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NORTH JAMAICAN DEEP FORE-REEF SPONGES

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Key words: Sponges, deep-water, fore-reef, Jamaica

ABSTRACT

An unexpectedly high amount of new species, revealed within only one hour of summarized bottom time, leads to the conclusion that the sponge fauna of the steep slopes of the deep fore-reef is still largely unknown. Four mixed gas dives at depths between 70 and 90 m, performed in May and June, 1993, at the deep fore-reef off the north Jamaican coast in front of the Discovery Bay Marine Laboratory, revealed a total of 27 demosponge species, ten of which are new to science.

INTRODUCTION

Compared to other regions, the Caribbean sponge fauna has been well investigated by studies throughout the last decades. Most of these investigations have been carried out by mere snorkeling or scuba diving on air in depths at 0–40 m (e.g. Wiedenmayer, 1977; van Soest, 1978, 1980, 1984; Zea, 1986; Pulitzer-Finali, 1986; Lehnert, 1993). Sponges from the deep fore-reef, exceeding depths of 40 m have been rarely investigated; if at all, samples were obtained by dredging (Lewis, 1965; van Soest & Stentoft, 1988). The latter authors described samples dredged from a depth of 110–325 m, off the coast of Barbados and showed that most of the species are different from those of shallower water. The deep fore-reef at depths between 70 and 90 m described here has not been investigated so far because dredging is hardly possible on the vertical walls there and diving on air does not allow enough bottomtime and is only possible under high personal risks (oxygen toxicity, nitrogen narcosis). Furthermore the attention the diver is able to pay to his objects is lowered by nitrogen narcosis.

For that reason four trimix scuba-dives were made at depths between 70 and 90 m in the period of May and June, 1993, off the coast of North Jamaica, in front of Discovery Bay. Compared to scuba-diving on air, trimix allows deeper dives without the risks mentioned be-

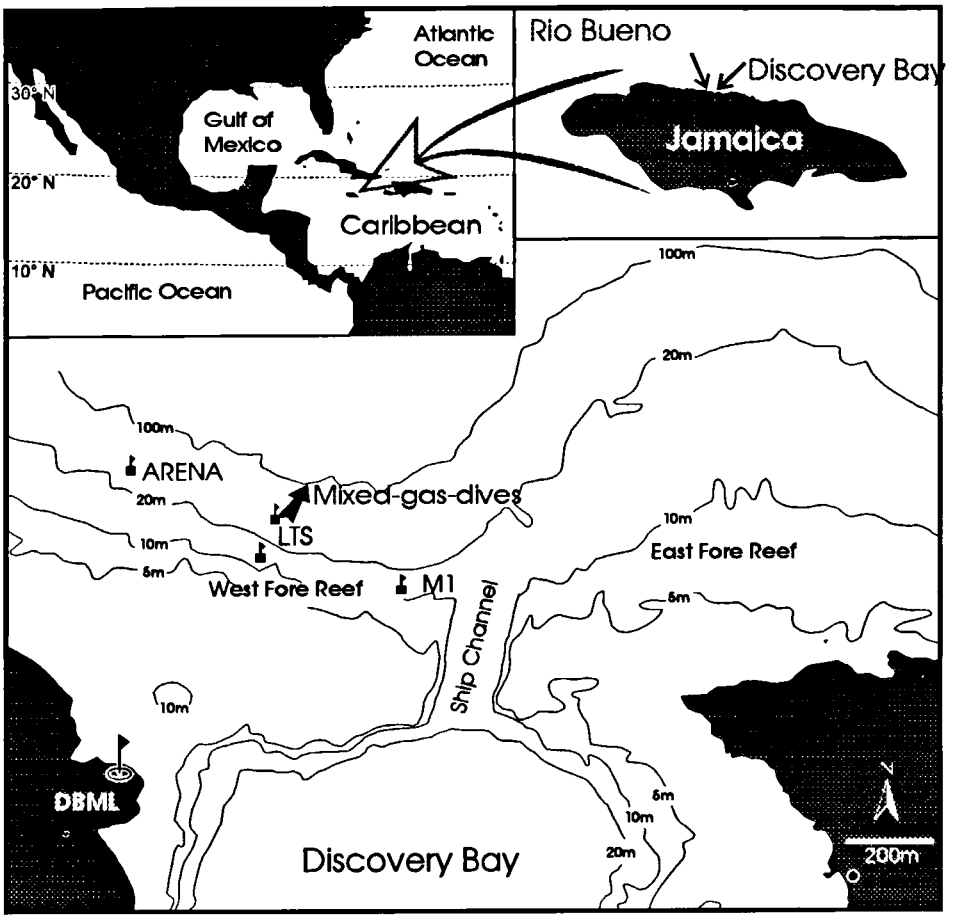


Fig. 1. Position of locality (LTS) of mixed gas dives. DBML: Discovery Bay Marine Laboratory. Arrow indicates direction of the dives.

cause nitrogen and oxygen are partly replaced by helium.

With the exception of the study of Lang et. al. (1975), who used a submersible and focused on the distribution of Demosponges with a basal skeleton of calciumcarbonate ("sclerosponges"), this is the first study of sponges from the deep fore–reef. Lang et. al. (1975) mentioned "a zone of maximum cavern development between 82 m and 91 m" at the deep fore–reef of Discovery Bay which is not accessible by submarine but which could be investigated by mixed gas diving.

Considering the fact that only four trimix–dives were performed with a total bottom time of 60 min. (15 min. per dive), additional new species can be expected to be found by further studies using mixed gas diving to reach deeper habitats.

METHODS

All dives were performed in front of the Discovery Bay Marine Laboratory at the LTS–locality (Fig. 1). For the descent and ascent from a depth of 35 m nitrox was used as a so–called travel–mix. Nitrox, having a higher content of oxygen compared to air, lowers the time of necessary decompression. At 35 m in depth the nitrox tanks were left at the bottom, near the accompanying safety divers, and the deep divers switched to their trimix tanks, carried on their backs. In addition to the nitrox tank carried in front every deep diver carried two trimix–tanks, each supplied with a first stage regulator and a pressure gauge. The deep divers followed an already existing rope leading down the fore–reef. Having reached the planned depth they moved horizon-

tally sampling sponges, in case of current always against it. The time within the maximum depth was always 15 minutes, with a point of return into the direction of the rope after half of that time. The sponges collected were put into plastic bags and dried after return to the laboratory.

The ascent had to take place along the rope to make sure that the deep divers would find their travel–mix tanks for the ascent to lower depths. From 10 m upwards, decompression was performed on pure oxygen, supplied by the boat. This again lowered the decompression time and therefore contributed to the safety of the divers. An example for a mixed gas–dive is given at the end of the methods.

Dive–plan for a dive to 92m: (Abbreviations: LS: Leaving surface, AB: arriving bottom, BT: Bottom time, LB: Leaving Bottom, A: Arriving, sur: surface; *: switch to / from nitrox at 30m, O2: switch to oxygen). Unusual depth–values are due to translation from feet to meters. Time is given in minutes.
LS: 0:00; AB: 0:05; BT: [15]; LB: 0:20; A 36.6m: 0:26; A 33.5m: 0:28; A 30.5m: 0:30; *; A 27.4m: 0:31; A 24.4m: 0:33; A 21.3m: 0:34; A 18.3m: 0:37; A 15.2m: 0:41; A 12.2m: 0:46, (O2),A: 9.1m: 0:57; A 6.1m: 0:67, A 3.0m: 0:82; A sur: 108

For identification small pieces of the sponges were boiled in nitric acid and, after washing in distilled water and then in aceton, were mounted on a slide in canada balsam for light– microscopy or on a stub for SEM investigation.

Additionally, handmade thin sections were obtained with a razor blade, mounted on a slide in canada balsam and examined under light-microscopy.

Photographs of a part of the samples, SEM–microphotographs of the spicule–types, microphotographs of spongin–fibers and, wherever necessary, of the spicule arrangement were taken of all species.

The order in which the species are treated follows Van Soest & Stentoft, 1988.

SYSTEMATIC DESCRIPTIONS

Class Demospongiae
Order Astrophorida
Family Geodiidae
Genus *Geodia* Lamarck, 1815

Geodia corticostylifera Hajdu et al., 1992
Figs 34-38.

Material: ZMA POR. 11270, Jamaica, Discovery Bay, LTS, 82.3m, #J180.

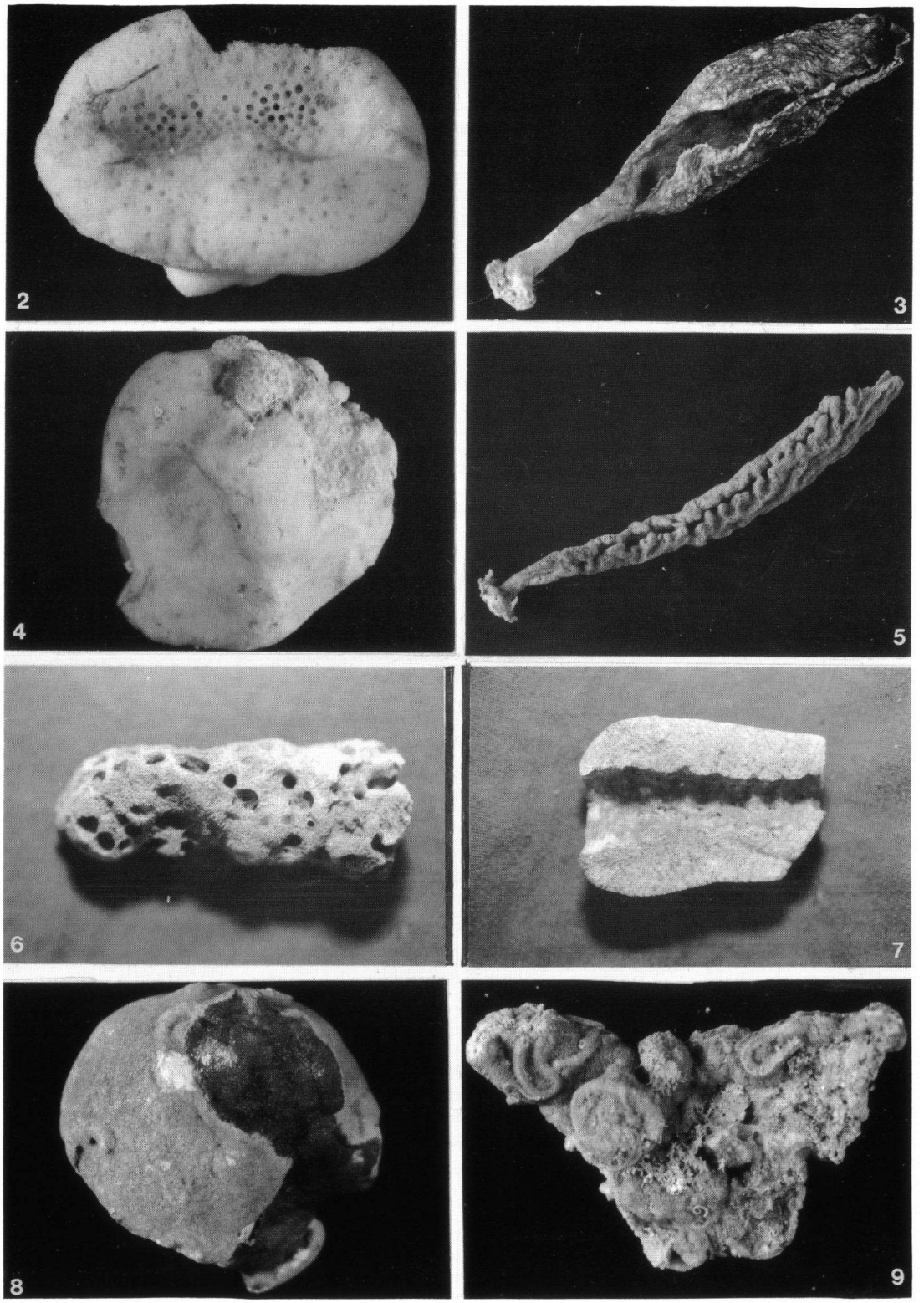
Description: Big vase–shaped, brownish–grey sponge, up to 0.5m high and in diameter. Very hard and difficult to cut. Cortex with abundant sterrasters. Surface smooth, inside of the vase often convoluted.
Spicules: Oxeas, 1300–2000 x 24–38 µm (including some styles of about 1700 µm), small cortical styles, 500 x 5 µm; small cortical oxeas 150-180 x 2 µm; orthotriaenes, 1300 – 1800 µm; sterrasters, in a large size range, round to oval, 40–100 µm in diameter; large oxyasters, 38–42 µm; small chiaster-like oxyspherasters, 6-15 µm.
Distribution: Brazil, Venezuela, Jamaica.
Remarks: From a comparison with data supplied in the study of Hajdu et al. (1992), it is clear that specimens from shallower water have somewhat smaller sterrasters and oxyasters. Other details, including the presence of a category of small oxeas in the cortex in addition to the abundant styles, are similar. The differences are thought to be infraspecific and might be due to the deep fore–reef habitat. *G. neptuni* is similar in habitus and general spiculation, but differs especially in lacking cortical styles.

Order Lithistida
Family Theonellidae
Genus *Discodermia* Du Bocage, 1879

Discodermia dissoluta (Schmidt, 1880)
Figs 2, 39-42.

Material: ZMA POR. 11271, Jamaica, Discovery Bay, LTS, 89.9m, #J237; ZMA POR. 11272, Jamaica, do., 82.3m, #J137.

Description: Small, firm conical or ball–shaped sponge, white or light grey, 3–4 cm high. There is an apical depression. Consistency is hard, incompressible. Surface smooth, rough to the touch. Oscules are scattered over the surface, 1–2 mm in diameter.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Figs. 2-9, habits of Jamaican deep water sponges. 2. *Discodermia dissoluta* du Bocage (1869); diameter of sponge: 2 cm; note apical depresion with ehalant openings. 3. *Dictyonella foliaformis* n.sp., holotype ZMA POR. 11292; length of sponge: 8.5 cm; note stalk-like lower part and leaf-like upper part which was spread out in life. 4. *Topsentia bahamensis* Díaz et al., 1993; widest extension of sponge: 4.8 cm; note small colony of *Montastrea annularis*, growing on the sponge (top right). 5. *Axinella digitiformis* n. sp., holotype ZMA POR. 11309; length of sponge: 11.3 cm; it was attached to the substratum with the small plate on the lower left; the convoluted ridges on the surface correspond to a central canal which has an opening on top (upper right). 6. *Agelas sventres* n.sp., holotype ZMA POR. 11322, length of fragment: 8 cm. 7. *Agelas tubulata* n.sp., holotype ZMA POR. 11323, length of fragment: 6 cm. 8. *Ceratoporella nicholsoni* (Hickson, 1911); diameter of sponge: 4.8 cm; dark part on the right: Bryozoan colony inhibiting growth of the sponge. 9. *Stromatospongia vermicola* Hartman, 1969; widest extension of sponge: 5.1 cm. Note polychaete wormtubes on surface, always associated with the sponge.

Skeleton: Surface skeleton consists of discotriaenes covered by a thin but continuous crust of microscleres. Choanosomal skeletal architecture well-developed with all desmas zygosed and stout, 40-100 µm thick perpendicular bundles of oxeotes, lying at distances of 500-800 µm, and containing up to 25 or more spicules per cross section .

Spicules: tetracrepid desmas, rhabdome 220-300 µm, rhabd 13-38 µm in diameter ; discotriaenes with predominantly rounded almost circular discs (only occasionally the rims were lobed), 100–150 µm in diameter, rhabd 5-15 µm long; thin oxeotes with mucronate or blunt ends, 200–1000 x 6–10 µm; acanthomicrorhabds, 10–15 x 2–3 µm; centrotylote acanthoxeas, 70–100 x 2–3 µm.

Distribution: Barbados, Curaçao, Colombia, Jamaica.

Remarks: The specimens were compared with shallow water material from Curaçao (Van Soest, 1981) and Colombia (Zea, 1986). Two discrepancies were apparent: the deep fore-reef specimens do not have the subectosomal area free of zygoses as in the shallow specimens, in that respect conforming to the other Caribbean *Discodermia* species, viz. *D. polydiscus* reported from deep water by Van Soest & Stentoft, 1988; furthermore, the larger category of acanthose microscleres is twice as long and persistently centrotylote as opposed to the smaller and fusiform acanthoxeas of the shallow-water specimens. For the time being these differences are considered infraspecific. *D. polydiscus* differs in having discotriaenes with much larger and much more irregular discs (cf. Van Soest & Stentoft, 1988).

Order Hadromerida
Family Timeidae
Genus *Diplastrella* Topsent, 1918

Diplastrella megastellata Hechtel, 1965
Figs 43-46.

Material: ZMA POR. 11286 , Jamaica, Discovery Bay, LTS, 91.44m, # J239; ZMA POR. 11287, Jamaica, do., 84.4m, #J172.

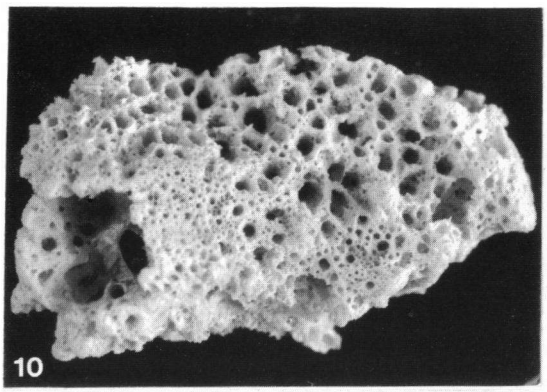
Description: Red, very thin (<1 mm) encrusting sponge. No oscules visible. Surface rough to the touch due to very abundant long tylostyles which protrude through the surface.

Skeleton: Tylostyles are arranged in wide-flaring bouquets with heads in isolated tight concentrations, points facing out. Asters scattered throughout the body but densely arranged at the surface, about halfway along the length of the tylostyles (which protrude for about half of their length beyond the surface). A layer of oxyspherasters is found at the contact with the substrate.

Spicules: Tylostyles, robust, with well-developed rounded heads, 375–1000 x 10–20 µm. Large oxyspherasters with short conical rays frequently forked at the apices, rather rare, 50–75 µm in diameter. Diplasters with conical rays, 15–25 µm in longest dimension.

Distribution: Jamaica, Bonaire, Curaçao.

Remarks: Oxyspherasters in #J172 are quite rare, but the other spicule types are obviously the same. The holotype was collected by Hechtel (1965) in "a few feet of water", the colour was reported to be dull brownish-olive. The sponge described here was red and collected at 90 m depth. Possibly, the colour of this thin sponge is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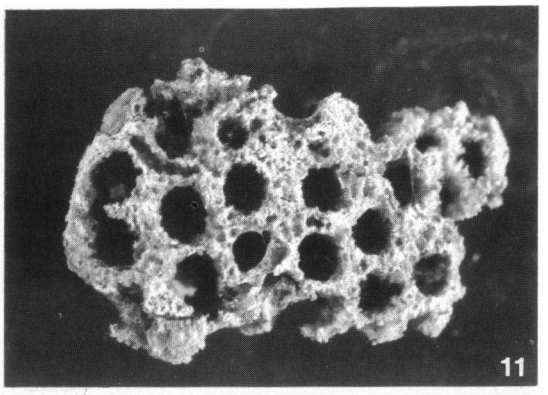
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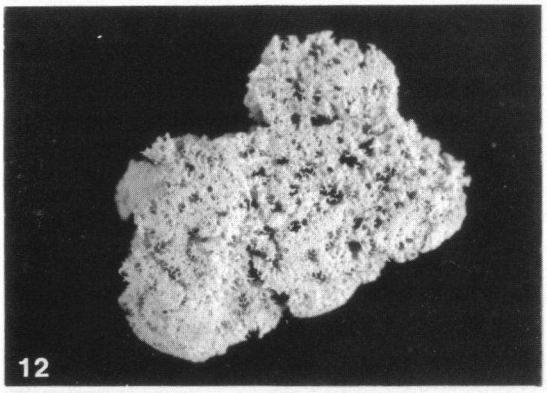
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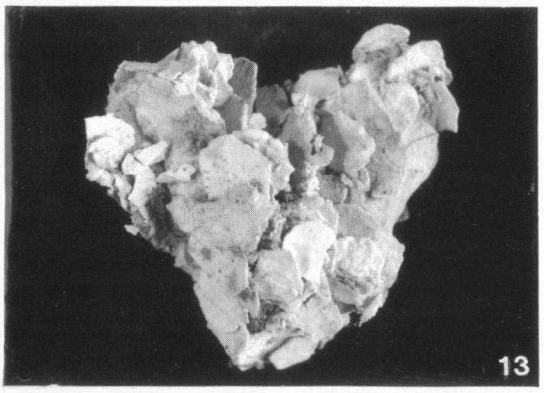
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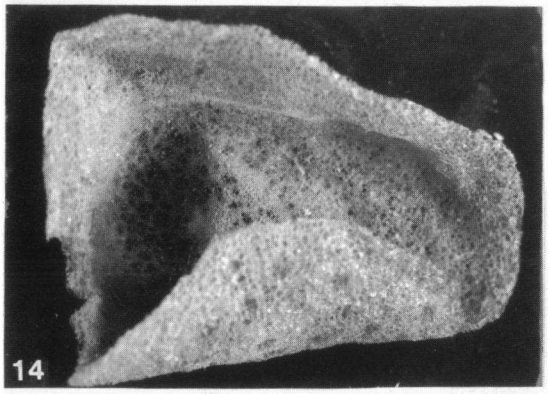
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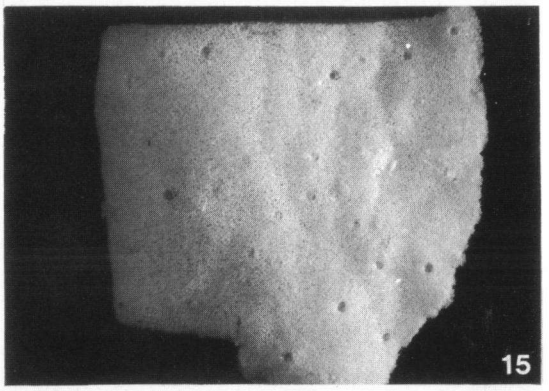
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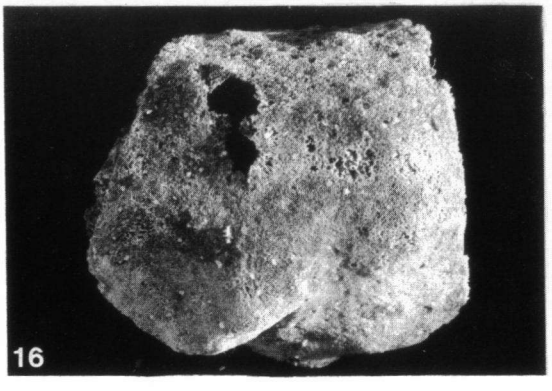
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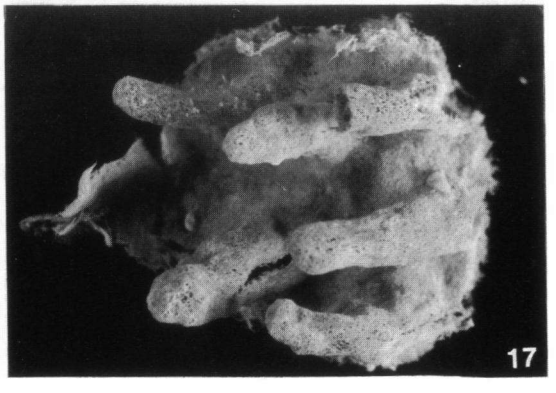
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Figs. 10-17, habits of Jamaican deep water sponges. 10. *Tedania* cf. *ignis* (Duchassaing & Michelotti, 1864); size: 5.9 cm; note oscule on top right and surface with finer and coarser surface structure. 11. *Clathria faviformis* n.sp., holotype, ZMA POR. 11334; widest extension of sponge: 5.3 cm; note characteristic surfacepattern. 12. *Haliclona strongylophora* n.sp., holotype ZMA POR. 11336; widest extension of fragment: 2.3 cm. 13. *Haliclona megasclera* n.sp., holotype ZMA POR. 11338, widest extension of fragment: 4 cm; the sponge agglutinated many leaves of Halimeda sp. 14. *Amphimedon caribica* (Pulitzer-Finali, 1986); widest extension of sponge: 5.5 cm. 15. *Petrosia pellasarca* (De Laubenfels, 1934); widest extension of fragment: 2.2 cm. 16. *Petrosia massiva* n.sp., holotype ZMA POR. 11347; widest extension of fragment: 3.2 cm. Note osculum and small pores on surface. 17. *Oceanapia stalagmitica* (Wiedenmayer, 1977); widest extension of fragment: 5 cm. Note surface, covered with blind-ending fistules.

influenced by the substrate colour. Both have the same spiculation so that they are considered conspecific. Kobluk & Van Soest (1989) report this species as a common inhabitant of reef cavities at 24 m in Bonaire; a representative slide was studied revealing the presence of much smaller spherasters (30 µm) and more definitely streptaster-like diplasters with a clearly developed shaft. Further unpublished specimens in the ZMA collection, e.g. from Colombia, demonstrate a considerable range in the size of spherasters and the shape of diplasters.

Order Halichondrida
Family Dictyonellidae
Genus *Scopalina* Schmidt, 1862

Scopalina ruetzleri (Wiedenmayer, 1977)
Fig. 47.

Material: ZMA POR. 11289, Jamaica, Discovery Bay, LTS, 54.9m, #J241.

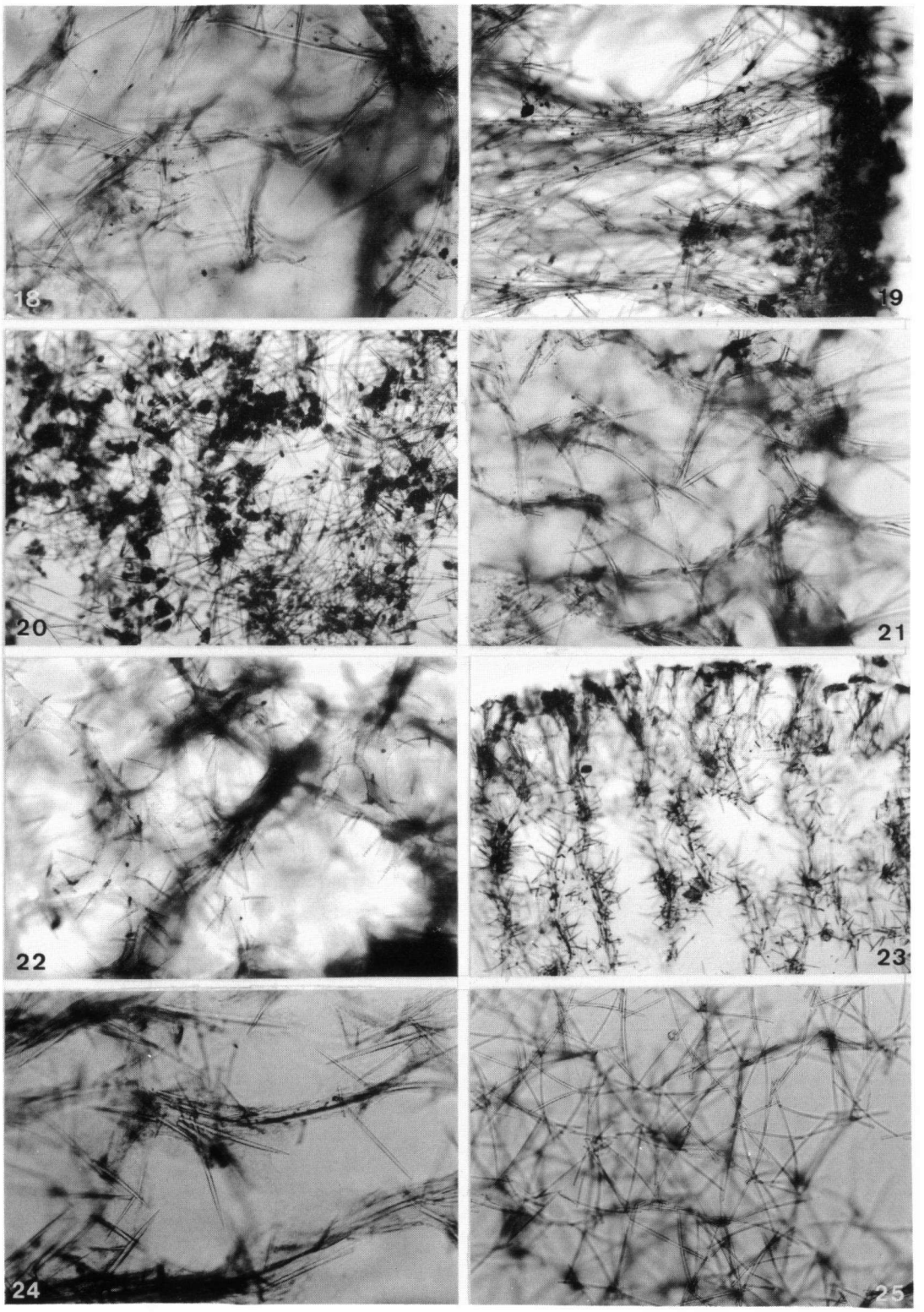
Description: Orange coloured, conulose, very soft sponge; easily damaged. About 1–3 cm thick and 10 x 7 cm in lateral expansion with irregular outlines. Oscules flush with the surface, 7–9 mm in diameter.
Skeleton: Low density of spicules and fibres, highly granulated soft parts. Dendritic spongin fibres cored rather sparingly with styles, tapering by occasional bifurcations from 150 µm diameter at the base of the sponge to 20-30 µm at the surface.
Spicules: Styles, 300–450 x 4–6 µm.
Distribution: Bahamas, Bermuda, Bonaire, Curaçao, Puerto Rico, Venezuela, Belize, Colombia, Jamaica.
Remarks: The ecological range of this - perhaps commonest Caribbean - sponge (originally described as *Ulosa*, then transferred to *Dictyonella* and finally to its proper present genus) is here extended to include the deep fore reef habitat. The species has been reported reliably from shallow and deeper reefs, from bays, harbour constructions and mangroves.

Genus *Dictyonella* Schmidt, 1868

Dictyonella foliaformis sp. n.
Figs 3, 18, 48-49.

Material: Holotype: ZMA POR. 11292, Jamaica, Discovery Bay, LTS, 61m, #J240.

Description: Shaped like an orange coloured leaf with a thin stalk. Stalk up to 10 cm high, 0.3 cm in diameter, leaf about 4 cm wide, a few mm thick. Surface covered with small tubercles. Consistency firm. No oscules visible.
Skeleton: The ectosome is an irregular arrangement of scattered single spicules. The choanosome is a vague reticulation of paucispicular tracts, surrounded by spongin, mesh size 50–140 µm. The ascending spicule tracts follow sinuous courses, and they are bound rather diffusedly with considerable amounts of spongin. Equally vague and irregular, but frequent anastomoses occur, thus making the skeleton technically plumoreticulate, but perhaps a better term would be plumodendritic. Coring of fibres sparsely and irregularly.
Spicules: Long thin stylote spicules, often with one or both ends blunt or mucronate, 500–1000 x 2–8 µm. They may be straight, but are more frequently curved or bent, occasionally looped at one end.
Etymology: Named after the leaf like growth form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Figs, 18-25, micrographs of sections of Jamaican deep water sponges. 18. *Dictyonella foliaeformis* n.sp., choanosome; width of photo 1.8 mm. 19. *Topsentia bahamensis* Díaz et al., 1993, cross section of peripheral skeleton; width 1.7 mm. 20. *Topsentia bahamensis* Díaz et al., 1993, ectosome charged with sediment particles; width 3.3. mm. 21. *Axinella digitiformis* n.sp., extra-axial skeleton; width 1.6 mm. 22. *Agelas sevntres* n.sp., choanosome. width 1.4 mm. 23. *Agelas tubulata* n.sp., cross section of peripheral skeleton; width 2.4 mm. 24. *Clathria faviformis* n.sp., choanosome; width 1.3 mm. 25. *Haliclona strongylophora* n.sp., choanosome; width 0.8 mm.

(lat. folium: leaf and lat. forma: form, shape)
Remarks: The generic assignment of this new species is tentative. The genus *Dictyonella* (e.g. *D. obtusa*) has precisely the type of spicules found in our specimen, but the skeleton is normally dendritic, without anastomoses between the spicule bundles (cf. Van Soest et al., 1990). Also the habit of a thin blade is not found in any described *Dictyonella* , excepting *D. dasyphylla* De Laubenfels, 1954, which is almost certainly not a *Dictyonella* but a Raspailid. So far the genus *Dictyonella* has only been reported reliably from the Mediterranean-Atlantic region.

The new species was compared with other leaf-like Caribbean Halichondrida, viz. *Phakellia connexiva* Ridley&Dendy (1887), *P. folium* Schmidt, 1870, and *Axinella shoemakeri* (De Laubenfels, 1934). The *Phakellia* species have two distinctly different types of megascleres, viz. straight styles and sinuous strongyles; *A. shoemakeri* has shorter styles, oxeas and trichodragmata (cf. Alvarez et al., in the press).

A remote possibility is that our new species is a representative of the genus *Stylissa* Hentschel; this genus has exclusively styles in an irregular reticulation; the type, *S. flabelliformis* Hentschel (1912) is thickly flabelliform.

Family Halichondriidae
Genus *Topsentia* Berg, 1899

Topsentia bahamensis Díaz, Pomponi & Van Soest, 1993
Figs 4, 19-20, 50.

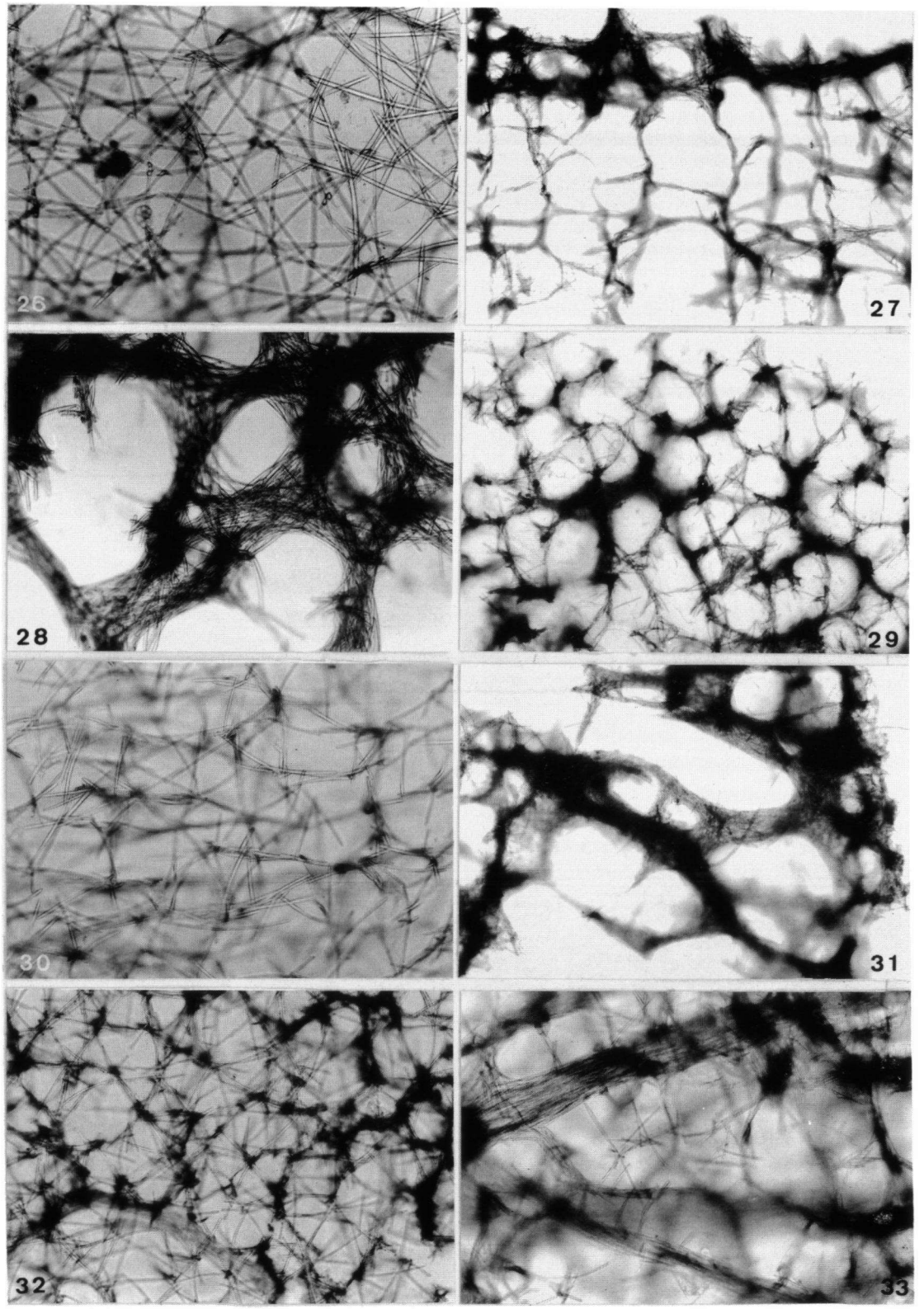
Material: ZMA POR. 11305, Jamaica, Discovery Bay, LTS, 75m, #J165; ZMA POR. 11306, do., 91.4m, #J231.

Description: White massive sponge, very hard. Up to 5 cm high and 3–5 cm in diameter. Surface optically smooth without any oscules. Rough to the touch. On one sample a scleractinian coral grew on the sponge.
Skeleton: The ectosome contains a thin and irregular tangential skeleton of smaller oxeas, and considerable amounts of sediment. The choanosome is a confused mass of spicules, packed around canals and subdermal spaces; binding spongin not visible, virtually absent. .
Spicules: Oxeas of a very wide size–range and always with acute tips, 225 – 950 x 5–35 μm; occasionally stylote modifications are found. There are two clearly demarcated size categories, small-thin, concentrated in the ectosome and scattered in the choanosome: 225-420 x 5-12, and long-thick spicules making up the bulk of the sponge: 650-950 x 20-45 μm; intermediate sizes are infrequent but do occur.
Distribution: Bahamas, Jamaica.
Remarks: In a recent revision of Central Atlantic Halichondrids, Díaz et al. (1993) distinguished three species of *Topsentia*, *T. bahamensis*, *T. ophiraphidites* and *T. pseudoporrecta*. The key provided in this revision clearly indicated that our specimens belong to *T. bahamensis* on account of its thin layer of tangential spicules. Our specimens are also similar to *T. ophirhaphidites*, but that species has no tangential ectosomal spicules and there are mostly three categories of spicules; its colour - though variable - is not reported as white. *T. pseudoporrecta* is clearly different in shape (fistular) and spicule size (oxeas up to 1800 x 60 μm).

Family Axinellidae
Genus *Axinella* Schmidt, 1862

Axinella digitiformis sp. n.
Figs 5, 21, 51-52.

Material: Holotype, ZMA POR. 11309, Jamaica, Discovery Bay, LTS, 77.1m, #J167.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Figs. 26-33, micrographs of sections of Jamaican deep water sponges. 26. *Haliclona megasclera* n.sp., choanosome; width 0.9 mm. 27. *Amphimedon caribica* (Pulitzer-Finali, 1986), cross section of peripheral skeleton; width 0.9 mm. 28. *Xestospongia rampa* (De Laubenfels, 1934), choanosome; width 2.1 mm. 29. *Xestospongia proxima* (Duchassaing & Michelotti, 1864), choanosome; width 1.6 mm. 30. *Petrosia pellasarca* (De Laubenfels, 1934), choanosome; width 1.3 mm. 31. *Petrosia massiva* n.sp., cross section of peripheral skeleton; width 1.7 mm. 32. *Oceanapia stalagmitica* (Wiedenmayer, 1977), ectosome; width 1.1 mm. 33. *Oceanapia stalagmitica* (Wiedenmayer, 1977), choanosome; width 1.8 mm.

Description: Orange, hollow finger–shaped sponge with an irregularly, convoluted surface, growing from a small base up to 10 cm high, about 1 cm in diameter. There is a central canal which connects to the surrounding water through many holes and ridges. At one side the holes interconnect to form a fissure over most of the length of the sponge. The outer walls of the tube/finger, are 2–3 mm thick, surface, microhispid, uneven with many connected ridges and depressions in between.

Skeleton: A fair amount of spongin binds all tracts and single spicules. In the centre of the wall the skeleton is clearly, but only slightly condensed, with predominantly ascending spicule tracts lying close together, interconnected by single spicules. Most spicules are styles, but some oxeas are found in the ascending tracts. The extra-axial skeleton is loose, with thin spicule tracts leading to the surface, interconnected by spicule tracts and single spicules. Overall spicular density is low compared to other *Axinella* species.

Spicules: Styles to subtylostyles to tylostyles, often with subterminal ring or swelling, in two size categories: Large styles–tylostyles, 300–550 x 10–15 µm, small styles–tylostyles, 220–300 x 2–6 µm, oxeas, 350–450 x 7–16 µm.

Etymology: After the fingershaped growth form of this species (lat. digitus: finger).

Remarks: The Axinellidae of the Central West Atlantic were recently revised by Alvarez et al. (in the press). Six species and one uncertain species were distinguished. In the key provided in this study, our material keys out as *A. corrugata* (George & Wilson, 1919) and it is likely that this is also the species most similar to our new species. They share the lobate-corrugated surface and general spicule sizes. The habit of *corrugata* is variable, but does not include tube/fingershaped forms; the styles of *corrugata* are not divisible in two categories; the overall spicular density is much higher. A second species close to our new species is *A. meandroides* Alvarez et al., 1996; it shares the two style categories. However, it has a massive meandroid/honeycombed habit and the larger category of styles reaches 1725 µm.

Order Agelasida
Family Agelasidae
Genus *Agelas* Duchassaing & Michelotti, 1864

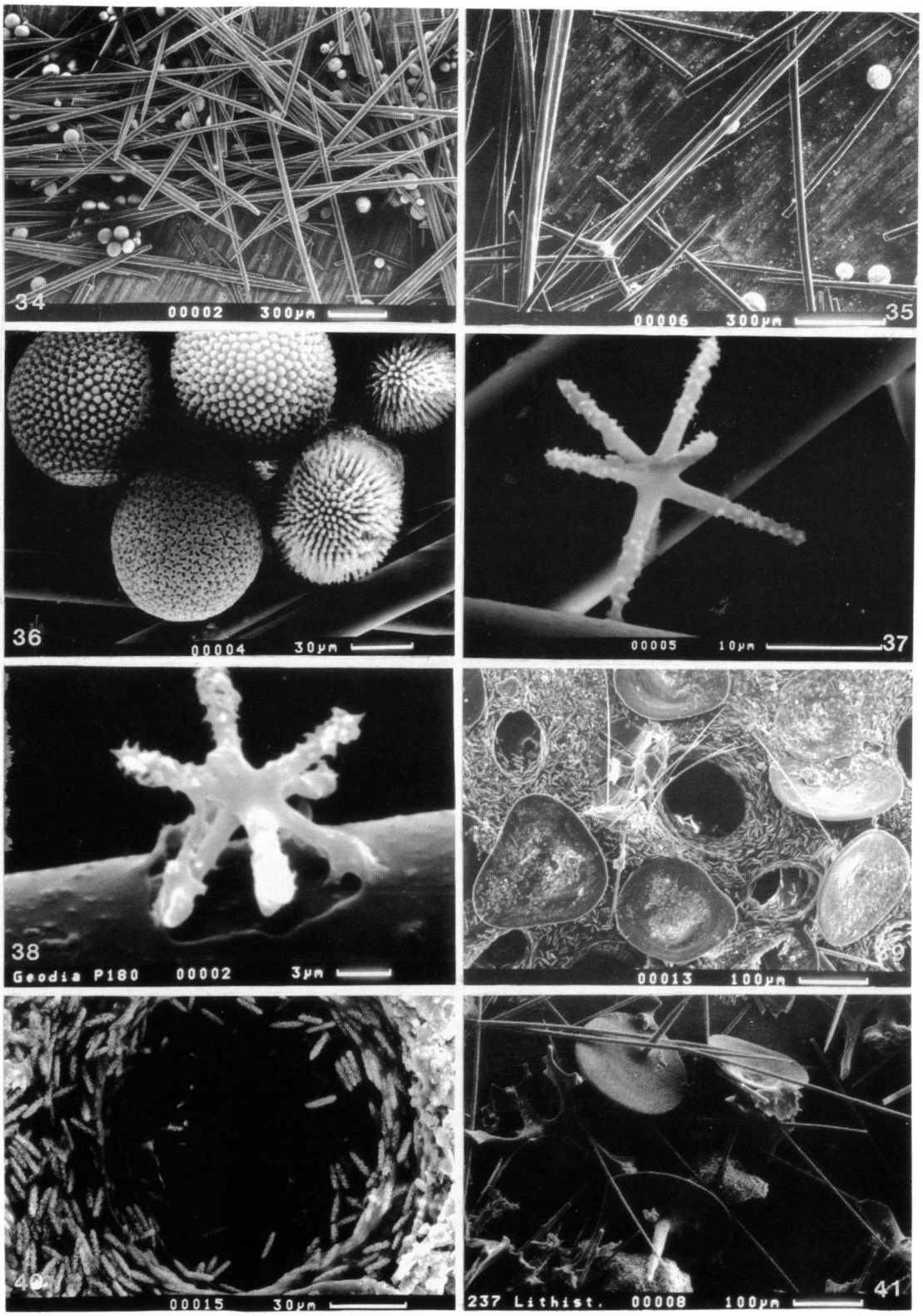
All species of the genus have styles with more or less regular spaced rows of thorns as the only spicule–type present. These styles simulate acanthostyles of the order Poecilosclerida, but are probably not homologous, as the thin growth stages are smooth. Non-morphological characters (chemistry and nucleic acid sequence data) indicate a close relationship to the family Axinellidae. The spongin fibers are differentiated into primary and secondary fibres. Primaries are cored and echinated by the acanthostyles while secondaries have only echinating spicules or may be devoid of spicules. Caribbean *Agelas* are in need of revision, but the well-known species are treated by Zea (1987). These species are most easily distinguished by growth–form, internal characters like fibers and spiculation apparently vary considerably within species.

Agelas clathrodes (Schmidt, 1870)
Fig. 53.

Material: ZMA POR. 11317, Jamaica, Discovery Bay, LTS, 76.2m, #J163,

Description: Massive, bright orange sponge. Size up to 1 x 0.5 x 0.25 m. Consistency firm but elastic. Surface irregular, in places lumpy, but smooth, with many small circular and bigger elongate apertures.

Skeleton: Fibres are 40-150 µm in diameter, mostly uncored so no clear distinction in primary and secondary fibres is apparent; they are echinated


34
00002 300µm
35
00006 300µm
36
00004 30µm
37
00005 10µm
38
Geodia P180 00002 3µm
39
00013 100µm
40
00015 30µm
41
237 Lithist. 00008 100µm

Figs. 34-41, SEM micrographs of spicules of Jamaican deep water sponges. 34. *Geodia corticostylifera* Hajdu et al., 1992, oxeas and sterrasters. 35. *Geodia corticostylifera* Hajdu et al., 1992, triaene, oxeas and sterrasters. 36. *Geodia corticostylifera* Hajdu et al., 1992, developmental stages of sterrasters. 37. *Geodia corticostylifera* Hajdu et al., 1992, large oxyaster. 38. *Geodia corticostylifera* Hajdu et al., 1992, small chiaster-like oxyaster. 39. *Discodermia dissoluta* (Schmidt, 1880), surface armour of discotriaenes covered by acanthomicrorhabds; note inhalant openings. 40. *Discodermia dissoluta* (Schmidt, 1880), inhalant pore with numerous acanthomicrorhabds. 41. *Discodermia dissoluta* (Schmidt, 1880), discotriaenes and oxeas.

regularly and fairly crowdedly near the periphery, but spicules become rare towards the interior of the sponge and in places fibres are completely devoid of spicules. Mesh size 200-500 µm, distance between echinating spicules 20-100 µm.
Spicules: Acanthostyles with regular rows of thorns, 100–250 x 11-15 µm, 13–21 rows of thorns, the thorns of different sizes. In many cases bigger thorns are at the ends of the spicule, 3–4 rows of smaller thorns occurring in the middle; occasionally, acanthoxea occur, but these are obvious modifications of the acanthostyles.
Distribution: Barbados, Bahamas, Jamaica, Puerto Rico, Virgin Islands, Antigua, Venezuela, Curaçao, Bonaire, Belize, Brazil, Colombia.
Remarks: The skeleton was compared with a slide of (one of the ?) Schmidt's type specimen(s?) incorporated in the Zoologisk Museum København. The skeletal structure and spicule form and size are closely similar. Van Soest & Stentoft's (1988) material also partly conforms to the present material, so we can assume that this species occurs frequently in deep water.

Agelas conifera (Schmidt, 1870)
Fig. 54.

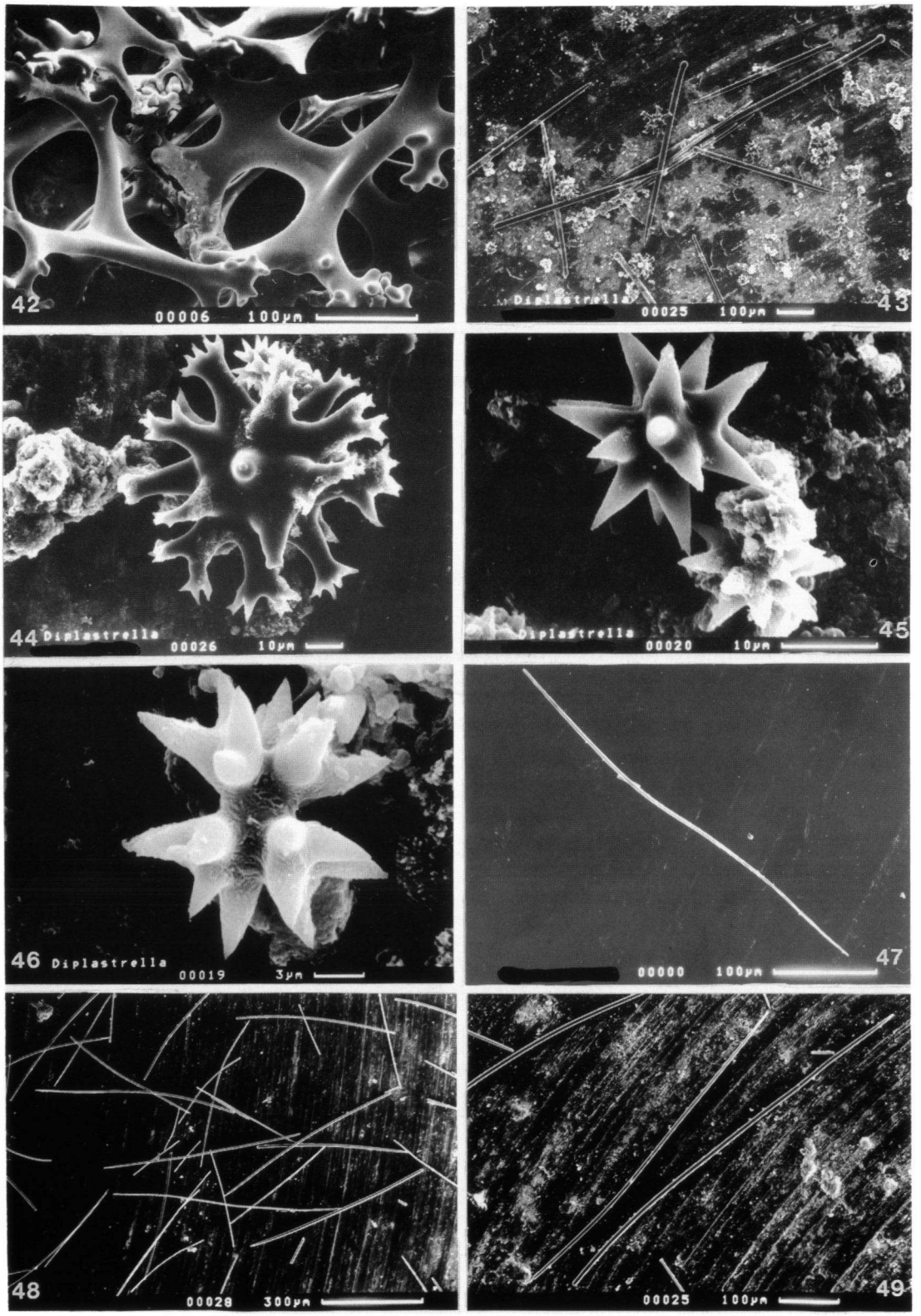
Material: ZMA POR. 11321, Jamaica, Discovery Bay, LTS, 61m, #J178.
Description: Brown tube–shaped sponge. Often clusters of tubes, up to 0.5 m long and 10–20 cm in diameter. Surface smooth, sometimes convoluted. Consistency firm, elastic, easy to cut. Oscules only on the inner walls of the tubes.
Skeleton: Ascending fibers are 90-200 µm in diameter, extensively cored by 5-12 spicules per cross section. Interconnecting fibres are 25-70 µm in diameter, variable in thickness, and form irregular meshes of 100-700 µm. Distance between echinating spicules 20-200 µm, echination generally sparse but occurring throughout the skeleton.
Spicules: Acanthostyles, 75–150 x 13-18 µm with 11–20 rows of small thorns.
Distribution: Bahamas, Puerto Rico, Curaçao, Bonaire, Belize, Colombia, Jamaica.
Remarks: The spicules appear to have their whorls more closely together than in *A. clathrodes*, but this is caused by their relatively shorter and fatter shape.

This species apparently occurs in several growth forms: long repent branches with relatively low oscular mounds, branches with short oscular tubes, groups of long tubes in which no branches are recognizable. The tube-shaped form of this species is wide-spread. There is apparently considerable variability in the extent to which volcanoe-shaped oscular hillocks grow out into tubes. In view of the fact that long tubes so far have not been found on the reefs of e.g. Curaçao and Bonaire (personal observations), while they are relatively common in e.g. Colombia (Zea, 1987) it may be inferred that geographic and environmental factors are likely of influence.

Agelas sventres n.sp.
Figs 6, 22, 55.

Material: Holotype ZMA POR. 11322, Jamaica, Discovery Bay, LTS, 51.8m, #J177.

Description: Orange coloured, lobate to finger-shaped sponge, up to 30 cm long and usually 2–3 cm in diameter. Surface smooth but provided with with many apertures, some of which are circular oscules flush with the surface, others are roofed over with a parchment-like membrane. Often infested with black zoanthids. Inside the specimens are riddled by a system of longitudinal holes and canals.
Skeleton: Trabeculate due to the extensive cavities.


42
00006 100µm
Diplastrella
00025 100µm
43
44 Diplastrella
00026 10µm
Diplastrella
00020 10µm
45
46 Diplastrella
00019 3µm
00000 100µm
47
48
00028 300µm
00025 100µm
49

Figs. 42-49, SEM micrographs of spicules of Jamaican deep water sponges. 42. *Discodermia dissoluta* (Schmidt, 1880), desmas. 43. *Diplastrella megastellata* Hechtel, 1965, overview showing tylostyles and asters. 44. *Diplastrella megastellata* Hechtel, 1965, large oxyspheraster with forked and ornamented rays. 45. *Diplastrella megastellata* Hechtel, 1965, diplaster from above. 46. *Diplastrella megastellata* Hechtel, 1965, diplaster from the side. 47. *Scopalina ruetzleri* (Wiedenmayer, 1977),, style. 48. *Dictyonella foliaeformis* n.sp., overview of styles. 49. *Dictyonella foliaeformis* n.sp., several styles.

Cored ascending fibres are short running perpendicular to the system of canals. Meshes of the skeleton are elongate and interconnecting fibres often comparatively long. Echinating spicules usually crowded, sometimes concentrated only on side of the fiber.
Spicules: Acanthostyles, short, 75–160 x 7-16 µm, with a low number, 8–15 rows of relatively small thorns.
Ecology: Grows only on steep slopes.
Etymology: The name is a combination of "Sven" (i.e. Sven Zea) and "tres" which refers to the fact that Sven Zea dubbed this species (in litteris) "*Agelas* species 3", under which name it was known for many years.
Remarks: The species is represented in the collections of ZMA from deep reef localities in Colombia and Curaçao. Its distinctive characters are the cavernous interior in combination with a digitate-lobate-ramose habit. It is probably related to *A. dispar* which likewise is cavernous and has relatively short acanthostyles with a low number of thorns.

Agelas tubulata n.sp.
Figs 7, 23, 56.

Material: Holotype ZMA POR. 11323, Discovery Bay, LTS, 83.8m, #J174.

Description: Orange–yellow tubes, often in clusters, up to 20 cm high and 5–8 cm in diameter. Surface smooth. Consistency elastic, compressible. Some zoanthids are spread over the surface.
Skeleton: A very neat anisotropic reticulation of ascending primary fibres, 40-70 µm in diameter cored by 1-4 spicules, diverging to the surface, lying at distances of 300-400 µm apart; and interconnecting secondary fibres 20-50 µm diameter, forming almost square meshes; primary and secondary fibres are rather similar in diameter; here and there tertiary fibers interconnect the secondary fibres, subdividing the meshes of mostly 400 µm diameter into smaller ones. Echinating spicules crowded, standing at distances of 20-40 µm, on all fibers.
Spicules: Acanthostyles, 100–210 x 4-10 µm with 13–27 rows of small thorns.
Remarks: The new species is superficially similar to tube-shaped specimens of *A. conifera* , but they differ in being yellow-orange (*A. conifera* is brown), much finer grained and more regular skeleton, much thinner and less cored ascending fibres, and an unusually high number of whorls of thorns. Small tubes occur in *A. schmidti*, but these follow a creeping course and pop up here and there from underneath corals, quite different from the present erect tubes.

Family Ceratoporellidae
Genus *Ceratoporella* Hickson, 1912

Ceratoporella nicholsoni (Hickson, 1911)
Figs 8, 57.

Material: ZMA POR. 11325, 11326, Jamaica, Discovery Bay, LTS, #J160, J236, 76.2–91.4 m. Further material, not registered in ZMA: # J164, J171, J233.

Description: The living sponge grows on a dense basal skeleton of aragonite and is a one mm thin, orange crust on this skeleton. The youngest one or two layers of small chambers are filled with living tissue, all chambers below are filled in with aragonite. The living tissue contains acanthostyles which are sometimes incorporated in the basal skeleton. Other samples of this species were collected in reef caves between 20 and 30 m depth.
Spicules: Acanthostyles, 115–325 x 6-15 µm with rows of thorns clearly but more irregularly in rows than in the genus *Agelas*. Spines well-developed near the head, but becoming small or

Table 1
Spicule sizes (µm) of West Indian *Hymedesmia* species *)

species	ectosomal tornotes	large acanthostyles	small acanthostyles	arcuate isochelae
Hymedesmia jamaicensis van Soest, 1984	160–190.0–228 x 0.5–1	133–214.3–276 x 4.5–6.5–9.5	53–73.2–106 x 3–4.7–7.5	12–15.2–18
Hymedesmia palmatichelifera van Soest, 1984	167–200.2–232 x 1.5–2.1–2.5	293–320.0–361 x 6–7.1–8	66–76.6–91 x 4–5.7–7.5	15–16.7–19 ("palmate")
Hymedesmia agariciicola van Soest, 1984	111–123.0–142 x 1	91–141.0–194 4–4.8–5.5	48–51.2–57 2.5–2.7–3.5	1) 18–19.2–21 2) 8–10.2–12
Hymedesmia curacaoensis van Soest, 1984	182–205.2–230 x 1.5–2.05–2.5	205–216.2–229 8–8.7–10	57–78.8–114 3.5–4.6–6	28–30.0–33
Hymedesmia nummota De Laubenfels, 1936	478–565 x 6–8	970–1240 x 18–21	620 x 10	44–63
Hymedesmia caribica sp. n	220–255 x 3–5	200–250 x 5–10	70–105 x 4–7	20–27

*)*Hymedesmia stellata* Bowerbank sensu Topsent, 1889 is unrecognizable according to Van Soest, 1984
Hymedesmia schmidti Carter, 1882 is referred to *Hamacantha* by Van Soest, 1984

absent near the pointed end.
Distribution: Jamaica.
Remarks: The verticillate acanthostyles are clearly homologous to those of *Agelas* but they are characteristically longer and slimmer, with less well-developed rows of spines.

Genus *Stromatospongia* Hartman, 1969

Stromatospongia vermicola Hartman, 1969
Figs 9, 58.

Material: ZMA POR. 11327, Jamaica, Discovery Bay, LTS, #J236, 88.4 m.

Description: Encrusting orange–red sponge with a basal skeleton of aragonite. This "sclerosponge" always lives together with a polychaete worm. Only a small colony was found, growing together with a *Ceratoporella nicholsoni* and encrusted at the underside by *Forcepia (Trachyforcepia) vermicola* n.sp. (cf. below).
Spicules: Acanthostyles, 75–480 x 4–17 µm. Biggest thorns at the ends of the spicules.
Distribution: Jamaica.
Remarks: The genera *Ceratoporella* (clearly tubular-layered basal skeleton) and *Stromatospongia* (irregular thin basal skeleton) are very closely related and may eventually be united in view of the fact that the spicules are closely similar. Reitner (1992) suggests *Stromatospongia vermicola* and *S. norae* Hartman, 1969 may be synonyms.

Order Poecilosclerida
Suborder Myxillina
Family Tedaniidae
Genus *Tedania* Gray 1867
Subgenus *Tedania* sensu Desqueyroux & Van Soest, 1996

Tedania (Tedania) cf. **ignis** (Duchassaing & Michelotti, 1864)
Figs 10, 59-61.

Material: ZMA POR. 11328, Jamaica, Discovery Bay, LTS, 91.4m, #J232.

Description: Bright red clathrate sponge with a conspicuous net-like structure of connecting ridges and deep depressions in between. The mesh size of this surface net is different in different areas of the sponge. There are areas with 1–3 mm meshes and areas with meshes smaller than 1 mm. Oscules are on top of 2–4 cm high cones, 1–2 cm in diameter.
Skeleton: An irregular isotropic reticulation of multispicular tracts, 6-10 spicules in cross section, forming triangular and quadrangular meshes of about 200 µm in diameter.
Spicules: Ectosomal tylotes with microspined heads, 215–240 x 3–4 µm; choanosomal thick styles 250–300 x 9–11 µm, occasionally strongyles of the same size; onychaetes I, 220–250 x 3–5 µm; onychaetes II, 35–70 x 1 µm.
Distribution: Virgin Islands, Bermuda, Bahamas, Florida, Cuba, Colombia, Curaçao, Bonaire, Jamaica.
Remarks: The specific identification of the present material is tentative. Wiedenmayer (1977) and van Soest (1984) reported this species from shallow lagoons as "typical member of the fouling community". In Jamaica it occurs in the lagoon, too, as a massive orange sponge without the clathrate surface structure, perhaps with less-heavily developed spicule tracts, but the same spiculation. *Tedania (Tedania)* species from tropical localities all over the world display similar spiculation, so that may not be a good species criterion. In the absence of clear characters discriminating this deep water fore reef material from the shallow lagoon populations we employ here a wide definition of the species *T. ignis.*

Family Coelosphaeridae
Genus *Forcepia* Vosmaer, 1885
Subgenus *Trachyforcepia* Topsent, 1904

Forcepia (Trachyforcepia) vermicola n.sp.
Figs 62-66.

Material: Holotype, ZMA POR. 11327, Jamaica, Discovery Bay, LTS, #J236, 88.4 m; encrusting the underside of *Stromatospongia vermicola.*

Description: Extremely thin, light brown, smooth encrustation in tiny cavities underneath a mass of serpulids and *Stromatospongia* . Size only a few mm2. Surface smooth.
Skeleton: The ectosome is formed by a felted mass of tylotes and microscleres. The choano-some is barely developed and there are presumably basal single acanthostyles erect on the substrate.
Spicules: Ectosomal tylotes, entirely smooth, with prominent elongate heads: 170-216 x 1.5-3 µm (heads 4-5 µm); acanthostyles in two size categories, both entirely spined, large ones: 200 - 250 x 5 - 10 µm, small ones: 60 - 105 x 4 - 7 µm; forceps, thin, rugose, legs very close together and ending with a very sharp bend, legs slightly unequal in length: 51-74 x 0.5 µm; arcuate chelae in two distinct categories: large, strongly convex, with broad flattened shaft and short broad alae: 22-27 µm (shaft 6-8 µm), and small, less curved, pointed at both ends, with long alae: 10-16 µm.
Etymology: The name refers to its habitat underneath worm tubes.
Remarks: There are two other described species of *Forcepia* in the Caribbean, viz. *F. trilabis* (Boury-Esnault, 1973) and *F. grandisigmata* Van Soest, 1984. Both differ clearly from the above described new species in spicule sizes and shapes. Both lack acanthostyles and have much larger tylotes and forceps.

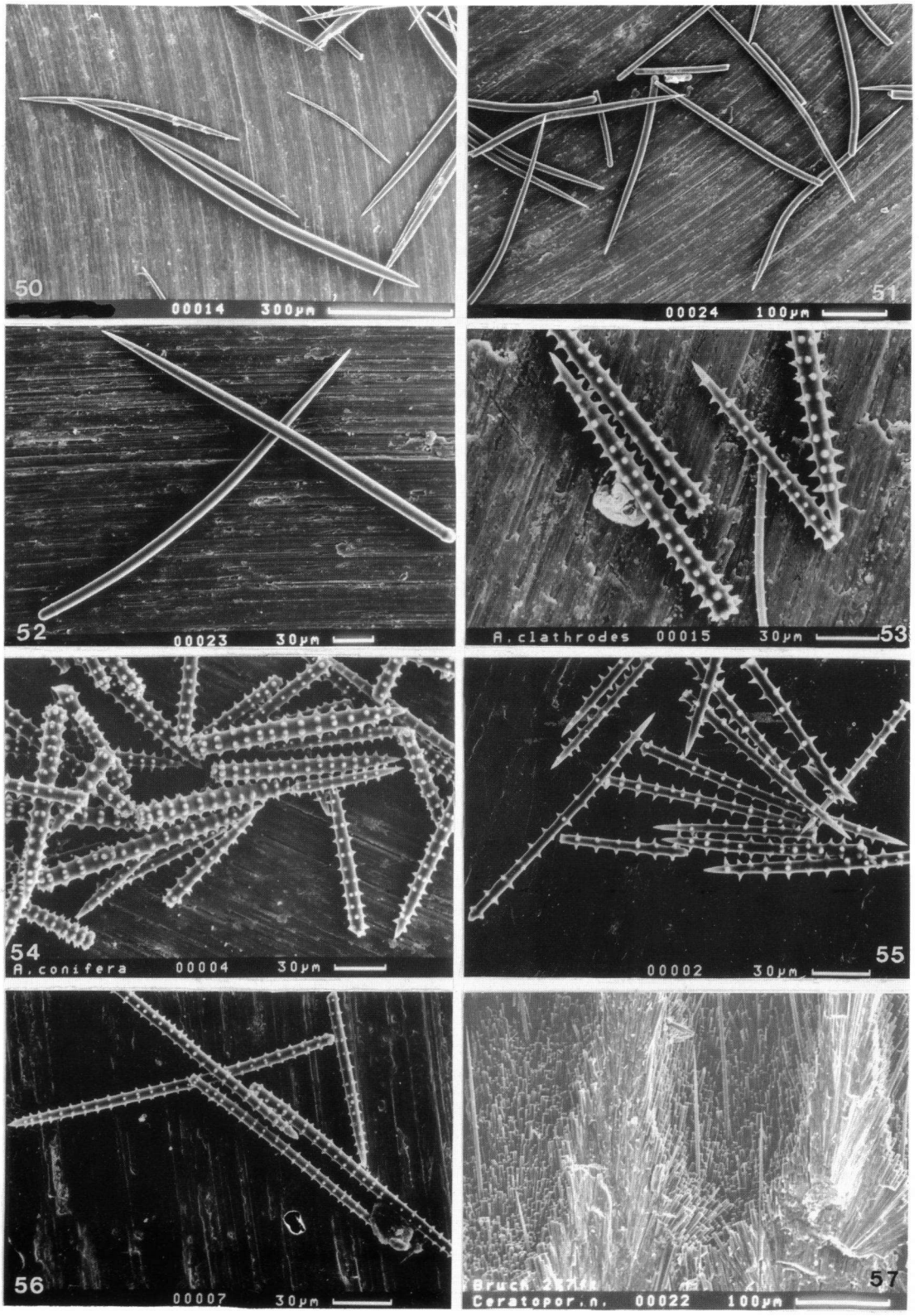
The genus *Trachyforcepia* Topsent (1904), intended for *Forcepia* species with acanthostyles, is here employed as a convenient subgeneric unit. Absence or presence of acanthostyles is such a common phenomenon in many Poecilosclerid families and genera, that it is considered unlikely to have significance at the generic level.

Family Hymedesmiidae
Genus *Hymedesmia* Bowerbank, 1864

Hymedesmia caribica sp. n.
Figs 67-70.

Material: Holotype: ZMA 11325, Jamaica, Discovery Bay, LTS, 76.2m, #J160.

Description: Light brown sponge, growing on the side/underside of a colony of *Ceratoporella nicholsoni.* Specimen is dry and microhispid (but its surface characters of course are no longer apparent); no visble oscules. Thickness of the encrustation on the surface is about 1 mm and 2 x 1 cm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00023 30µm
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54
A.conifera 00004 30µm
55
00002 30µm
56
00007 30µm
Bruce 2
Ceratopor.n. 00022 100µm
57

Figs. 50-57, SEM micrographs of spicules of Jamaican deep water sponges. 50. *Topsentia bahamensis* Díaz et al., 1993, oxeas of wide size range. 51. *Axinella digitiformis* sp. n., overview of spicules including styles and oxeas. 52. *Axinella digitiformis* sp. n., styles. 53. *Agelas clathrodes* (Schmidt, 1870), spined styles. 54. *Agelas conifera* (Schmidt, 1870), spined styles. 55. *Agelas sventres* n.sp., spined styles. 56. *Agelas tubulata* n.sp., spined styles. 57. *Ceratoporella nicholsoni* (Hickson, 1911), base of surface layer of chambers; acanthostyles partly embedded into the aragonite skeleton, free points protruding.

in lateral expansion.
Skeleton: Acanthostyles arranged singly erect on the substrate; bundles of tornotes run to the surface where they become tangential. Chelae numerous in the ectosome.
Spicules: Tornotes with slightly swollen heads, 220–255 x 3–5 μm; acanthostyles in two size categories, larger with most thorns near the blunt end: 200–250 x 5–10 μm, and smaller , spined all over, 70–105 x 4–7 μm; large, strongly convex arcuate isochelae, 20–27 μm.
Etymology: Named after the region where this species was found.
Remarks: The new species is assigned to the genus *Hymedesmia* because of the occurence of two size categories of acanthostyles (one of them being a acanthotylostyle, however), arranged erect on the substrate. The new species was compared to the holotypes of Caribbean species of *Hymedesmia* incorporated in the ZMA collections. Their characters are listed in Table 1.

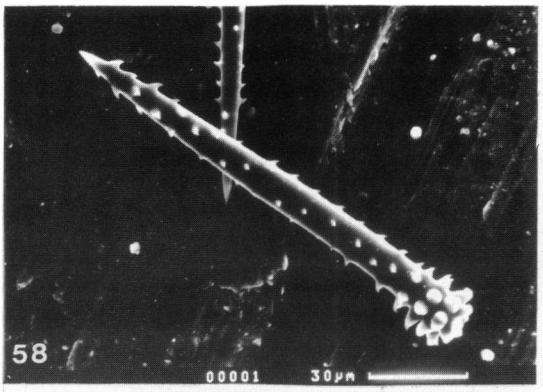
The present species differs from *H. nummota* De Laubenfels, 1936 in having much smaller and thinner spicules. It differs from *H. jamaicensis* Van Soest, 1984 and *H. palmatichelifera* Van Soest, 1984 in having strongly convex arcuate isochelae (slimmer and less convex in those two species), and larger and thicker ectosomal tornotes.
It differs from *H. agariciicola* Van Soest, 1984 in having only one size category of arcuate isochelae and in having larger and thicker ectosomal tornotes and acanthostyles.
It differs from *H. curacaoensis* Van Soest, 1984 in having smaller arcuate isochelae and larger and thicker ectosomal tornotes.

Suborder Microcionina
Family Microcionidae
Genus *Clathria* Schmidt, 1862
Subgenus *Clathria* Schmidt, 1862

Clathria (Clathria) faviformis n.sp.
Figs 11, 24, 71-72.

Material: Holotype: ZMA POR. 11334, Jamaica, Discovery Bay, LTS, 54.9m, #J179.

Description: Orange coloured massive sponge, about 15 x 15 cm in lateral expansion and 3–5 cm thick, elastic but easy to cut. The surface is crowded with circular oscules, 3–6 mm in diameter, walls between oscules 2–4 mm thick, giving the sponge the appearence of a honeycomb. The sponge is orange brown, rather firm, only slightly elastic in the dry state.
Skeleton: Auxiliary oxeas lie scattered throughout both the surface (in association with protruding principal styles) as well as within the mesohyl. Choanosomal skeleton is plumoreticulate system of spongin fibres near centre of skeleton, becoming plumose near periphery. Principal styles both core skeletal tracts and protrude through them in "spicate" arrangement (see Hooper et al., 1991). Echinating acanthostyles are quite different spicules from principal styles and are scattered sparsely over fibres and particularly at fibre nodes.The choanosome is a characteristic arrangement of plumose columns, 200-450 μm apart.
Spicules: Thin auxiliary oxeas, 70–90 x 2–3 μm; principal styles, heads often spined, 210–420 x 6–10 μm; echinating acanthostyles, 80–100 x 7–9 μm.
Etymology: Named after the growth–form of the sponge which resembles a honeycomb (lat. favus: honeycomb)
Remarks: No *Clathria* species from the Caribbean region have so far been found in which the ectosomal subtylostyles are lacking and are replaced by thin curved oxeas. The species is furthermore unusual in lacking microscleres, a feature shared only with *Clathria vasiformis* (De Laubenfels,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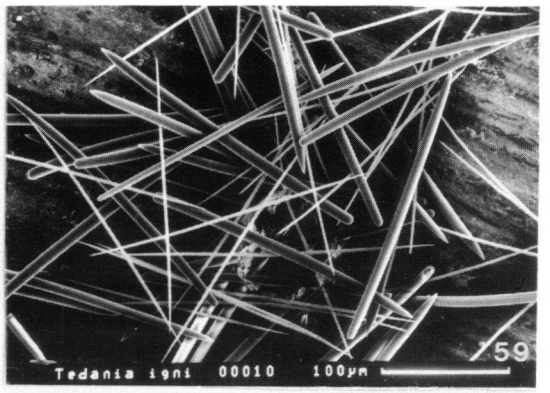
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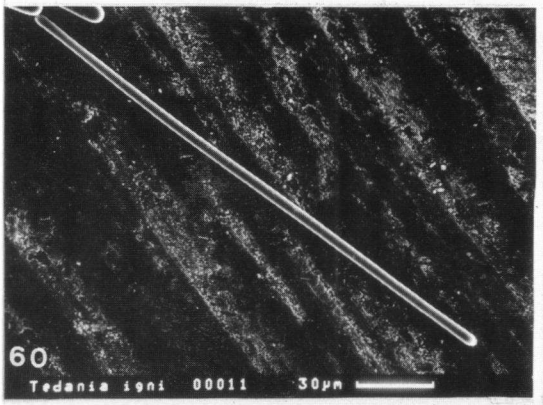
59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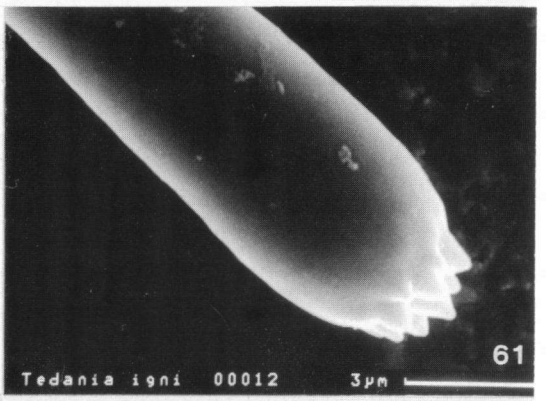
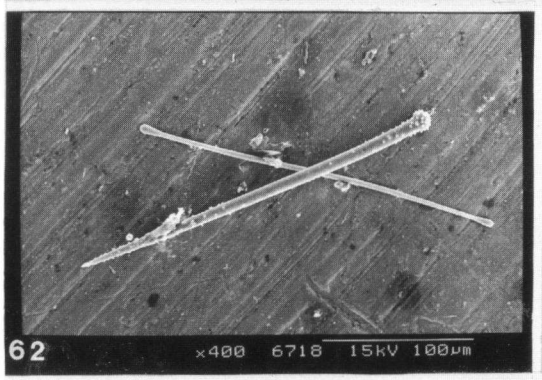

Tedania igni 00012 3µm
61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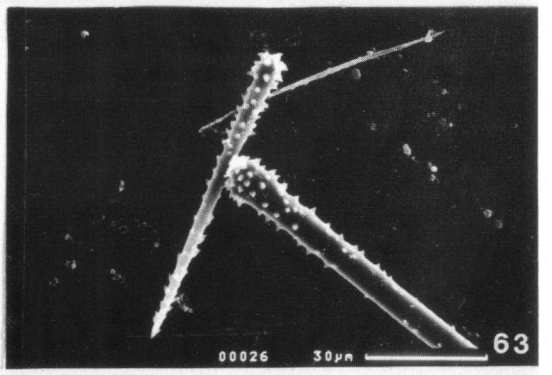
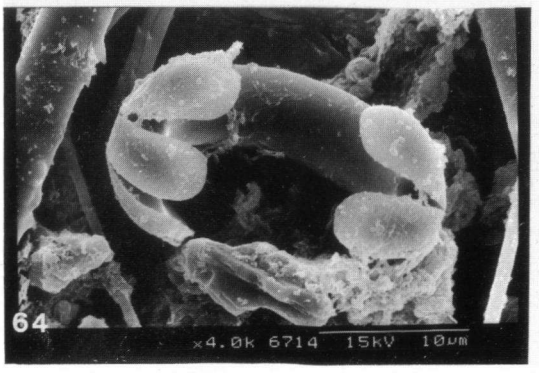

00026 30µm
63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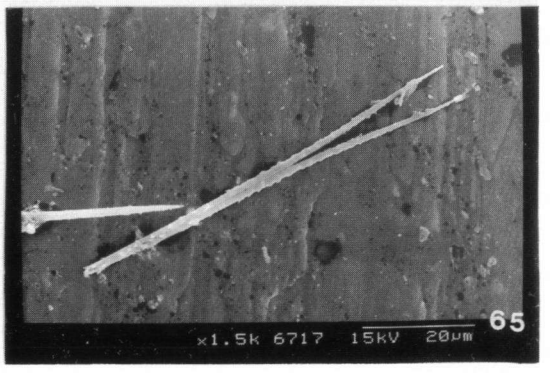

×1.5k 6717 15kV 20µm
65

Figs. 58-65, SEM micrographs of spicules of Jamaican deep water sponges. 58. *Stromatospongia vermicola* Hartman, 1969, spined style. 59. *Tedania* cf. *ignis* (Duchassaing & Michelotti, 1864), overview of spicules, including styles, and onychaetes. 60. *Tedania* cf. *ignis* (Duchassaing & Michelotti, 1864), tylote. 61. *Tedania* cf. *ignis* (Duchassaing & Michelotti, 1864), detail of microspined head of tylote. 62. *Forcepia vermicola* n.sp., tylote and large acanthostyle. 63. *Forcepia vermicola* n.sp., small and large acanthostyle. 64. *Forcepia vermicola* n.sp., large arcuate isochela. 65. *Forcepia vermicola* n.sp., forceps; note sharp bend and tightly adhering upper part of legs.

1953). In a way this species bridges the gap with Raspailids which also lack ectosomal subtylostyles and microscleres. However, the apomorphy of that group, viz. ectosomal single styles surrounded by bouquets of small styles or anisoxeas, is lacking in our species. The growth form is also unique among *Clathria* species of the region.

Order Haplosclerida
Family Chalinidae
Genus *Haliclona* Grant, 1835

Haliclona strongylophora sp. n.
Figs 12, 25, 73.

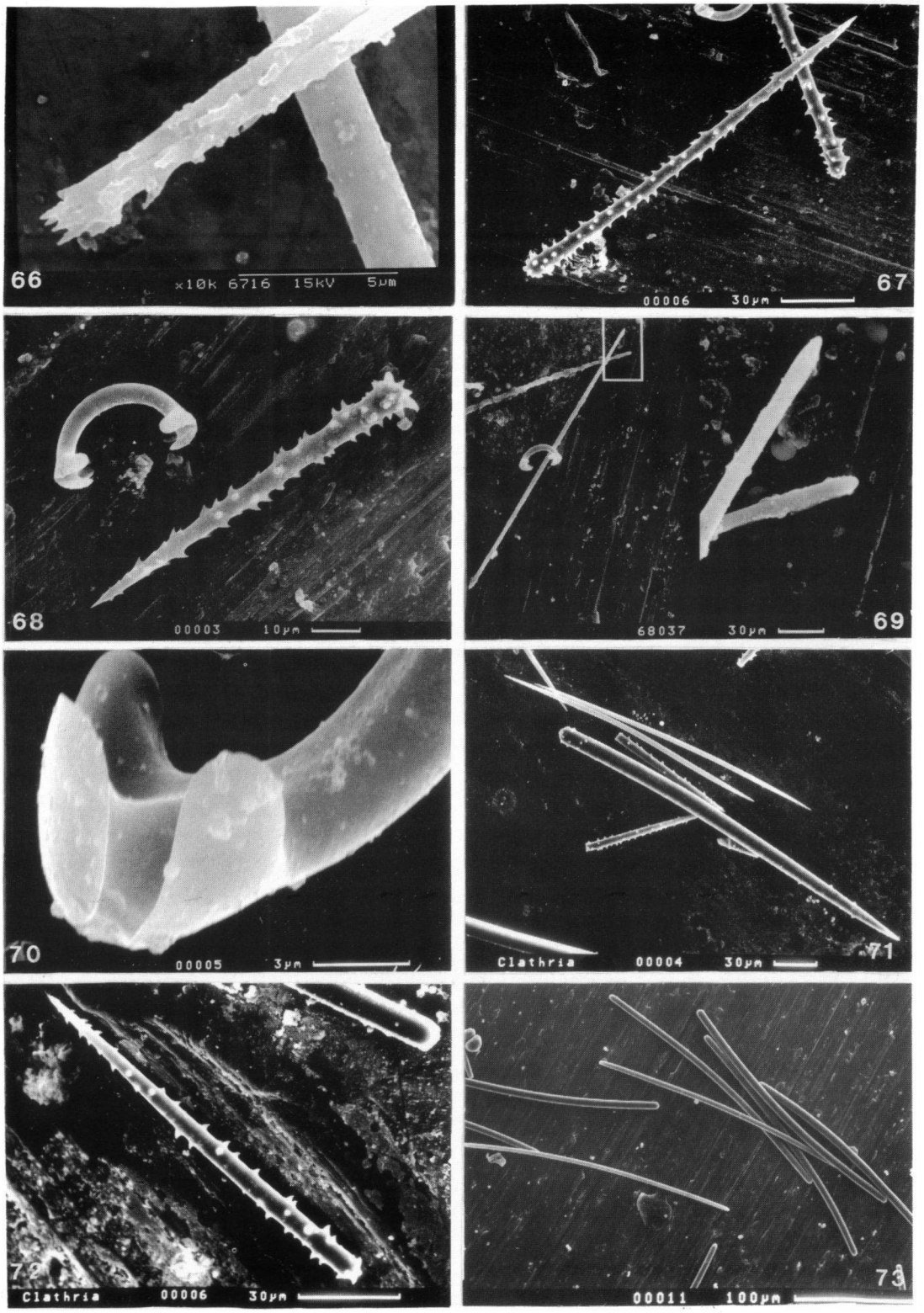
Material: Holotype: ZMA POR. 11336, Jamaica, Discovery Bay, LTS, 76.2m, # J161; . Paratype: ZMA POR. 11337, Jamaica, do.77.7m, #J168.

Description: Soft, dark brown, encrusting sponge. Covers areas up to 15 x 30 cm, about 1 cm in thickness. Surface optically smooth, no oscules apparent. Spongin is more abundant than in *H. implexiformis*. It is light grey in the dry state and easily crumbled.
Skeleton: The ectosome is an irregular reticulation of single spicules and contains a considerable amount of foraminiferans and sediments. The choanosome is an isotropic reticulation of single spicules, in some parts there are paucispicular ascending tracts connected by single spicules, mesh size 100–200 µm.
Spicules: Strongyles 150–200 x 4–10 µm, there are thin growth–stages of the spicules present with the same range in length. These thinner growth stages often have conical or telescoped ends and in some cases irregular shaped swell-ings. No oxeas were observed among the full grown spicules.
Etymology: Named after the strongyles, which are characteristic for this species.
Remarks: The new species differs from all other described Caribbean *Haliclona* species (cf. Van Soest, 1980; De Weerdt et al., 1991) in having strongyles as the only spicule type; strongylote modifications occur in several species as a minority spicule type, never so far as an exclusive spicule type. It should perhaps be assigned to the genus *Prianos* Gray (1867), type species *Reniera amorpha* Schmidt (1864), as this has also strongyles in a single spicule reticulation. *R. amorpha* has never been redescribed and possibly is a synonym of *Reniera cratera*, likewise a species with strongyles in a single spicule reticulation. However, in view of the widespread occurrence of strongyles in the Haplosclerida, and the variable nature of the apices in juvenile spicules, we do not think that character has significance at the generic level. Like, *H. cratera*, the new species is a clear member of De Weerdt's (1969) *aquaeductus* - group.

Haliclona megasclera sp. n.
Figs 13, 26, 74.

Material: Holotype: ZMA POR. 11338, Jamaica, Discovery Bay, LTS, 77.7 m, #J170.

Description: Grey, leather–like, massive sponge. In dry condition there is a parchment-like detachable "skin". No oscules apparent. The sponge agglutinates numerous leaves of *Halimeda* sp. which made up a good part of the whole structure.
Skeleton: The ectosome is a fairly regular reticulation of single spicules and some sediment, largely independent of the choanosomal skeleton because of subdermal lacunae. The choanosme is an irregular reticulation of paucispicular primary lines (2-3 spicules thick) interconnected by single spicules, mesh size of 150–350 µm.
Spicules: Oxeas slightly curved, 282–300–370 x 9–12 µm. Thin, rhaphid–like growth stages of


66
×10K 6716 15kV 5µm
67
00006 30µm
68
00003 10µm
69
68037 30µm
70
00005 3µm
71
Clathria 00004 30µm
72
Clathria 00006 30µm
73
00011 100µm

Figs. 66-73, SEM micrographs of spicules of Jamaican deep water sponges. 66. *Forcepia vermicola* n.sp., spined ends of forceps. 67. *Hymedesmia caribica* n.sp., large acanthostyle. 68. *Hymedesmia caribica* n.sp., small acanthostyle and arcuate chela. 69. *Hymedesmia caribica* n.sp., left: tornote and chela; right: close-up of unequal ends of tornotes. 70. *Hymedesmia caribica* n.sp., close-up of chela. 71. *Clathria faviformis* n.sp., overview of spicules, including style, acanthostyles and oxeas. 72. *Clathria faviformis* n.sp., small acanthostyle. 73. *Haliclona strongylophora* n.sp., strongyles.

oxeas, are numerous in the ectosome.
Etymology: After the big sized oxeas.
Remarks: The large sized oxeas exceed the size range of all other Caribbean *Haliclona* and differentiate this species, even from *H. mucofibrosa* De Weerdt et al. (1991) of which the spicules may reach 250 µm. Together with other features, such as the paucispicular primary lines and the irregular skeleton, this identifies the new species with De Weerdt's (1989) *angulata* - group (although most members of this group have microscleres).

Family Niphatidae
Genus *Amphimedon* Duchassaing & Michelotti, 1864

Amphimedon caribica (Pulitzer–Finali, 1986) n. comb.
Figs 14, 27, 75.

Cribrochalina caribica Pulitzer–Finali, 1986:
Cribrochalina spiculosa sensu Van Soest, 1980: 43, pl. VII figs. 2-3, text fig. 15 (not: Dendy, 1890)

Material: ZMA POR. 11339, Jamaica, Discovery Bay, LTS, , 45.7m, #J156; ZMA POR. 11340, do., 77.1m , #J166.

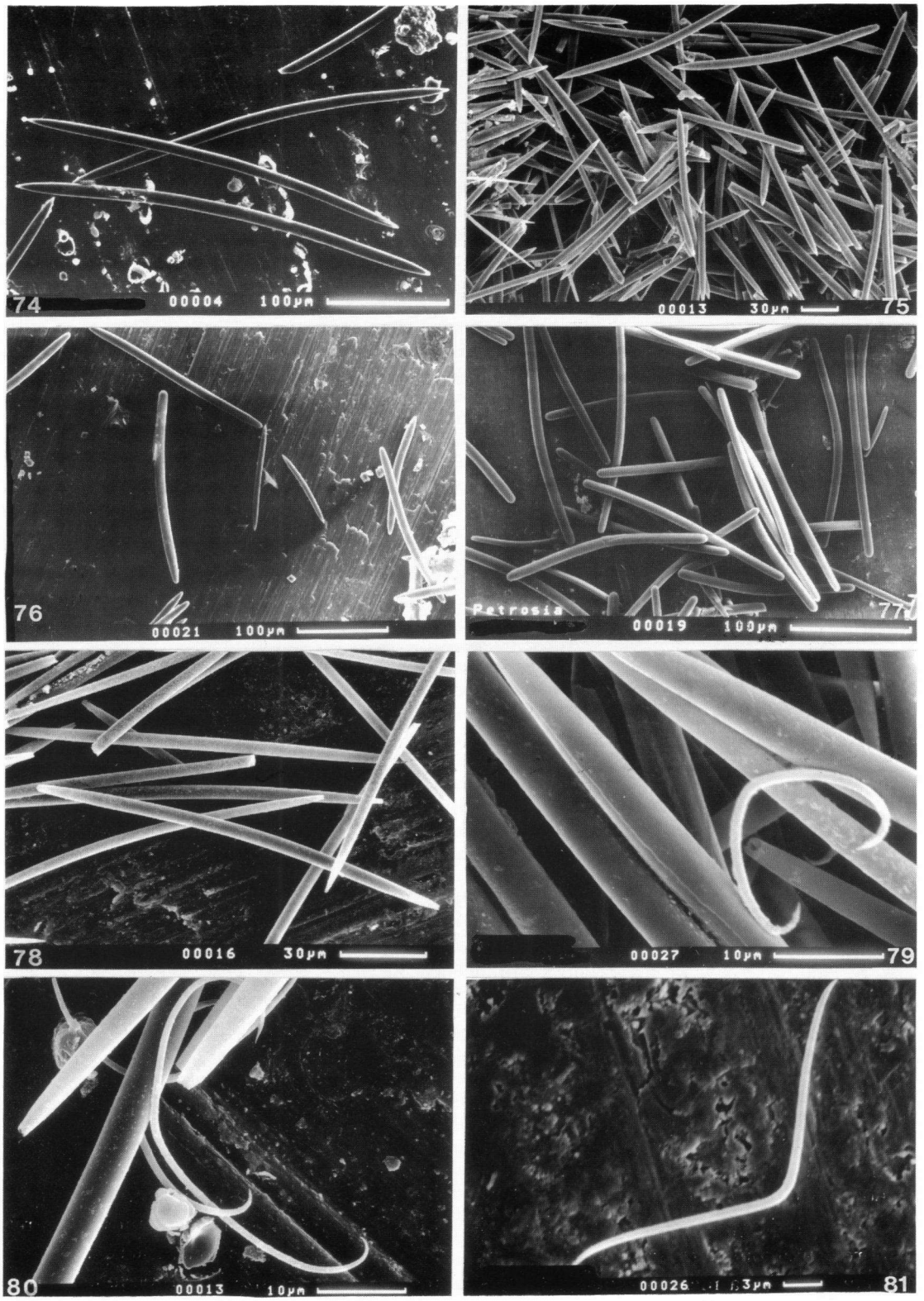
Description: Pale–yellow, plate-like sponge, about 10–30 cm in diameter and only 0.5–1 cm thick. Oscules are circular, 2–3 mm in diameter, flush with the smooth surface and scattered on the upper side of the sponge.
Skeleton: Ectosomal skeleton a more or less tangential reticulation of spicule tracts bound by spongin, forming irregular rounded meshes of 200 - 600 µm in diameter. Choanosomal skeleton: an anisotropical reticulation of thicker primary fibres, interconnected by secondary fibres at right angles, with a mesh size of 45–800 µm; fibres, 45–200 µm in diameter, cored by 3-10 spicules.
Spicules: Oxeas, occasionally styles and strongyles, 140–190 x 3–10 µm.
Distribution: Puerto Rico, Hispaniola, Jamaica.
Remarks: Van Soest (1980) misinterpreted the species *Siphonochalina spiculosa* Dendy, 1890. This was corrected by Pulitzer-Finali (1986) who erected a new species for it. The genus *Cribrochalina* is not the right group for this species as the type species, *C. vasculum*, is a Petrosiid, close to *Petrosia.* It shares the large size variation of the spicules with that genus but differs in having a predominance of longitudinal spicule tracts, with only rare anastomoses. *Amphimedon* fits this species much better and it is proposed to assign this species to it. Among Caribbean *Amphimedon* representatives, this species stands out through its cup-shaped or flabellate growth form with oscules concentrated on the "inside" of the sponge. It is somewhat intermediate between *Callyspongia* and *Amphimedon* in that respect.

Family Petrosiidae
Genus *Xestospongia* de Laubenfels, 1932

Xestospongia muta (Schmidt, 1870)

Material: ZMA POR. 11341, Jamaica, Discovery Bay, LTS, 88.4m, #J235.

Description: White, reddish–brown and violet mottled, vase–shaped sponge, stony hard. Up to 1.5 m high and 0.75 m in diameter. Surface optically smooth but rough to the touch. Surface of outer wall sometimes covered with irregular, flattened, sometimes branched, lobate protuberances. No oscules apparent.
Skeleton: Ectosome a reticulation of polyspicular tracts and single spicules. Choanosome a reticulation of dense polyspicular tracts, 150–300 µm in diameter, mesh size 150–1000 µm.
Spicules: Strongyloxeas 300–460 x 13–20 µm.
Distribution: Florida, Bahamas, Puerto Rico, Cu-


74
00004 100µm
00013 30µm 75
76
00021 100µm
Petrosia
00019 100µm 77
78
00016 30µm
00027 10µm 79
80
00013 10µm
00026 3µm 81

Figs. 74-81, SEM micrographs of spicules of Jamaican deep water sponges. 74. *Haliclona megasclera* n.sp., oxeas. 75. *Amphimedon caribica* (Pulitzer-Finali, 1986), overview of spicules, including oxeas and stylote modifications. 76. *Petrosia pellasarca* (De Laubenfels, 1934), overview of spicules, including larger and smaller categories. 77. *Petrosia massiva* n.sp., strongyles of larger and smaller size categories. 78. *Oceanapia stalagmitica* (Wiedenmayer, 1977), overview of oxeas. 79. *Oceanapia stalagmitica* (Wiedenmayer, 1977), small sigma. 80. *Oceanapia stalagmitica* (Wiedenmayer, 1977), large sigmas. 81. *Oceanapia stalagmitica* (Wiedenmayer, 1977), toxa.

ba, Curaçao, Colombia.
Remarks: This species has been reported from deep water (72-90 m) before by Van Soest (1980).

Xestospongia rampa (De Laubenfels, 1934) Fig. 28.

Strongylophora rampa De Laubenfels, 1934: 19.

Material: ZMA POR. 11343, Jamaica, Discovery Bay, LTS, 92.4m, #J234; ZMA POR. 11344, do., 76.2m, #J159.

Description: Pink and white mottled vase shaped sponge, stony hard. Size up to 30 cm high and 20 cm in upper diameter of the vase. Surface smooth but rough to the touch. No oscules apparent. Surface covered with dark coloured zoanthids.
Skeleton: The ectosome is a reticulation of spicule tracts and single spicules. The choanosome consists of a dense reticulation of thick polyspicular tracts, 150–400 µm in diameter, mesh size 150–1100 µm.
Spicules: Thick strongyles 120 – 420 x 12–21 µm. Immature strongyles are much thinner and may vary from oxeas to strongyles. Occasionally styles or oxeas with rounded points.
Distribution: Puerto Rico, Jamaica.
Remarks: De Laubenfels's specimens were cylindrical, but considerably smaller (7 cm diameter, 7 cm high); spicule sizes and other skeletal details match; they were from 60-220 m depth. De Laubenfels' assignment to *Strongylophora* was changed to *Xestospongia* by Zea & Rützler (1983) because of absence of true microstrongyles and continuous size range rather than discrete size categories. The species is similar in spiculation to *X. portoricensis* Van Soest (1980), but that species has a basal mass, about 10 cm in diameter from which protrude 4 conical elevations of 4–10 cm in length, 2–3 cm in diameter. It differs therefore clearly from our vase–shaped specimen. Furthermore the size–range of the spicules in *rampa* is much larger than that of *portoricensis* (377-429 µm).

Xestospongia proxima (Duchassaing & Michelotti, 1864). Fig. 29.

Material: ZMA POR. 11345, Jamaica, Discovery Bay, LTS, 77.1m, #J169.

Description: Pink coloured, massive sponge, 3–5 cm thick and 10 x 8 cm in lateral expansion, tough and, even under water, conspicuously sticky when handled. Surface smooth, oscules circular, flush with the surface, about 7 mm in diameter. Found below an overhang. It is brown–orange coloured in the dry state and incompressible.
Skeleton: The ectosome is an irregular reticulation of single spicules and paucispicular tracts with various amounts of spongin, mesh size 100–350 µm. The choanosome is a very dense irregular reticulation of multispicular tracts surrounded by spongin, 30–150 µm in diameter, mesh size 50–250 µm.
Spicules: Oxeas, 150–200 x 4–9 µm.
Distribution: Virgin Islands, Puerto Rico, Colombia, Barbados, Jamaica.
Remarks: The skeleton of the present specimen was compared with a slide of Duchassaing & Michelotti's schizotype in the Natural History Museum (London) (BMNH 1928: 11: 12: 45) and both were found to have the same atypical *Xestospongia* skeleton of dense irregular reticulation of thin short oxeas. Somewhat puzzling is the variability in live colour reported for this species: black-brown (Duch. & Mich., 1864), greenish black (De Laubenfels, 1934 as *Densa araminta*), maroon (Zea, 1986), whitish grey (Van Soest & Stentoft, 1988) and pink (present material). Possibly there is more than one *Xestospongia*

species with this characteristic skeleton, but firm evidence is lacking, because conditions of light and depth may influence coloration. The stickiness may be atrributed to the presence of 3-alkylpiperidine derivates, such as xestamines, described from several Caribbean Haplosclerid sponges (Andersen et al., in the press).

Genus *Petrosia* Vosmaer, 1885

Petrosia pellasarca (De Laubenfels, 1934)
Figs 15, 30, 76.

Material: ZMA POR. 11346, Jamaica, Discovery Bay, LTS, 76.2 m, #J157.

Description: Brown plate–like sponge. Size up to 30 cm in diameter and about 1 cm thick. Surface optically smooth but microhispid. In the dry state, upper side brown and green coloured, bottomside ochre–yellow. Consistency hard, not compressible. Surface covered with minute (<1 mm in diameter) circular exhalant openings.
Skeleton: The ectosome is an irregular reticulation of spicules with erect spicule brushes at the nodes. The choanosomal skeleton is largely anisotropic and consists of ascending paucispicular tracts or single spicules connected by single spicules, mesh size 100–150 μm.
Spicules: Strongylote oxeas, occasionally stylotes, in two size–classes, small strongylote oxeas, 20–34 x 2–3 μm, found only in the ectosome "echinating" the larger strongyloxeas, which have a wide size range, 65–280 x 6–10 μm; microscleres rare thin toxas 20-40 μm.
Distribution: Puerto Rico, Barbados, Colombia, Jamaica
Remarks: The habit and spicule sizes and categories conform to the holotype (we examined a slide made of De Laubenfels's specimen, USNM 22336). The oxeas are more blunt in our specimen, but otherwise similar. The skeletal architecture is so close to what is characteristic of *Haliclona*, that assignment to *Petrosia* is tentative. The two size categories of oxeas are typical for the genus *Petrosia* and that is the reason we maintain the species provisionally in it.

Petrosia massiva sp. n.
Figs 16, 31, 77.

Material: Holotype, ZMA POR 11347, Jamaica, Discovery Bay, LTS, 70.1m, #J158.

Description: Massive yellowish sponge, 3–4 cm in thickness and 15 x 25 cm in lateral expansion. Consistency firm, only slightly elastic. Surface smooth with some circular or elongate oscules 3–7 mm in diameter. It is brown and rather hard in the dry state.
Skeleton: The ectosome is a reticulation of spicule tracts and single spicules. In the choanosome polyspicular tracts 30–50 μm in diameter form more or less rectangular meshes, mesh size 50–400 μm. Many loose spicules. Spongin is fairly abundant, binding the tracts.
Spicules: Strongyles of two size categories, small 21–28 x 2–3 μm and large, 90–250 x 6–9 μm; younger growth stages of these spicules are often oxeote. Smaller category concentrated in the ectosome.
Etymology: Named after the growth form of the sponge.
Remarks: The new species has the crowded, heavily spiculated skeleton of a typical *Petrosia*. It shows affinities to *Strongylophora davilai* Alcolado, 1979 and to *Cribrochalina dura* Wilson (1902), both of which are probably members of *Petrosia*. The first has similar habit and spicules/sizes, but is grey in life, the second has a branching habit and oxeas rather than strongyles. Another Caribbean *Petrosia* is *P. weinbergi* Van Soest (1980), of which the holotype (ZMA POR. 3670) was re-examined. This is a green species with more definitely oxeote spicules; it lacks the strongly developed spicule tracts except in the peripheral region, and has larger irregular meshes.

Family Phloeodictyidae
Genus *Oceanapia* Norman, 1867

Oceanapia stalagmitica (Wiedenmayer, 1977)
Figs 17, 32, 78-81.

Biminia stalagmitica Wiedenmayer, 1977: 124, pl. 26, fig. 1; text figs 133-134.

Material: ZMA POR. 11348, Jamaica, Discovery Bay, LTS, 74.7 m, #J162; ZMA POR. 11349, do., 48.8 m, #J242.

Description: Reddish or violet massive sponge with large tan areas, rather hard. Up to 6 cm in thickness and about 25 x 30 cm in lateral expansion. Many thin, blind ending fistules, 2–3 cm long and about 0.5 cm in diameter on the surface. Chimney–shaped oscules with paper–thin walls, 3–4 cm high and about 2 cm in diameter.
Skeleton: The ectosome is a reticulation of single spicules and paucispicular tracts, occasionally supported by long polyspicular tracts. The choanosome is made up by long polyspicular tracts, 50–250 µm in diameter, connected by single spicules or spicule tracts, tracts run parallell to the surface and support the ectosomal skeleton. If the sponge is torn apart the strong spicule tracts are visible.
Spicules: Oxeas 125–200 x 4–6 µm. Thin sigmas in two size categories: small abundant sigmas, 10–25 µm, less frequent large sigmas, 40–52 µm, rare toxas, 35–45 µm.
Distribution: Bahamas, Jamaica.
Remarks: The present specimen corresponds to the holotype described by Wiedenmayer (1977) in shape, colour, consistency and spicule types. It differs somewhat in the size range of spicules: The holotype has smaller oxeas (100–*132*–155 x 3.5–*4.2*–5 µm), Wiedenmayer did not mention two size categories of sigmas but gave 11–*19*–32 µm as size range for them which is comparable to the small sigmas in our specimen. Also the toxas of the holotype are smaller (10–*23*–32 µm). Differences with the holotype seem to be confined to size of spicules which is very variable in many species.

Biminia is considered a synonym of *Oceanapia*, as the only difference with other *Oceanapia* species is the possession of toxas, which are shared with various Haplosclerid genera.

Order Verongida
Family Aplysinellidae
Genus *Aiolochroia* Wiedenmayer, 1977

Aiolochroia crassa (Hyatt, 1875)

Material: ZMA POR. 11350, Jamaica, Discovery Bay, LTS, 73.2m depth, #J176.

Description: Yellow, blue or green sponges which turn black when exposed to air. Growing as lobate masses or clusters of tubes. Tubes up to 25 cm high and 3–4 cm in diameter. Surface covered with conules 2–4 mm high. Smooth surface areas with fields of pores. Firm consistency, like rubber. Easy to cut. Oscules at the end of elevated cones or on top of tubes.
Fibres: Characteristic thick spongin fibres with opaque pith, 200–600 µm in diameter.
Ecology: This species occurs also in shallower water with a high abundance between 40 and 60 m. Van Soest & Stentoft (1988) reported this species (as *Pseudoceratina*) from 153 m depth.
Distribution: Virgin Islands, Bermuda, Antigua, Bahamas, Curaçao, Colombia, Barbados, Jamaica.
Remarks: This species has been assigned to different genera in the past 20 years: Wiedenmayer (1977) discovered that its original genus name, *Dendrospongia* Hyatt (1878) was preoccupied and erected *Aiolochroia*. Subsequently, Bergquist (1980) referred it to *Pseudoceratina* Carter (1885), and that was accepted by most recent authors. Recently, Bergquist (1995) revised this genus and concluded that *crassa* could not stay in *Pseudoceratina*, suggesting its return to *Aiolochroia*.

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