoms. Collected by Bengal Fisheries steamer " Golden Crown," 1st-3rd January 1909.

Family DESMACIDONIDAE.

Subfamily *MYCALINAE.*

Histoderma encrusta, sp. nov.

This sponge forms a thin but hard encrustation on a small piece of dead coral. In its centre there is a papilla bearing a small osculum. The colour of the sponge is white in alcohol, but was bright red when

alive. The nature of the skeleton cannot be made out as the encrustation is thin and hard and cannot be cut into sections.

The megascleres are all tylotes and are of two kinds :—

(*a*) Small tyloti straight or with a slight curve and measuring ·21–·22 mm. in length and ·0057 in breadth (fig. 3, *a*).

(*b*) Large tyloti with a distinct angular bend in the centre measuring ·28–·29 mm. in length and ·0057 in breadth (fig. 3, *b*).

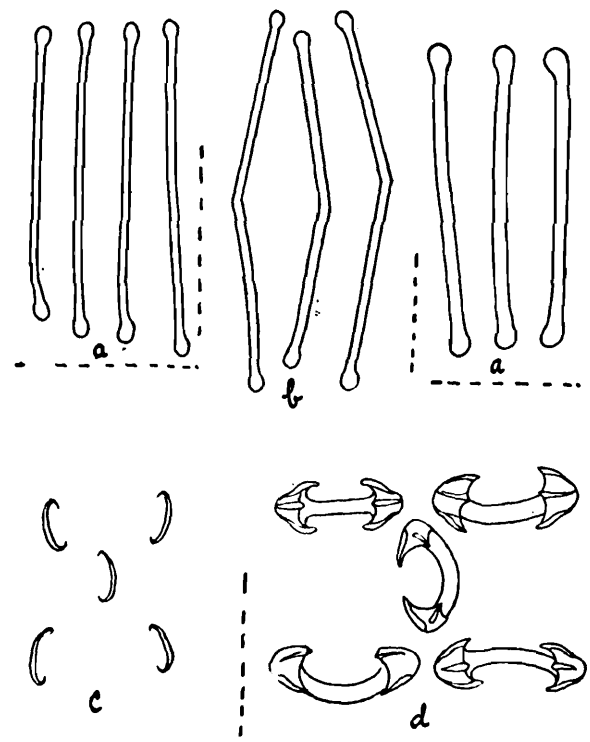

FIG. 3.—*Histoderma encrusta*, sp. nov.
a. Small tyloti × 160.
b. Large tyloti × 160.
c. Contorted sigmata × 160.
d. Palmate isochaelae × 160.

The microscleres are contorted sigmata ·03–·04 mm. in length from bend to bend (fig. 3,*c*). Palmate isochaelae measuring ·023–·026 mm. in length (fig. 3, *d*) are also present.

Locality.—Kilakarai, Ramnad district, from Coral reefs. Collected by Dr. S. W Kemp, 18th February 1913.

Type.—No. P. 195/1, in the Zool. Surv. Ind. (*Ind. Mus.*).

Subfamily *ECTONINAE.*

Clatharia encrusta, sp. nov.

The sponge consists of a dense reticulation of minute branches spreading over the outer surface of a bivalve shell occupying an area 3·5 mm. × 3 cm. It is very soft and compressible and is of a dirty brown colour in alcohol.

The spicules consist of styli and subtylostyli. Both the styli and subtylostyli are smooth and curved tapering gradually to a point from the head. Two sizes can be distinguished in these ; one of which varies

in length from ·43–·5 mm. (figs. 4*a*, *g* and figs. 4, *c*, c'), and the other from ·26–·3 mm. (fig. 4, *b*). Both the types are equally abundant and are ·017 mm. thick. The spined spicules are acanthosubtylostyles (fig. 4, *d*). They measure from·065–·073 mm. in length and ·005–·004 mm. in thickness. The spines in some cases project simply outwards from

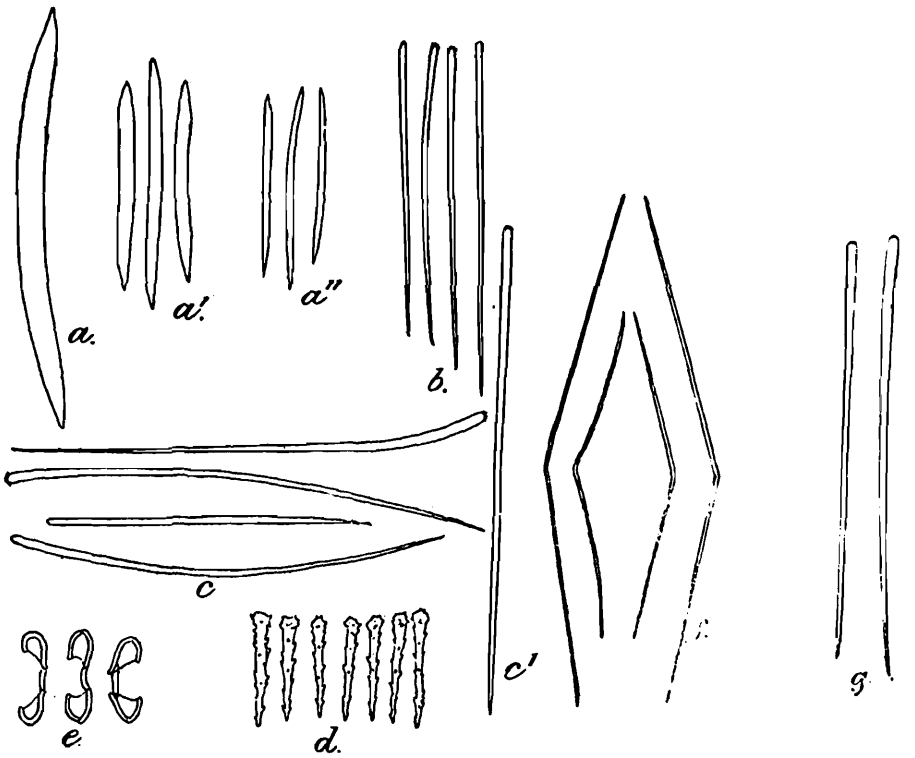

FIG. 4.—*Clathria encrusta*, sp. nov.

a, *a'*, *a''*. Oxea × 35.
b, *c*, *c'*. Styli × 35.
d. Acanthostyles × 160.
e. Palmate isochaelae × 160.
f. Toxae × 160.
g. Styli × 35.

the shaft, in other cases they are hooked with their points directed towards the head. The spines on the heads of the spicules point outwards. This species comes very close to *Clatharia partita* (Hallmann)[1] and *Clatharia tenebratus* (Whitelegge) [2] in the size of the spicules, but in the present species the heads of the megascleres are slightly hispid.

A certain number of small oxea (figs. 4,*a'*,*a''*) are also met with, they measure ·67 mm. in length and ·04–·01 mm. in breadth. Fig. 4, *a* represents one of the abnormal oxea.

The microscleres of this sponge are of the toxa and isochaela type. The toxae (figs. 4, *a*, *f*) are slightly angulated in the middle and are ·37 mm. long. The isochaelae (fig. 4, *e*) are typical palmate isochaelae of clatharia-type, measuring ·016 mm. in length.

Locality.—Orissa Coast, 20 fathom. Collected by Bengal Fisheries steamer "Golden Crown," 24th February, 1909.

Type.—No. P. 196/1, in the Zool. Surv. Ind. (*Ind. Mus.*).

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[1] Hallmann, *Zool. Results F. I. S.* "*Endeavour*," I, p. 223 (1912).
[2] Whitelegge, *Memoirs Australian Museum*, ('Thetis' Report), IV, p. 501 (1907).

Raspalia anastomosa, sp. nov.

It is an arborescent sponge and was found attached to the subtratum by a thick stem measuring about 1·5 cm. in maximum thickness. In its lower parts this sponge divides dichotomously but this arrangement is soon lost by the fusion and anastomosis of the different branches. The end branches are free and taper to a point. The branches measure 3 mm. in diameter. In texture it is hard. Its colour in alcohol is dark brown. The surface of the sponge is hispid owing to the projection of a large number of spicules from it. Minute osculae are scattered in great profusion all over the surface. The skeleton consists of a core of reticulation of spongin in which lie embedded the smooth megascleres with echinating acanthostyles. The whole skeletal frame-work can well be compared with the stele of a fern. From this reticulation of spongin small spiculo-fibres run outwards and project above the surface. Here and there loose subtylostyles are also found in the spongin.

The spicules are as follows :—

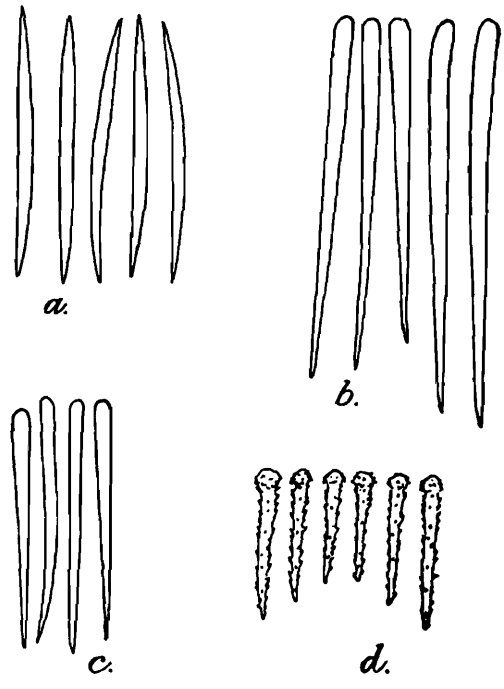

FIG. 5.—*Raspalia anastomosa*, sp. nov.
a. Oxea × 35.
b, *c*. Styli × 35.
d. Acanthostyles × 160.

(1) Oxea (fig. 5, *a*)are smooth curved and fairly thick for their size; they measure ·56–·71 mm. in length and ·034 mm. in thickness.

(2) Styli (figs. 5, *b*, *c*) are mostly straight though some are slightly curved. A few of them have a slightly swollen head and may be described as subtylostyles. These are invariably longer than the oxea and measure ·72–1·06 mm. in length and approximately ·05 mm. in thickness.

(3) Lastly there are the acanthotylostyles (fig. 5, *d*). These are very minute compared with others, measuring only

·07·083 mm. in length. They are perfectly straight with the spines on the shaft pointing upwards and slightly bent. The heads of these are slightly dilated. In external form this species comes very close to Dendy's *Raspalia thurstoni*,[1] which, however, does not possess any oxea and has much smaller spicules. It is also closely allied to *Raspalia bifurcata* (Ridley),[2] but the form of the new species is different and the spicules are much thicker. It differs from *R. hornelli* Dendy [3] in the absence of strongyles.

Locality.—Ganjam Coast, Madras ; 24-30 fathoms. Collected by the Bengal Fisheries steamer " Golden Crown," 8th-16th March, 1909.

Type.—No. P. 197/1, in the Zool. Surv. Ind. (*Ind. Mus.*).

Raspalia fruticosa (Dendy).

1887. *Raspalia fruticosa*, Dendy, *Ann. Mag. Nat. Hist.* (5) XX, p. 160, pl. xii, figs. 2, 2*a*.
1905. *Raspalia fruticosa* var. *tenuiramosa*, Dendy, *Ceylon Pearl Oyster Fisheries Report*, III, p. 172.
1912. *Raspalia fruticosa* var. *aruensis*, Hentschel, *Abhand. Senckenb. Nat. Ges.* XXXIV, p. 372.
1916. *Raspalia fruticosa* var. *tenuiramosa*, Dendy, *Marine Zoology Okhamandal*, II, p. 130.

This species has been described several times previously. The interest of the present specimen lies chiefly in the fact that it is recorded for the first time from the northern portions of the Bay of Bengal. Besides this its colour in the living state, which is dark brick red, is recorded for the first time.

The present specimen varies slightly from the type in spicule measurements. The ordinary styli are a little longer being ·36 mm. in length and the thin long styli a little shorter, being only ·7 mm. in length. The acanthostyles measure ·11–·15 mm. in length and ·011–·0076 mm. in breadth.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Subfamily *AXINELLINAE*.

Acanthella ramosa, sp. nov.

This is a ramifying sponge with solid branches which anastomose at irregular intervals. The branches near the base are thicker than those further away. The surface of the branches is raised into small pointed conuli. A number of oscular openings are visible all over the sponge body. In texture the sponge is hard.

The spicules consist of large straight oxea, curved oxea, styli and vermiculoid strongyles.

The large oxea measure ·5–·7 mm. in length and ·019 mm. in thickness, and are the most abundant of all the spicules. Some of these

[1] Dendy, *Ann. Mag. Nat. Hist.* (5) XX, p. 161 (1887).
[2] Ridley, " *Alert* " *Report*, p. 459 (1884).
[3] Dendy, *Ceylon Pearl Oyster Fisheries Report*, III, p. 172 (1905).

are slightly curved (fig. 6, *b'*,). The highly curved oxea measure ·54 mm. in length (fig. 6, *c*).

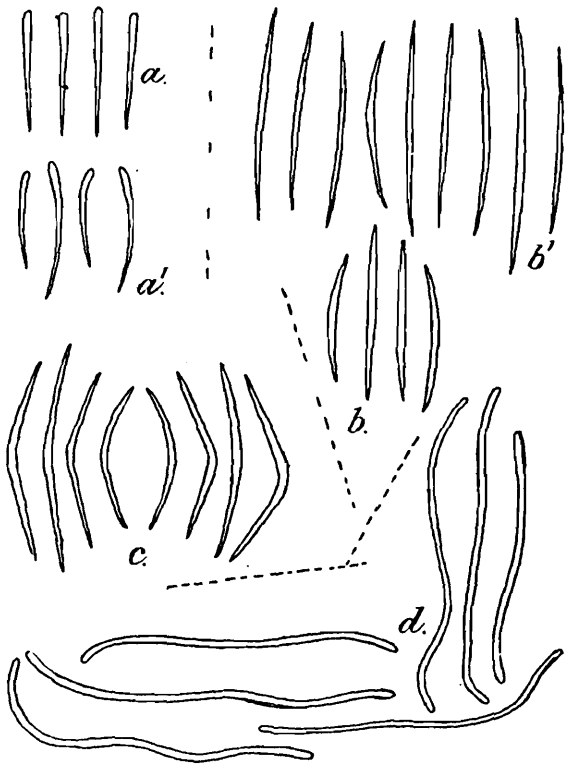

FIG. 6.—*Acanthella ramosa*, sp. nov.
a, *a.'* Styli × 35.
b, *b.'* *c*. Oxea × 35.
d. Vermiculoid strongyles × 12.

The short oxea measure ·33 mm. in length and ·012 mm. in thickness (fig. 6, *b*).

The styli (figs. 6, *a*, *a'*) measure ·38 mm. × ·021 mm. They are mostly curved but some of them are straight, occasionally styli are met with which are bent sharply at the pointed ends.

The vermiculoid spicules (fig. 6, *d*) are irregularly curved strongyles. The largest of them that could be measured reached a length of 1·08 mm. Some of them are so long that they extend beyond the field of the microscope even with the lowest power objectives.

Locality.—Ganjam Coast, 24-30 fathoms. Collected by the Bengal Fisheries steamer " Golden Crown," 8th-16th March, 1909.

Type.—No. P. 198/1, in the Zool. Surv. Ind. (*Ind. Mus.*).

Amorphinopsis excavans var. **digitifera** (Annandale).

1915. *Amorphinopsis excavans* var. *digitifera*, Annandale, *Rec. Ind. Mus.* XI, p. 469.

This identification is based on a comparison of the specimens with the specimen and slides of the type in the Indian Museum. The colour of the living sponge is dull yellow green. The only differences worth noting are that the present specimen does not possess the digitiform processes. The big oxea in this case are not quite so big as in the type.

Annandale does not give any measurements of the spicules ; these are as follows :—

Large oxea ·8 mm. long × ·025 mm. broad. Medium oxea, ·5 mm. long. Small oxea ·3 mm. long. Medium styli ·5–·68 mm. long × ·017 mm. broad. Small styli ·2 mm. long.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Amorphinopsis kempi, sp. nov.

This sponge consists of a basal plate-like portion attached to the ground, from which a number of free cylindrical processes rise vertically upwards and give off similar but very much shorter branches at irregular intervals. The surface of the sponge is hispidated by projecting brushes of spicule-fibres. In texture the sponge is compressible and is of a dark brown colour in alcohol.

The skeleton consists of a number of parallel strands of spicule-fibres which gradually curve outwards and project beyond the surface of the sponge. The longitudinal strands of spicule-fibres are connected with each other by a number of transverse connections of a similar kind. The spicules consist of oxea and styli of various sizes.

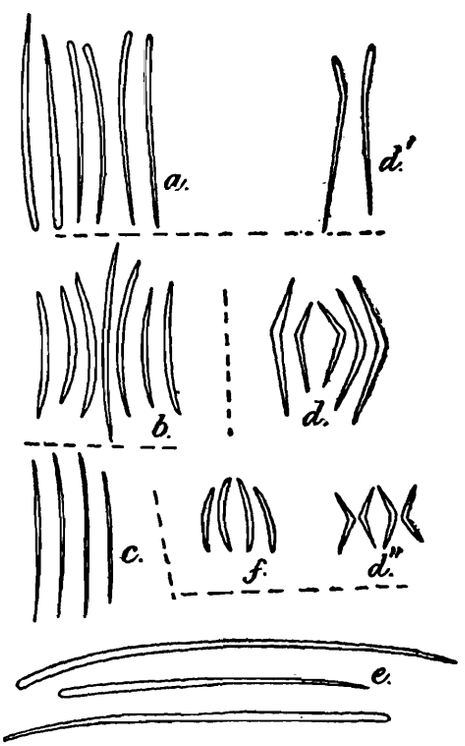

FIG. 7,—*Amorphinopsis kempi*, sp. nov.

a. Styli × 35.
b, c. Oxea × 35.
d. d', d''. Styli and geniculated oxea × 35.
e. Small styli × 160.
f. Small oxea × 35.

Large oxea (figs. 7, *b, c*) are rather scarce ; they are curved and measure ·36–·4 mm. × ·017 mm. Small oxea measure ·18–·25 mm. in length and ·017 mm. in thickness. There are in addition a number of very small oxea (fig. 7, *f*). The styli (fig. 7, *a*) are mostly curved, but a few straight ones are also present. They measure ·5–·66 mm.

in length and ·017–·023 mm. in thickness. In addition a number of very delicate spicules are met with. Their true nature as styli is only revealed under high power objectives. They measure ·26 mm., in length and ·003 mm. in thickness (fig. 7, *e*). Geniculated oxea and styli (figs. 7, *d*, *d'*, *d''*) typical of the genus are also present.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Type,—No. P. 199/1, in the Zool. Surv. Ind. (*Ind. Mus.*).

Family CLAVULIDAE.

Subfamily *SPIRASTRELLINAE.*

Spirastrella florida (Lendenfeld).

This is a small sessile tubular sponge [1] measuring 30 mm. in length and 15 mm. in maximum diameter. Its texture is hard ; the colour in alcohol is yellowish brown. The surface of the sponge is smooth and glabrous, but slightly uneven. The osculae and pores are not visible to the naked eye or even with a lens. The interior of the sponge is traversed by a few fairly wide exhalant canals as is evident in certain parts of the sponge from where certain excrescences have fallen away. A dermal membrane is present.

The skeletal framework consists of a very dense mass of bundles of spicules ramifying in all directions and forming a net work between the cavities of the canal system. Towards the surface all these bundles end with the pointed ends of the spicules directed outwards ; as a result of this a thick cortical palisade of spicules is formed.

The spicules hardly ever project beyond the dermal membrane. The megascleres consist of smooth curved tylostyles with the maximum thickness in many cases in the middle. In some cases the heads are slightly lobed. They measure from ·47–·54 mm. in length and ·02 mm. in thickness. A number of small sized tylostyles are met with measuring ·18–·2 mm. Some of these are thinner than others for their size and the head is not well developed. These may possibly be young spicules.

The microscleres are of the spinispire type, measuring ·015–·019 mm. These are mostly sigmoid though a number are of the typical spiral form. They have thick spines sticking out from their convex sides and the distinguishing feature of this species is that these spines are minutely dentate towards their ends. These resemble figures of some spinispirae given by Vosmaer (*op. cit.*). The sponge No. S.E. 92-A, according to Vosmaer, is *Spirastrella purpurea,* but the similarity between this sponge and the Kilikarai specimen ceases with the sigmoid spinispirae. None of the other kinds of spinispirae, figured by Vosmaer for his sponge No. S. E. 92-A, are found in the present specimen.

Locality.—Kilakarai, Gulf of Mannar. Collected by Dr. N. Annandale.

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[1] For literature and synonymy see Vosmaer, *Siboga Expedition Monographs, Porifera, Genus Spirastrella,* (1911).

Spirastrella punctulata (Ridley).

1884. *Spirastrella punctulata*, Ridley, *Zoological Collections of H. M. S. "Alert,"* p. 623.

There are two specimens of this sponge in the collection, both of a small size, cake-shaped with a circular outline at the top. One of them has a large hollow at the base and in the other this depression is correspondingly small. The larger specimen measures 41 mm. in diameter and 20 mm. in height. The outline of the small specimen is irregular at the top, it measures 35 mm. in diameter and 11 mm. in height.

The colour in alcohol is brown. The texture is firm and only slightly compressible. The surface is slightly rough to touch. At the top of the sponge there are a number of oscular openings flush with the surface of the sponge. No pores are visible even under a hand lens. There is a thin dermal membrane.

The skeletal framework consists of loose bundles of tylostyles, which run up to the surface in vertical columns. Here and there a few cross bundles connecting the main courses of spiculo-fibres, which are devoid of spongin, are also present.

Below the dermal membrane the tylostyles form a thick palisade of spicules, which forms a cortical layer. Immediately below this layer there are a number of canals which open out at the oscula.

The spicules are smooth, slightly curved tylostyles with their maximum thickness in the middle. In a number of cases the head is a little below the apex. They measure ·48–·53 mm. A number of tylostyles are smaller in size being ·2–·3 mm. in length.

The microscleres are zig-zag spinispires with spines sticking out from their convex sides. They measure ·02–·03 mm. in length. Occasionally a spinispire is met with possessing two whorls of spines, one at each end.

Locality.—Kilakarai, Gulf of Manaar. Collected by Dr. N. Annandale.

Subfamily *CLIONINAE.*

Cliona viridis (Schmidt).

1900. *Cliona viridis*, Topsent, *Arch. Zool. Exp. Gen.* (3) VIII, p. 84.
1903. *Cliona orientalis*, Thiele, *Abhand. Senckenb. Nat. Ges.* XXV, p. 71.
1915. *Cliona viridis*, Annandale, *Rec. Ind. Mus.* XI, p. 13.

The sponge forms a thin but leathery encrustation on a part of a coral measuring 7·5 cm. × 5 cm. × 3 cm. The ramifications of the sponge spread into the body of the coral to a depth of about 2 centimetres.

The tylostyle megascleres measure ·3–·41 mm. in length and are ·017 mm. thick. A fair proportion are nearly half the length of the others, *i.e.*, 2 mm. Microscleres are all spinispires and measure ·038–·046 mm. in length.

I had an opportunity of seeing slides in Dr. Annandale's cabinet marked *Cliona viridis* 8842/6 from Mergui and *Cliona orientalis* (Thiele) No. 73—14. The difference between the microscleres of *C. orientalis* (Thiele) and *C. viridis* (Schmidt) is about the same as that between the type of *viridis* and the specimens coming from Campeche described by

Topsent. I am therefore inclined to think that *Cliona viridis* and *orientalis* are synonymous.

Locality.—Kilakarai, Ramnad District, from Coral reefs. Collected by Dr. S. W Kemp.

Subfamily *SUBERETINAE.*

Suberites cruciatus var. **depressa** (Dendy).

1905. *Suberites cruciatus*, Dendy, *Ceylon Pearl Oyster Fisheries Report*, III, p. 131.
1921. *Suberites cruciatus* var. *depressa*, Dendy, *Trans. Linn. Soc.* (*Zool.*), XVIII, pt. 1, p. 147.

This consists of a thin encrustation over the greater part of a gastropod. Its colour was orange when alive and has changed to steely blue in alcohol.

Dendy does not give any measurements for the spicules of the variety but mentions that the largest are slightly bigger than those in the type. The tylostyles in the present specimen measure ·26–·31 mm. in length, which agrees pretty closely with the type, but they are slightly thicker, measuring ·013 mm. in breadth. The smaller tylostyles measure ·125–·175 mm. in length and ·008 mm. in thickness.

The shape of the head agrees well with the description given for the variety. Most of the tylostyles of the present specimen are like those figured by Dendy [1] for *Suberites cruciatus* in fig. 10, *a*, *b*, *e*, and *g* on plate V, but differ from figs. *c*, *d*, and *f* on the same plate. Some of the tylostyles, however, have very faint thickenings on their heads and pass very gradually to smooth normal tylostyles.

Locality.—Waltair. Collected by Dr. S. W Kemp.

Suberites carnosus (Johnst.) Gray.

1900. *Suberites carnosus*, Topsent, *Arch. Zool. Exp. Gen.* (3) VIII, p. 233.

This species is represented in the collection by three specimens, two of which appear to be complete and the third is broken.

The three specimens are club-shaped, the head end possessing warty protuberances. They are hard and friable in texture and have a muddy brown colour in alcohol. The surface is rough to touch. There is a single oscular opening which leads into a wide canal running throughout the length of the sponge.

The skeletal framework consists of a very dense mass of thick but loose bundles of spiculo-fibres running in all directions, but towards the surface these lie tangentially.

The megascleres are all tylostyles. Some are straight, others are slightly curved, being thickest in the middle. These are definitely of two sizes. The bigger spicules are ·55–·71 mm. long by ·025 mm. broad. The smaller spicules are nearly ½ the size of the bigger ones; possibly they are young growing forms. These specimens resemble *Suberites durissimus* (Ridley and Dendy) in shape and general appearance.

Locality.—Great Cocos Island, 2nd-7th August, 1889.

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[1] Dendy, *Ceylon Pearl Oyster Fisheries Report*, III, p. 131 (1905).