

SPONGES OF PAPUA AND NEW GUINEA—PART
ORDER HAPLOSCLERIDA TOPSENT

P. A. THOMAS*

Central Marine Fisheries Research Institute, Cochin-682 031

ABSTRACT

Ten species of sponges of the order Haplosclerida from Papua and New Guinea are described here with illustrations. A new species *Strongylophora septata* is described here.

INTRODUCTION

IN THIS second part of the series on Sponges of Papua and New Guinea, 10 species of the Order Haplosclerida Topsent are dealt with in detail. The area of collection has been well illustrated in the first part of this series (Thomas, 1982).

The general classification followed here is that of de Laubenfels (1936), but following Hechtel (1985) the family Adociidae is treated under Order Haplosclerida.

Species dealt with here are rather well distributed except a new species *Strongylophora septata*. This new species falling under the genus *Strongylophora* Dendy, is erected here with some hesitation, but the distinctive nature of the characters which separate this new species from *S. durissima* Dendy (1905) which is the type of the genus from Ceylon (= Sri Lanka) pearl oyster beds and which occurs side by side with the present new species at Papua and New Guinea appear so convincing as to preclude any treatment other than what is proposed here.

* Present address : V.R.C. of C.M.F.R.I., Vizhinjam 695 521.

The author expresses his sincere thanks to Dr. P. S. B. R. James, Director, C.M.F.R. Institute for kindly permitting him to publish the account. He is also indebted to Shri C. Mukundan, C.M.F.R.I., Vizhinjam for going through the account critically suggesting improvements.

SYSTEMATICS

Order HAPLOSCLERIDA Topsent

Four families viz. Haliclونidae de Laubenfels, Desmacidonidae Gray, Adociidae de Laubenfels and Callyspongiidae de Laubenfels of this order are represented in the present collection.

Family HALICLONIDAE de Laubenfels

Haliclona cribricutis (Dendy) (Fig. 1 a)

Haliclona cribricutis Thomas, 1973, p. 18, pl. 1, fig. 12 ; pl. 6, fig. 8 (synonymy)

Material : One entire specimen and three bits.

Description : Entire specimen, probably repent in live condition ; irregularly tuberos with a length of 135 mm and a diameter of 20 mm ; bits represented may be parts of a

single specimen and have conical projections arising from upper parts.

Colour : Dirty brown.

Consistency : Hard and incompressible with poor resiliency.

Oscules small and scattered all over except at or near points of attachment ; elliptical to irregular in outline and compound in nature ; diameter 2-3 mm. Pores minute, elliptical in outline and with 0.03 mm average diameter.

Surface smooth in entire specimen, but conulose in the bits. Conules disposed in a straight line forming a continuous ridge at places. Surface minutely reticulate in between conules.

Main skeleton is an irregular reticulation of stout polyspicular fibres with sparse spongin content. Meshes become rather well demarcated towards peripheral parts. Conules often supported by large main fibres (fused fibres ?). Dermal reticulation irregular with pores located at centre of each mesh. Average diameter of fibres 0.188 mm.

Spicules : (1) Oxeas. Slightly curved and abruptly to gradually pointed ; size, 0.147-0.25 × 0.006-0.008 mm.

Distribution : Indian Ocean, Australian region.

Family DESMACIDONIDAE Gray

Gelliodes fibulatus Ridley (Fig. 1 b - d)

Gelliodes fibulatus Thomas, 1968 (unpublished) (non Babic, 1922, p. 234).

Material : Several bits, probably parts of the same specimen.

Description : Sponge, a clathrous mass of slender branches varying in diameter from 4 to 12 mm. These branches show a tendency to get fused with adjacent branches.

Colour : Dark brown to pale brown in dry condition.

Consistency : Brittle when dry.

Surface highly conulose ; conules formed by protruding tips of main fibres, sometimes compound and with spine-like projections (Fig. 1 b). Height of conules varies considerably from 0.5 to 4.0 mm. In actively growing parts such conules may be densely distributed and this arrangement gives a characteristic brush-like appearance to extremities of branches. A few outermost fibres originating from adjacent conules run in a parallel course, one above the other and this arrangement provides a basket-like appearance to the inter conular space. Dermal membrane retained only at some places and reinforced by spicules both proper and arenaceous. Details regarding oscules and pores could not be traced out due to dry and poorly preserved condition of material.

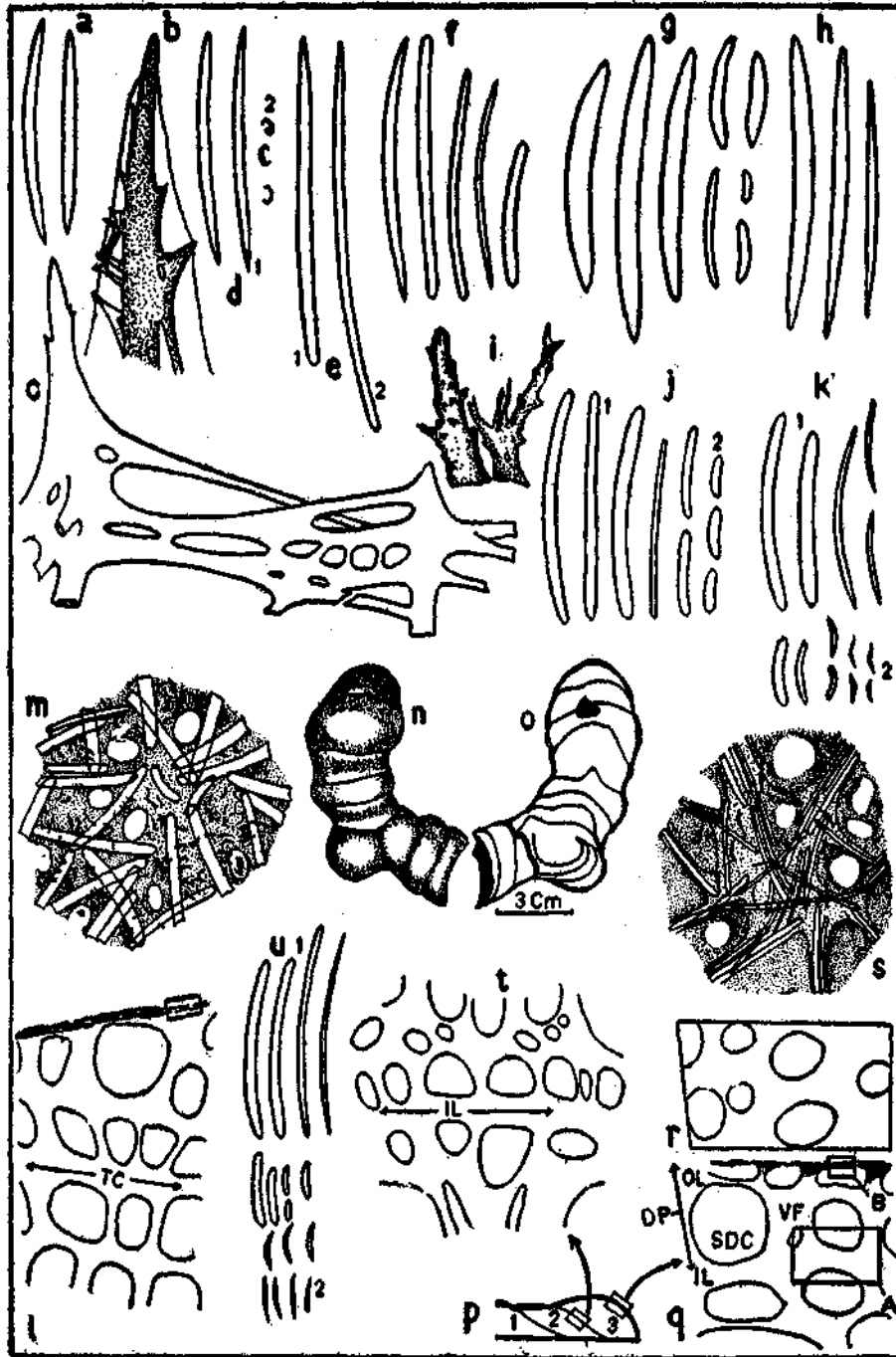
Skeleton composed of main fibres running vertically up along interior of each branch and then getting diverted into peripheral parts. These fibres may be of a compound nature at places. Spongin sparsely noted and spicules may even project partly out of fibres. Average diameter of main fibres around 0.21 mm. Connectives irregularly disposed in interior, but may assume a definite parallel course towards outer parts. Average diameter of these connectives is 0.147 mm. Spicules seen scattered outside these fibres in plenty (Fig. 1 c).

Spicules : (1) Oxeas. Gradually curved and sharply pointed : size, 0.29 × 0.010 mm when well developed (Fig. 1 d. 1). (2) Sigmas rather abundant ; chord upto 0.016 mm (Fig. 1 d. 2).

Distribution : Red Sea, Indian Ocean and Australian region.

Iotrochota purpurea (Bowerbank) (Fig. 1 e)

Iotrochota purpurea Thomas, 1973, p. 19, pl. 1, fig. 8 ; pl. 7, fig. 9 (synonymy).



For explanation, please see facing page

Material : Several small bits, probably of the same specimen.

Description : Bits at hand may represent parts of a large clathrous or ramose specimen. Branches 4 to 8 mm in diameter and with conical aculations from surface.

Colour : Black; pigment granules of 0.008 mm average diameter distributed rather profusely in dermal as well as in interior parts.

Consistency : Rough and friable in dry condition.

Surface conulose, conules 0.5 to 1.5 mm high. Oscules and pores not traceable due to dry nature of specimen.

Dermal membrane stretches across extremities of fibres that end in surface and at places reinforced with styles. Main skeleton is a reticulation of amber-coloured spongin fibres. Primary fibres rather distinct towards peripheral parts, but irregular in deeper areas. Diameter of primaries about 0.13 mm while that of connectives 0.037 mm.

Spicules : (1) Slender styles. Dermal; slightly curved and sharply pointed or blunt rarely. Size upto 0.252×0.004 mm

(Fig. 1 e, 1). (2) Main styles. Slightly curved and sharply pointed, size 0.168×0.008 mm (Fig. 1 e, 2). (3) Birotulates. Not seen inspite of careful examination.

Distribution : Indo-Pacific.

Family ADOCIDAE de Laubenfels

Petrosia testudinaria (Lamarck) (Fig. 1 f)

Petrosia testudinaria Thomas, 1985, p. 246, pl. 2, fig. 9 (synonymy).

Material : Three bits.

Description : Specimen available is only a radial section along the crator wall of a large specimen with a width of 2.5 cm. Bit got broken into three smaller bits in transit. Outer surface of material with small irregular protuberances, while the inner ridged radially.

Colour : Pale brown when dry.

Consistency : Hard and incompressible.

Surface highly reticulate on both sides. Oscules open at inner surface of crator, while pores on outer surface; sometimes on localised areas.

Fig. 1. a. *Haliclona cribricutis*: Spicules, oxeas; b-d. *Gelliodes fibulatus*: b. tip of conule, enlarged, c. Skeletal arrangement; d. Spicules - (1) Oxeas, (2) Sigmas; e. *Istrochota purpurea*: Spicules—(1) Main style, (2) Dermal style; f. *Petrosia testudinaria*: Spicules; g. *Petrosia nigricans*: Spicules; h. *Petrosia* (cf) *seriata*: Spicules, oxeas; i. *Callyspongia fibrosa*: Conules; j. *Petrosia sphaeroida* (?): Spicules—(1) Strongyles, (2) Small strongyles; k-m. *Strongylophora durissima*: k. spicules—(1) Strongyles, (2) Microxeas; l. Section showing the thickened transverse connectives (TC); m. Dermal skeleton—area marked in Fig. 1, magnified (view from above); n-u. *Strongylophora septata* n.sp. n. Dorsal view of the type specimen showing the bulging nature of 'chambers'; o. Ventral view of the type specimen showing the nature of septa and 'chambers'; p. Diagrammatic representation of three adjacent 'chambers' (numbered 1-3); q. Dermal part marked in 'chamber' 3 of Fig. p. giving the detailed structure of dermal part (DP), the outer 'layer' (OL), inner 'layer' (IL), vertical fibres (VF) arising from the inner 'layer' and the sub-dermal cavities (SDC); r. the inner 'layer' of dermal part, marked A in Fig. q. enlarged to show the plate-like structure (view from above); s. Dermal skeleton, marked B in Fig. q. (view from above) t. Inter-chamberal septa marked in Fig. p found in between chambers 2 and 3, enlarged. Here only inner 'layer' (IL) of dermal part retained and original outer 'layer' is continued as main skeleton of 3rd chamber and u. Spicules—(1) Strongyles and oxeas; (2) Microxeas.

Skeletal arrangement is typical of the species.

Spicules : (1) Oxeas/strongyles. Hardly divisible into two sets; size, 0.168 – 0.375 × 0.008 – 0.016 mm (Fig. 1 f).

Distribution : Red Sea to Australian region.

Petrosia nigricans Lindgren (Fig. 1 g)

Petrosia nigricans Thomas, 1985, p. 246, pl. 2, fig. 11, (synonymy).

Material : Four bits.

Description : Thickly encrusting to massively lobose. Lobose specimen with conical projections bearing oscules at their summits; other specimens with short stumpy projections all over their upper surface.

Colour : Chocolate brown in colour both externally and internally.

Consistency : Hard and incompressible.

Surface reticulate. Oscules at summit of conical projections, diameter upto 2 mm. Pores minute, irregular and one per mesh.

Dermal skeleton well developed and composed of a polygonal meshed net work with mesh size of 0.25 mm supporting dermal membrane which is densely packed with pigment granules. Dermal part may contain sand grains occasionally.

Main skeleton is a rectangularly meshed network, but its original nature is masked by spicules strewn in between. Pigment granules richly distributed in interior also. In peripheral parts connecting fibres may get arranged in a parallel course and as these fibres are stouter than those elsewhere, it may give a concentrically laminated appearance in cross section.

Spicules : (1) Oxeas/strongyles. All growth stages that are intermediate may be met with. Some may even be biangulate. Size varies from 0.029 – 0.218 × 0.004 – 0.012 mm (Fig. 1 g).

Petrosia (cf) *seriata* (Hentschel) (Fig. 1 h)

Petrosia (cf) *seriata* Vacelet, Vasseur and Levi, 1976, p. 88, fig. 67 (synonymy).

Material : One complete specimen and 3 bits; bits may be parts of a single large specimen.

Description : Specimen (complete) has a clathrous appearance and was growing attached to substratum by many points. Size, 9 × 3 cm.

Colour : Dark brown.

Consistency : Tough and incompressible.

Surface uniform, but microscopically hispid at places. Oscules numerous and arranged serially in all bits which have ridges on surface. In complete specimen oscules are scattered irregularly on hillock-like projections; diameter, 2 to 4 mm. Pores minute, average diameter 0.5 mm.

Dermal skeleton ill-defined at places and spicules usually placed horizontally, but occasionally get arranged vertically giving a microscopic hispidity to surface. Subdermal cavities simple, circular and rarely show signs of fusion. Diameter of these cavities may be up to 0.47 mm.

Main skeleton dense and its demarcation into distinct primaries and secondaries often impossible. Fibres may get flattened at their junction making meshes almost circular in outline. Brown pigment granules are densely distributed in dermal as well as in deeper parts; irregular in shape and are distributed either singly or in groups.

Spicules : (1) Oxeas, uniformly curved and gradually pointed. Stylote or strongylote modifications may also be noted. Size, 0.126 – 0.187 × 0.003 – 0.006 mm (Fig. 1 h).

Distribution : Indo-Australian,

***Petrosia sphaeroida* (?) Tanita (Fig. 1 j)**

Petrosia sphaeroida (?) Vacelet, Vasseur and Levi
1976. p. 89 fig. 68 ; pl. 10, figs. a, c, d.

Material : Two slices, probably parts of the same specimen.

Description : Of two slices, one is a cross-section of a vase-like specimen while other, a longitudinal section along wall. Former slice has a thickness of about 10 mm and diameter of 80 mm. Central cavity, which this slice encloses, has a diameter of 32 mm.

Colour : Brown.

Consistency : Hard and incompressible.

Surface ridged, ridges may get cut up into conules and these may be seen serially at places. Conules often blunt and with low, radiating ridges and these ridges may get connected with similar ridges originating from adjacent conules.

Dermal reticulation is coarse and summit of conules often with thicker fibres and large meshes while valleys in between conules with fine reticulation having smaller meshes. No trace of dermal membrane could be located in dry stage. Dermal reticulation has primary, secondary and even tertiary fibres as in any species of the genus *Callyspongia* Duch. and Mich. Pores in groups, often supported by larger meshes. Oscules small, 1 to 1.5 mm in diameter. Several openings varying in diameter from 1 to 1.5 mm could be located on lining of central cavity of sponge. This lining is netted as in dermal part. Main skeleton is coarsely reticulate ; fibres rather coarse and no difference between ascending and connecting fibres could be noted. Some fibres end at surface and support dermal skeleton as in the genus *Callyspongia*. Spongin content is rather meagre and the fibres may vary from 0.037 to 0.132 mm in diameter with an average mesh size of 0.37 mm. Reticulation lining the central cavity is made of coarse fibres of diameter,

varying from 0.09 to 0.1 mm. Fibres mostly flattened in outline and mesh size may be upto 0.56 mm in diameter. Spicules may often project out of fibres as spongin content is quite negligible.

Spicules : (1) Strongyles. Slightly curved size; 0.162 — 0.252 × 0.008 — 0.012 mm (Fig. 1 j, 1). (2) Small strongyles. Slightly curved ; size 0.042 — 0.117 × 0.006 — 0.012 mm, rarely with oxeote modifications (Fig. 1 j, 2).

Remarks : Many species of the genus *Petrosia* Vosmaer, are known to possess more or less the same spicular compliments as in the present case and to make the problem still complicated some other genera also overlap with this in this respect. Hence, a detailed study is essential to ascertain the various valid species of the genus *Petrosia* and to separate it from the other closely allied ones.

Distribution : Indo-Pacific.

***Strongylophora durissima* Dendy (Fig. 1 k, l, m)**

Strongylophora durissima Thomas, 1986. pl. 2,
fig. 7.

Material : Two bits, probably parts of the same specimen.

Description : From appearance of slices at hand it is certain that these bits represent longitudinal section of a cup-shaped specimen. Thickness of wall about 10 mm. Inner surface of bit somewhat ridged ; ridges run vertically upto rim of cup. Outer surface undulated.

Colour : Pale white.

Consistency : Hard and incompressible as in any lithistid sponge.

Oscules circular, shallow, flush with surface and compound ; diameter up to 3 mm. Pores minute. Several small openings with a diameter of 1.5 mm (average) are noted on outer side of lamella and may represent openings of commensal barnacles.

Dermal skeleton well developed and composed of an ill-defined reticulation of triangular meshes. Reticulation, at places, divisible into primary, secondary and even tertiary fibres with their diameter decreasing gradually. Spongin content negligible and spicules may even be seen distributed singly forming sides of ultimate mesh.

Main skeleton closely meshed and composed of a reticulation of fibres; meshes irregular in deeper parts, but become distinctly rectangular towards peripheral parts. Connectives, at peripheral parts, become distinct after regular intervals (say, after two or three tiers) and since these thickened connectives (Fig. 1, l, TC) take a continuous course, the whole structure, in cross section, appears distinctly ladder-like. 4 to 7 such laminations may be noted in cross section of any actively growing part. Diameter of such thickened fibres may be upto 0.11 mm while that of main fibres only 0.056 mm. Spongin scarcely visible even in fibres.

Spicules : (1) Strongyles. Slightly curved; smaller forms always oxoote. Size 0.024 — 0.315 × 0.005 — 0.016 mm (Fig. 1 k, l). (2) Microxeas. Dermal, angulated at the middle; size, 0.033 × 0.002 mm (Fig. 1 k 2).

Distribution : Indo-Pacific.

Strongylophora septata n. sp. (Fig. 1 n - u)

Material : One complete specimen and 4 bits.

Description : Sponge erect in early stage of growth and may become repent in advanced stages of growth. Body with bulbous projections set in a linear pattern indicating an additional chamber formed as a result of a particular period's growth; alternate chambers bulge more (Fig. 1 n, o, p). The total length of the complete specimen (Type) 110 mm and width, 35 mm (width taken at the largest chamber). It appears from shape of specimen that it was

growing attached to substratum by one side (repent ?) and was removed from substratum by cutting it longitudinally. Other bits, however, show no sign of a lateral attachment and hence may be regarded as growing vertically up. Chambered nature of sponge quit distinct in all cases. Largest bit with maximum diameter of 30 mm.

Colour : Dermal part pale white and the interior gray.

Consistency : Hard and incompressible.

Oscules large, compound, perfectly circular and 5 mm in average diameter. Pores small, 0.04 mm in diameter and irregular to oval in shape.

Dermal skeleton thick and distinctly different from that of deeper parts both in colour and spicular arrangement. Dermal part resemble the 'rind' of any *Geodia* spp. (Fig. 1 q, DP) in general appearance. Dermal part has a 'two-layered' appearance and outer layer with its associated skeleton supports dermal membrane (OL) while inner one (IL) is a mesh-work of stouter fibres. This 'layer', when viewed from above, has a plate-like appearance (Fig. 1 r) with perforations. Fibres have a diameter of 0.094-0.28 mm and packed with strongyles. Meshes that these fibres enclose, are oval in outline with a diameter varying from 0.132 to 0.471 mm. Fibres originating vertically (Fig. 1 q, VF) from these plate-like reticulum fan out at surface as dermal skeleton. Space in between two adjacent vertical fibres quite extensive and forms distinct subdermal canals (Fig. 1 q, SDC). Since such canals are serially arranged without any sign of fusion, 'rind' appears 'two-layered' in cross section (Fig. 1 q).

Dermal skeleton is composed of strongyles in meshes as seen in *S. durissima* described earlier. Fibres divisible into primaries, secondaries and even tertiaries. Spongin content rather scarce and at places strongyles

may be seen arranged horizontally. Microxeas seen ornamenting dermal meshes in varying degrees (Fig. 1 s).

Main skeleton irregular with fibres disposed in an irregular manner (Fig. 1 t, on either side of IL). No demarcation between primaries and secondaries; spongin content negligible.

Growth pattern: Since growth pattern noted in this new species is not common among sponges it is felt that details are worth mentioning. In this case original 'rind-like' dermal region is retained and by subsequent growth another new chamber is added to the original one and such a pattern has not been seen so far among sponges. In a sufficiently larger specimen several such chambers can be found in a superimposed fashion.

During the process of growth, there is every likelihood that some cells from the outermost 'chamber' escape out through dermal part and form a new 'chamber' which in structural details, bear a close resemblance to the original 'chamber'. It may be seen that dermal skeleton ('rind-like' part) of original chamber that gets buried under new chamber, is composed only of plate like 'inner layer' (Fig. 1 t, IL) of dermal part without any trace of outer 'layer'. Probably outer 'layer' gets atrophied in due course as no physiological purpose is served by this part. Variation in size, at least in some parts, of chambers may be due to foul and fair seasons experienced by sponge.

Spicules: (1) Strongyles. Uniformly curved to biangulate. Size $0.016-0.294 \times 0.002-0.012$ mm. Young ones rarely oxecote (Fig. 1 u, 1). They are inseparable into sets. (2) Microxeas, Centrangulated with maximum size of 0.029×0.002 mm (Fig. 1 u, 2).

Remarks: There is absolutely no difference between the spicules of this new species and of *S. durissima* Dendy collected from the same

locality. Specimens of *S. durissima* have as characteristic lithistid appearance while the specimens belonging to the present new species differ considerably from those of the former in the structure of dermal skeleton and also in its 'chambered' architecture. It is not known whether *S. durissima* has such a chambered architecture in its early stage of growth and the available literature on this species throws no light on this aspect. Hence, it is felt that the present new species can be retained until more data become available. Considering the presence of septa separating adjacent 'chambers' the specific name '*septata*' is suggested here.

Family CALLYSPONGIIDAE de Laubenfels

Callyspongia fibrosa (Ridley and Dendy) (Fig. 1 i)

Callyspongia fibrosa Thomas, 1935. p. 248 pl. 2 fig. 14 (synonymy).

Material: Two specimens.

Description: Specimens were entirely different in their morphology; one is finger-shaped while other lamellar. Finger-shaped specimen is divided into three branches at its apical part while lamellar one has a height of 90 mm with a lateral spread of 80 mm. Lamella has a thickness of 2 mm and one side ornamented with conules. Growing tip of this specimen transparent as fibres are thinly distributed and fibres destined to form conules are traceable throughout this transparent zone.

Colour: Brown.

Consistency: Soft and spongy with good resiliency.

Surface conulose, conules compound, 2 to 5 mm high and arranged on all sides in finger-like specimen while on one side in lamellar specimen.

Oscules and pores seen only on one side in lamellar specimen, but scattered throughout in other.

Dermal skeleton is a reticulation of smaller fibres forming fine meshes that are divisible into primaries, secondaries or even tertiaries and are cored by a single row of spicules. Main skeleton with well developed reticulation of primaries and connectives. Fibres which run through middle of lamella are stoutest (0.067 mm diameter) and these fibres curve out towards surface forming main fibres. These main fibres, at surface, support dermal reticulation. Near surface these main fibres become thin (0.042 mm diameter) and run parallel to each other. Main fibres connected in a scalariform pattern by fibres of about 0.04 mm diameter and this arrangement gives

a rectangular shape to meshes. Both primaries and connectives equally cored by oxeas and spongin, pale brown in colour. In between rectangular meshes thus formed, there may be slender fibres stretching across in between arms of meshes. These slender fibres are never cored by oxeas.

Spicules : (1) Oxeas. Straight, uniformly or asymmetrically curved ; tips gradually to acutely pointed or even blunt. Size, 0.084-0.126 × 0.004-0.005 mm.

Distribution : Indian Ocean, Australian region and Atlantic Ocean (?).

REFERENCES

- BABIC, K. 1922. Monactinellida und Tetractinellida des Adriatischen Meeres. *Zool. Jb. Syst.* 46 : 217-302.
- DE LAUBENFEIS, M. W. 1936. A discussion of the sponge fauna of Dry Tortugas in particular and the West Indies in general with material for a revision of the families and orders of porifera. *Papers Tortugas Lab.* 30 : 1-225.
- DENDY A. 1905. Report on the sponge collected by Prof. Herdman at Ceylon in 1902. *Rep. Govt. Ceylon Pearl Oyster Fish. Gulf Mannar Suppl.* 18 : 57-246.
- HECHTEL G. J. 1965. A systematic study of the Demospongiae of Port Royal, Jamaica. *Bull. Peabody Mus. nat. Hist.* 20 : 1-104.
- THOMAS, P. A. 1968. Studies on sponges. *Ph.D. Thesis, Kerala Univ., Trivandrum.*
- 1973. Marine Demospongiae of Mahe Island in the Seychelles Bank (Indian Ocean). *Mus. Roy. L. Afr. Cent. Belgium.* 203 : 1-98.
- 1982. Sponges of Papua and New Guinea. Pt. I. Order Keratosida Grant. *J. mar. biol. Ass. India*, 24 (1 & 2) : 15-22.
- 1985. Demospongiae of the Gulf of Mannar and Palk Bay. In : P.S.B.R. James (Ed.) *Recent Advances in Marine Biology*. Today and Tomorrow's Printers and Publishers, New Delhi. 205-365.
- VACELET, J. P. VASSEUR AND C. LEVI 1976. Spongiaires de la Pente externe des récifs coralliens de Tulea (sud-ouest de Madagascar). *Mem. Mus. natn. Hist. nat.* 49 : 1-116.