

SPONGES OF PAPUA AND NEW GUINEA III ORDERS POECILOSCLERIDA TOPSENT AND HALICHONDRIDA VOSMAER

P. A. THOMAS*

Central Marine Fisheries Research Institute, Cochin

ABSTRACT

Eight species belonging to the orders Poecilosclerida Topsent and Halichondrida Vosmaer collected from Papua and New Guinea are described with suitable illustrations. Of these 8 species, the distribution of 4 (*Echinodictyum clathratum* Dendy, *Agelas nauritiana* var. *oxeata* Levi, *Axinella carteri* Dendy and *Phakettia conulosa* Dendy) hereby extended to Papua and New Guinea and one, *Agelas braekmani* is described new to science.

INTRODUCTION

THE PRESENT account, which is the third in the series on the sponges of Papua and New Guinea, deals with a total of 8 species falling under the orders Poecilosclerida (5 species) and Halichondrida (3 species). It is generally seen that any collection of Porifera from the extant seas is dominated by the members of Poecilosclerida, but in the present sample the number of species noted (5 nos.) is not at all impressive and the apparent scarcity may be attributed to the fact that specimens were collected by the Division of Bio-ecolog, Brussels University, Belgium, in connection with the studies on bioactive substances from marine organisms; and this Team while collecting specimens paid more attention to collecting massive forms sufficient enough to make a desired quantity and in this attempt they might have ignored several inconspicuous ones which really account to the numerical abundance of poeciloscleridean sponges.

Similarly, the order Halichondrida is represented here by 3 species, a number far too less than what is naturally expected. In the present collection several specimens belonging to the various genera of this order are represented, but the specimens available are only small bits or thin slices of an entire specimen and this situation, in many cases

rendered their specific identification rather impossible. Future workers interested in documenting the species of these two orders may bear above limitations of the present author in mind while studying the specimens of the above orders.

Details pertaining to the collection spots, classification followed *etc.* have been dealt with in the first part of the series. Only a restricted synonymy is given for each species in the present account also.

The author expresses his sincere thanks to Dr. P.S.B.R. James, former Director, C.M.F.R. Institute, Cochin-14, for kindly permitting him to publish the account.

SYSTEMATICS

Order *Poecilosclerida* Topsent

Three families and 5 species belonging to the order are represented. They are Phorbasidae de Laubenfels, Agelasidae Verrill, and Amphilectidae de Laubenfels.

Family Phorbasidae de Laubenfels

Genus *Echinodictyum* Ridley

1. *Echinodictyum clathratum* Dendy (Fig. 1a)

Echinodictyum clathratum Thomas, 1973, p. 24, pl. 1, fig. 6; Thomas, 1986, p.250 (synonymy)

*Present address: V.R.C. of C.M.F.R.I., Vizinjam-695 521, Kerala

Material : One specimen

Description : Specimen 10 cm high and 5 cm wide, compressed with basal width of 3.5 cm and tapering towards the growing tip. Stalk not fully preserved, but remnants visible. Main bulk of the body formed of a clathrous mass of thin, flattened branches varying in width from 0.5 to 2 mm and interconnected at irregular intervals forming a cavernous interior. These branches end at surface in conical structures (conules) which, in life are covered with an aspiculous membrane.

Colour : Dark brown when dry.

Consistency: Rough, friable when dry.

Oscules and pores not traceable; some irregular openings may be noted piercing the dermal membrane (oscules ?).

Skeleton is an irregular reticulation of fibers united compactly to form each branch. Fibers are echinated by acanthostyles often arranged vertically; peripheral fibers more profusely echinated than those in the interior. Conical branchlets may be seen originating from branches in peripheral parts. Fibers are cored by oxeas, spongin content rather poor. Towards the surface these branches may end in conical structures supported by styles in a brush-like manner, piercing the dermal membrane.

Spicules: (1) Oxeas. Uniformly curved and sharply pointed; stylote rarely. Size up to 0.7 × 0.16 mm; younger forms curved irregularly. (2) Styles. Tips often hair-like; size up to 1.5 × 0.006 mm; rarely represented. (3) Small styles. Common at the surface brushes; may be younger forms of the above category. (4) Acanthostyles. Head densely spined in some; entirely smooth younger forms may also be noted. Size up to 0.13 × 0.005 mm (Fig. 1, a).

Distribution: It is a widely distributed Indian Ocean species and is here recorded from Papua and New Guinea.

Family Agelasidae Verrill

Genus *Agelas* Duchassaing & Michelotti

2. *Agelas mauritiana* (Carter) (Fig. 1, b-d)

Agelas cavernosa Dendy, 1905, p. 174

Agelas mauritiana Thomas, 1979, p. 56, pl. 3, fig. 7, 7a (synonymy); Thomas, 1987, p. 256.

Material: Two entire specimens and three bits.

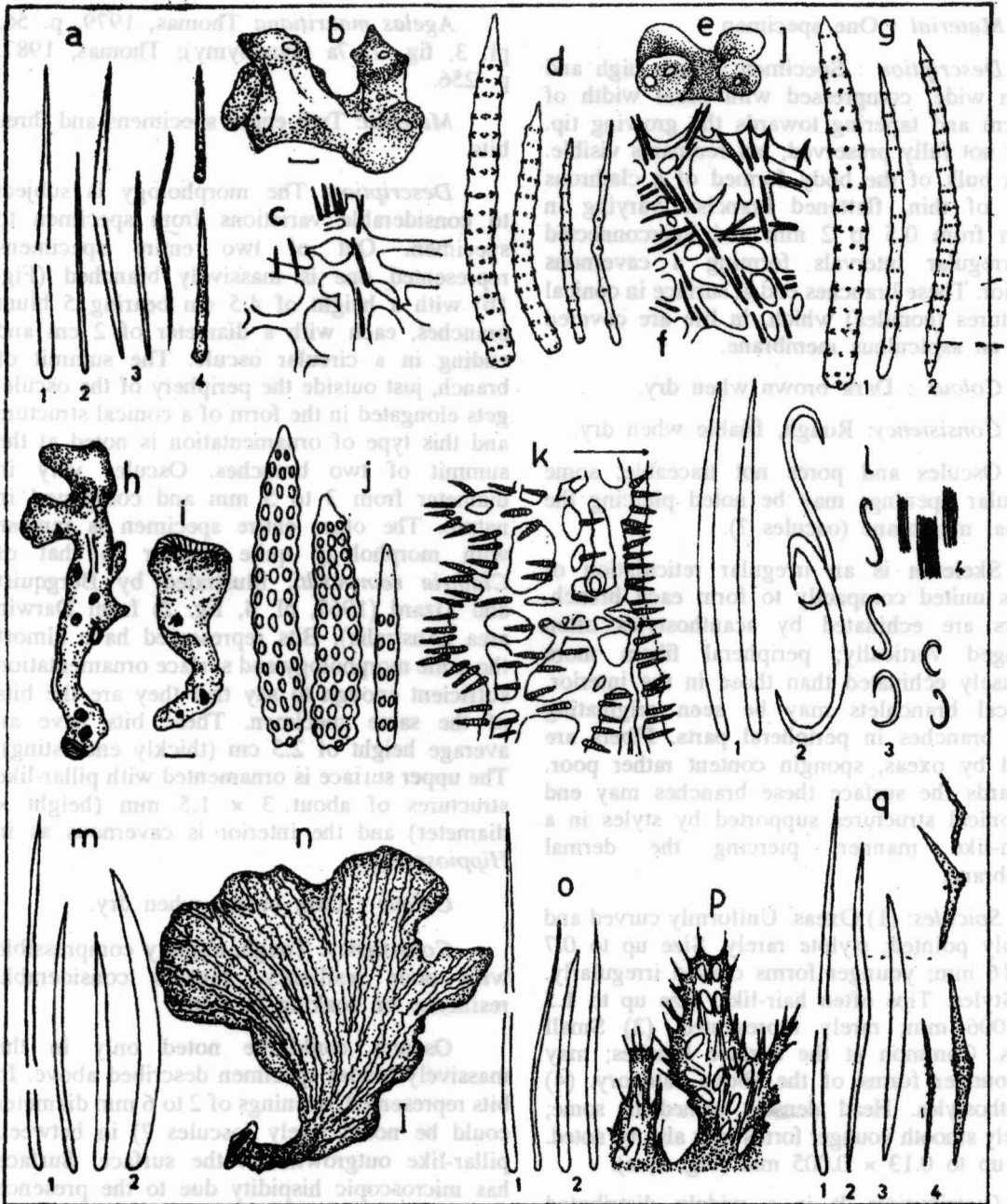
Description: The morphology is subject to considerable variations from specimen to specimen. Out of two entire specimens represented one is massively branched (Fig. 1b) with a height of 4.5 cm bearing 5 blunt branches, each with a diameter of 2 cm and ending in a circular oscule. The summit of branch, just outside the periphery of the oscule, gets elongated in the form of a conical structure and this type of ornamentation is noted at the summit of two branches. Oscules vary in diameter from 3 to 5 mm and compound in nature. The other entire specimen is ramose with morphology quite similar to that of *Clathria reinwardti*, illustrated by Bergquist and Tizard (1967, pl. 4, fig. 2) from Darwin area (Australia). Bits represented have almost the same morphology and surface ornamentation sufficient enough to say that they are the bits of the same specimen. These bits have an average height of 2.5 cm (thickly encrusting). The upper surface is ornamented with pillar-like structures of about 3 × 1.5 mm (height × diameter) and the interior is cavernous as in *Hippiospongia*.

Colour : Dark brown when dry.

Consistency: Tough, slightly compressible with poor resiliency, regains considerable resilience on soaking in water.

Oscules could be noted only in the massively lobose specimen described above. In bits represented, openings of 2 to 6 mm diameter could be noted rarely (oscules ?) in between pillar-like outgrowths at the surface. Surface has microscopic hispidity due to the presence of minute conules.

Skeleton is a well developed reticulation of amber coloured spongin fibers without any differentiation into primaries and connective. At places *i.e.*, inside pillar-like structures, some thicker fibers (compound fibers ?) take a vertical course. Such fibers may be densely cored and echinated by acanthostyles. In massively



- 1 a. *Echinodictyum clathratum* - spicules : (1) Style, (long), (2) Small style, (3) Oxeas, (4) Acanthostyles. b-d. *Agelas mauritiana*- (b) Entire specimen (inset scale - 10 mm), (c) Skeletal arrangement of massively lobose specimen, (d) Spicules: (1) different growth forms. e-g. *Agelas mauritiana* var. *oxeata*- (e) Specimen represented (inset scale = 10 mm), (f) Skeletal arrangement, (g) Spicules : (1) Acanthostyles, (2) Acanthoxea. h-k. *Agelas braekmani* n.sp.- (h) Type specimen, (i) specimen with funnel shaped terminal portion (inset scale = 10 mm), (j) Spicules, (k) LS of wall: showing the arrangement of skeleton, arrow indicates the surface of the specimen. (l) *Biemna fortis*- Spicules: (1) Styles, (2) Sigma, large, (3) Sigma, small, (4) Raphides in groups. m-n. *Axinella carteri*- (m) spicules: (1) Slender style, (2) Stout styles. (n) Specimen, entire view (inset scale = 10 mm). o-p. *Phakettia conulosa*- (o) Spicules: (1) Long styles, (2) Short styles, (p) conules surrounding the central pit. q. *Higginsia mixta*- Spicules: (1) Style, (2) Slender oxea (toxiform), (3) Stout oxea, (4) Acanthoxeas.

branched specimen described above, there is no differentiation into primaries and connectives in deeper parts, but towards the peripheral parts some fibers take a vertical course and may occasionally be cored by acanthostyles (Fig. 1 c). Diameter of fibers may vary considerably from 0.016 to 0.138 mm and meshes formed may be irregular in deeper parts to polygonal in peripheral areas. Outer arms of the surface meshes are sparsely echinated by styles in massively branching specimen while in thickly encrusting bits they are somewhat well echinated irrespective of the position.

The spicules projecting from the outer arms of peripheral meshes together with those emerging from the tips of 'main fibers' support the dermal membrane giving microscopic hispidity to the surface. In thickly encrusting bits the dermal part is reinforced with vertically arranged styles rather densely.

Spicules : (1) Acanthostyles. Verticillately spined; whorls 12 to 20; younger spicules smooth or sparsely spined. Spicular measurements are given in Table 1 (Fig. 1, d).

TABLE 1. Spicular measurements of *A. mauritiana* (mm)

St. No.	Form	Length	Width (excluding spines)
1.	Massively branching specimen	0.14-0.21 (0.117)	0.002-0.012 (0.008)
2.	Ramose specimen	0.189-0.25 (0.218)	0.008-0.016 (0.012)
3.	Thickly encrusting Specimen	0.109-0.23 (0.193)	0.004-0.012 (0.008)

*Averages

Remarks: de Laubenfels (1954) could collect specimens with different growthforms as represented in the present collection.

Distribution : Red Sea to Pacific Ocean.

3. *Agelas mauritiana* var. *oxeata* Levi (Fig. 1, e-g)

Agelas mauritiana var. *oxeata* Levi, 1961, p. 22

Material : One specimen

Description: The external form of the specimen resembles very much to the massively branching specimen of *A. mauritiana* described above, and has 4 blunt branches arising from a common encrusting base. Height of the specimen, 2.5 cm and maximum width, 4.5 cm (Fig. 1 e). The largest branch has an average diameter of 2.3 cm.

Colour : Dark brown when dry

Consistency: Slightly compressible with poor resiliency. Surface minutely hispid due to the presence of projecting tips of acanthostyles ending either singly or in brushes; hispidity more at growing tips of branches.

Oscules are seen at the summit of branches, circular and compound; diameter 2-4 mm.

Skeleton consists of distinct primaries and connectives, both cored and echinated by acanthostyles; primaries often with more spicules than connectives. Primaries run parallel to each other often diverging at the periphery; meshes irregular; peripheral meshes with more echinating spicules. Spongin is pale brown in colour and the quantity quite appreciable. Diameter of primaries from 0.06 - 0.11 mm while that of connectives from 0.016 - 0.063 mm. Tips of primaries ending in the surface often with acanthostyles arranged in brush-like manner supporting larger conules, while solitary spicules emerging vertically from the outermost arms of peripheral meshes support smaller conules, (Fig. 1, f).

Spicules : (1) Acanthostyles. Verticillately spined with 12 - 20 whorls, sometimes whorls wide apart; or suppressed in younger forms. Size 0.21 - 0.25 (0.23 mm) × 0.008 - 0.016 (0.012 mm) excluding spines. (2) Acanthoxeas. Arms often subequal, with 20-27 whorls of spines. There are grounds to believe that these acanthoxeas are modified acanthostyles with one end getting activated by some unknown environmental factors to continue growth and form an additional ray. A slight tilt in the axis of the acanthoxea just at the origin of the new ray, a few closely packed whorls of spines at the origin of the new ray, the absence of oxete younger spicules etc. may further corroborate this view (Fig. 1, g).

Remarks: The arrangement and structure of spicules in this variety are quite characteristic and sufficient enough to elevate it to the status of a species. Since it is not known that modifications seen in spicules are akin to any pathological conditions or not its varietal status is retained here.

Distribution: Levi (1961) created this variety from Aldabra Island and it is here recorded from Papua and New Guinea.

4. *Agelas braekmani* n.sp. (Fig. 1, h-k)

Material : Several bits, probably parts of an entire specimen.

Description: The largest bit has a length of 7.5 cm (type; Fig. 1, h). Bits tubular and irregularly branched, branches end blindly or in oscule. In another specimen (Fig. 1, i) a funnel-shaped opening could be noted at one end and the interior of this funnel-shaped structure is radially ridged; the funnel opens out through an orifice of about 30 mm diameter. The diameter of branch may come up to 10 mm on an average and the thickness of the wall up to 4 mm at places. Foreign particles (mainly shell pieces) are seen embedded on the wall at places.

Consistency: Stiff and cork-like.

Surface microscopically hispid throughout. Walls punctured here and there with openings (oscules?) varying in diameter from 2-4 mm. Oscules placed terminally on branches or at the extremity of tuberculated structure (branchlets ?) may also be noted. Pores in groups, spread over circular and depressed areas of 2 mm diameter.

The microscopic hispidity of the surface is due to the presence of spicules arising from the outermost arms of peripheral meshes projecting vertically. Dermal membrane covering these spicules gives a microscopic conulose structure to the surface.

Skeleton is a well developed reticulation of pale spongin fibers which are, at some places, divisible into primaries and connectives. Primary fibers are feebly cored by acanthostyles and are devoid of brush-like spicules arising from their extremities. The connectives have

no coring spicules, but echinating ones may be fairly common. A longitudinal section of the wall shows that both outer and inner surfaces are equally echinated by spicules, the difference being (1) a membrane similar to that seen in the dermal part is wanting and (2) at least some of the primary fibers end in brushes directing into the lumen of the tube. The connectives, in this case, are extensively echinated by acanthostyles as compared with other species of the genus *Agelas*, and the spicules of the inner half of the wall are directed inwards (that is, towards the lumen) while those of the outer half are directed outwards, though a clearcut demarkation is often impossible. Diameter of primaries may come up to 0.132 mm and of connectives from 0.042 - 0.076 mm; mesh size 0.18 - 0.56 mm.

Spicules : (1) Acanthostyles. Verticillately spined, whorls 8-18 in number; younger forms partly annulated, each spine tuberculated at base; size 0.130 - 0.212 (0.159) × 0.004 - 0.021 (0.015 mm excluding spines and up to 0.025 mm with spines).

Remarks: The present new species has many features in common with *Agelas* sp. described from Minicoy Island (Thomas, 1980), but considering the inconspicuous nature of the specimen from Minicoy, it is quite difficult to consider it conspecific with the present one. More material from Minicoy or elsewhere is necessary to come to any conclusion.

The specific name 'braekmani' suggested here is in honour of Dr. J.C. Braekman, Head, Division of Bio-ecology, Brussels University, Belgium, under whose supervision the bio-activity studies on sponges from Papua and New Guinea have been initiated.

Family Amphilectidae de Laubenfels

Genus *Biemna* Gray

5. *Biemna fortis* (Topsent) (Fig. 1, 1)

Biemna fortis Thomas, 1986, p. 288 (synonymy)

Material : Several bits; probably parts of the same specimen

Description : Shape irregular as if torn off longitudinally from a massive specimen. Pebbles, shell bits etc. are heavily incorporated into the body. Largest bit 5.5 × 3 cm in size.

Colour: Snow white externally due to the presence of spicules projecting in a slanting manner; interior sandy gray.

Consistency: Friable when dry

Surface has an eroded appearance with slanting spicules so characteristic of the buried portion of any specimen of the species.

Oscules and pores are not traceable. Skeleton consists of irregular bands of styles running to the surface and piercing it at an angle.

Spicules : (1) Styles. Slightly curved and sharply pointed, blunt in some, basal 1/3rd narrower than the rest. Size 0.11 - 1.32 (1.06) × 0.012 - 0.042 (0.033 mm) at the widest part and 0.008 - 0.021 (0.016 mm) at the narrower basal part. (2) Sigmas. Two types are noted; both C or S shaped, (a) chord 0.084 - 0.105 mm and (b) 0.014 - 0.042 mm. (3) Raphides. In groups, individual length up to 0.126 mm, hair-like.

Distribution: Red Sea to Australian region.

Order Halichondrida Vosmaer

Family Axinellidae Ridley and Dendy

Subfamily Axinellinae de Laubenfels

Genus *Axinella* Schmidt

6. *Axinella carteri* Dendy
(Fig. 1, m-n)

Axinella carteri Thomas, 1986, p.290, pl. 4, Fig. 24 (synonymy)

Material: Four specimens

Description: Specimens stalked and lamellate; both surfaces of the lamella ornamented alike with conules; conules often form ridges diverging towards the margin of lamella. Height of the largest specimen (Fig. 1, n) 13 cm and width, 11 cm. Thickness of lamella up to 5 mm (including conules). Stalk, rather robust, diameter 10 mm.

Colour: Brown when dry

Consistency: Hard and leathery

The skeletal arrangement tallies well with that described by earlier workers.

Spicules: (1) Stout styles. Slightly curved; size 0.31 - 0.68 (0.45 mm) × 0.008 - 0.032 (0.016 mm). (2) Slender styles. Very rare, sometimes setose; younger forms rather common and associated with conules. Size up to 1.2 × 0.013 mm. (Fig. 1, m).

Distribution: This is a widely distributed Indian Ocean species and is here recorded from Papua and New Guinea

Genus *Phakettia* de Laubenfels

7. *Phakettia conulosa* (Dendy)
(Fig. 1, o, p)

Phakettia conulosa Thomas, 1973, p.44, pl. 2, fig. 15; pl. 7, fig. 6 (synonymy)

Material : One bit, probably part of a large specimen

Description : Bit lamellate, height, 9 cm, width 5 cm and thickness, 1.5 cm; both sides conulose, conules closely set forming longitudinal ridges here and there; adjacent conules interconnected with a series of low conules giving a honey-comb like appearance to the surface. The central part of these hexagonal compartments are deep, sometimes up to 5 mm. These deep pits give a characteristic appearance to the surface (Fig. 1, p).

Colour: Sandy gray when dry

Consistency: Tough and incompressible

Oscules and pores not traceable, probably located inside the surface pits. Surface hispid due to the presence of styles projecting from conules. Skeleton compact and the arrangement tallies with earlier descriptions.

Spicules : (1) Short styles. Slightly curved and sharply pointed; size, 0.56 - 0.71 (0.63) × 0.008 - 0.021 (0.016 mm). (2) Long styles. Rare; size 0.75 - 1.3 (1.01) × 0.016 - 0.021 (0.017 mm). (Fig. 1, o).

Distribution: Widely distributed in the Indian Ocean and is here recorded from Papua and New Guinea.

Subfamily Higginssiinae de Laubenfels

Genus *Higginsia* Higgin

8. *Higginsia mixta* (Hentschel)

(Fig. 1, q)

Higginsia mixta Bergquist, 1965, p. 176, fig. 26. Thomas, 1986, p.297, pl. 5, fig. 9.

Material: Two specimens

Description: Specimen lamellate, without any trace of stalk and hence may be parts of a larger specimen. Larger bit about 14 cm height and 6 cm wide; thickness of the lamella 1 cm.

Colour: Sandy gray when dry

Consistency: Compact and friable when dry

Oscules and pores are not traceable. Surface hispid due to the presence of spicular brushes emerging from the surface.

Skeleton consists of irregular ascending tracts along the central part forming a compact axial part. Fibers diverging to the surface start

from this axial part. Oxeas dominate in the axial part whereas styles in the extra-axial fibers. In the extra-axial fibers styles may be seen in the central part surrounded by smaller oxeas. In the dermal part the styles project out forming surface brushes. Acanthoxeas are often associated with the dermal part though their presence in deeper areas cannot be ruled out. Spongin content varies considerably from place to place. **Spicules :** (1) Styles. Long, slender size up to 2.7×0.018 mm. (2) Slender oxeas. Evenly curved or toxiform; size up to 1.41×0.012 mm. (3) Stout oxeas. Evenly curved and sharply pointed; size $0.66 - 0.94 \times 0.008 - 0.036$ mm. (4) Acanthoxeas. Centrangulated with a central belt of longer spines; spined all over, but younger forms sometimes smooth; size $0.07 - 0.148 \times 0.002 - 0.006$ mm. (Fig. 1, q)

Remarks: Burton (1959) classified the present species under the group 'main magasclered' seldom exceeding 0.9 mm in length. But Bergquist (1965) and Thomas (1968, 1986) could record specimens with main megascleres exceeding the above limit.

Distribution: Indian Ocean, Australian region, Western Pacific.

REFERENCES

- BERGQUIST, P.R. 1965. The sponges of Micronesia, Part I. The Palau Archipelago. *Pacif. Sci.*, **19** (2) : 123-204.
- _____ AND C.A. TIZARD 1967. Australian intertidal sponges from the Darwin Area. *Micronesica*, **3** : 175-202.
- BURTON, M. 1959. Sponges (in) John Murray Expedition 1933-34. Scientific Reports. *Brit. Mus. nat. Hist.*, **10** (5) : 151-281.
- De LUBENFELS, M.W. 1954. The sponges of the West Central Pacific. *Ore. St. Monogr. Stud. Zool.*, No. **7** : 1-306.
- DENDY, A. 1905. Report on the sponges collected by Prof. Herdman, at Ceylon, in 1902. *Rep. Govt. Ceylon Pearl Oyster Fish. Gulf Mannar. Suppl.*, **18** : 57-246.
- LEVI, C. 1961. Les Spongiaires de l'île Aldabra. *Result. Scient. Comp. Calypso*, **5** (2) : 3-32.
- THOMAS, P.A. 1968. Studies on sponges. *Ph. D. Thesis, Kerala Univ.* (unpublished).
- _____ 1973. Marine Demospongiae of Mahe Island in the Seychelles Bank (Indian Ocean). *Ann. Musee. Royal de l'Afrique Centrale, Belgium*, No. **203** : 1-96.
- _____ 1979. Studies on sponges of the Mozambique Channel. II. Sponges of Mambone and Paradise Islands, *Ibid.*, No. **227** : 49-73.
- _____ 1980. Demospongiae of Minicoy Island (Indian Ocean) Pt. 2. Order Poecilosclerida. *J. mar. biol. Ass. India*, **22** (1 & 2) : 1-7.
- _____ 1986. 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.