STUDIES ON THE FAUNA OF CURAÇAO AND OTHER
CARIBBEAN ISLANDS: No. 191

MARINE SPONGES FROM CURAÇAO AND OTHER CARIBBEAN LOCALITIES

PART II. HAPLOSCLERIDA

by

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ABSTRACT

The present paper deals with the West Indian marine Haplosclerida incorporated in the collections of the Zoological Museum of Amsterdam. A total of 36 species is described and fully illustrated. Part of the material consists of the Duchassaing & Michelotti collection housed in Amsterdam; of all the Haplosclerid types of this collection an extensive redescription and a photographic illustration is given. Most of the type specimens are designated (para-)lectotypes. Eight new species are erected, viz. *Reniera curaçaoensis, R. carmabi, Sigmadocia piscaderaensis, Niphates alba, Xestospongia wiedenmayeri, X. portoricensis, Petrosia weinbergi*, and *Strongylophora hartmani.* The follwing new combinations are used: *Niphates amorpha* (for *N. digitalis* forma *amorpha* Wiedenmayer, 1977), *Cribrochalina spiculosa* (for *Siphonochalina spiculosa* Dendy, 1887), *Pellina nodosa* (for *Phloeodictyon nodosum* George & Wilson, 1919), and *Pachypellina podatypa* (for *Haliclona podatypa* De Laubenfels, 1934). Several new combinations are suggested for species not represented in the present collection, but studied for comparative reasons.

A new classification of marine Haplosclerid families is proposed, based on the study of the present collection, and on the study of many type species of Haplosclerid genera. The new classification comprises five families, viz. Haliclonidae, Niphatidae (n.), Callyspongiidae, Petrosiidae (n.) and Oceanapiidae (n.). The proposed classification is discussed and some phylogenetic ideas are presented. The zoogeography of the West Indian sponges is studied and some ecological data are given.

INTRODUCTION

This second part follows along the same general lines as the first part on Keratosa from Curaçao and other Caribbean localities (cf. VAN SOEST, 1978), viz. the collections of sponges incorporated in the Zoological Museum of Amsterdam are described and attempts are made to review the whole of the West Indian Sponge fauna, and to make general statements on zoogeography and ecology of the taxa. A special feature is the redescription of the Duchassaing & Michelotti collection of types.

The Haplosclerids are a notoriously difficult group. Both in the past (RIDLEY, 1884; RIDLEY & DENDY, 1887; VOSMAER, 1887; LENDENFELD, 1887; TOPSENT, 1928; BURTON, 1934b; DE LAUBENFELS, 1936a) and more recently (GRIESSINGER, 1971; LÉVI, 1973; WIEDENMAYER, 1977a, 1977b; BERGQUIST, 1978) attempts have been made to come to grips with the taxonomy of the higher taxa of this order. From the profound disagreement found in the recent proposals of subdivision, it is clear that a consensus is far from reached yet. One of the main reasons for the discrepancies is no doubt the regional basis on which the revised classification of the order was based. GRIESSINGER (1973) and LÉVI (1973) based their system mainly on Mediterranean Haplosclerids; WIEDENMAYER (1977a, 1977b) did so on West Indian material and BERGQUIST (1978) on New Zealand representatives. The present study is also a regional one, but in addition I checked the type species of many (regrettably not all) Haplosclerid genera occurring outside the West Indies. I will introduce below a new classification of the marine representatives of the order into five families, viz. Haliclonidae, Niphatidae (n.fam.), Callyspongiidae, Petrosiidae (n.fam.) and Oceanapiidae (n.fam.), which will be discussed at length in a separate section.

After completion of the present study it is estimated that the West Indian fauna contains 24 genera and about 60 species of marine Haplosclerid sponges. The present collection holds 36 species of 14 genera, but many of the remaining species have been studied by their type specimens.

ACKNOWLEDGEMENTS

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MATERIAL AND METHODS

Most of the collecting localities and the collectors are the same as those of the Keratosa part of this series (cf. VAN SOEST, 1978). New localities from which samples were available are listed below and by their accompanying number given in the maps (Figs. 44–49).

CURAÇAO: St. Joris Baai (55) – Piscadera Baai, N (56) – Piscadera Baai, NW (57) – Piscadera Baai, NE (58) – Piscadera Baai, north islet (59) – Piscadera Baai, north part, SW (60) – Piscadera Baai, middle part, SW (61) – Piscadera Baai, middle part, SE (62) – Piscadera Baai, SE part, NW (63), Piscadera Baai, SE part, NE (64) – Piscadera Baai, 4th buoy (65) – Piscadera Baai, near Enoch (7) – Piscadera Baai, entrance W (5) – Piscadera Baai, outer bay (8).
BONAIRE: Lac, Awa di Palu Grande (66) – Lagoen, SW (67) – Lac, Secu di Sorobon (68) – Lac, Playa Mangel (70).
PUERTO RICO: Mata de la Gata, near La Parguera (69) – San Cristóbal Reef, near Parguera (71) – Isla Magueyes, near Parguera (72) – Cayo Caracoles, off Parguera (73) – Shelf edge off Parguera (74) – Bahía Fosforescente (75) – Mata Gagada (76) – Punta Ensenada, NW of Rincón (77) – 4 km off Añasco river (78).
ARUBA: Lagoen Boekoeti, E of Oranjestad (79) – Spaans Lagoen (80).
ST. MARTIN: Rolandus Canal near Welvaartsbridge (81).
FLORIDA: Virginia Key, NE Coast (82) – E of Soldier Key (83).
MARGARITA: Estación Punta de Piedras (84) – Punta Mosquito (85).
NEW PROVIDENCE: Between Hog Island and Athol Island (86).
LA DÉSIRADE: Grande Anse (87).
TOBAGO: Buccoo Bay (88).
COLOMBIA: Carthagena (89).
GUADELOUPE: Port Louis (90).
NORTH CAROLINA: Bogue Sound (91).
ANGUILLA: Crocus bay (92).

The present material also includes the VAN DER HORST collection, already studied by ARNDT (1927).

Methods employed are the same as those described in the first part. For spicule counts a piece of sponge was cooked in a solution of sodium hypochloride, the remains washed, dried and mounted in Canada balsem on a slide. Spicule size data are based on 25–50 measurements for each category present.

Order **HAPLOSCLERIDA** Topsent, 1928

Definition: Ceractinomorpha with a reticulate skeleton of smooth oxeote spicules and a microsclere complement, if present, of sigmata, toxa and smooth microxea.

Family **HALICLONIDAE** De Laubenfels, 1932

Definition (emended herein): Haplosclerida with a choanosomal skeleton consisting of uni- or paucispicular primary (ascending) tracts or fibres, interconnected by single spicules at right angles; ectosomal skeleton, if present, a unilayered, unispicular isotropic reticulation.

The above definition is deviating strongly from the one given by De Laubenfels (1936a). The family Haliclonidae is here used to include both *Adocia* (of De Laubenfels' family Adociidae) and *Reniera* sensu Griessinger (1971, of his family Renieridae). For a justification of this, one is referred to the separate section on familial classification.

Genus **Haliclona** Grant, 1835

Definition: Haliclonidae without an ectosomal skeleton and without microscleres.

The above definition may seem particularly negative, but in my opinion both characters are in Hennigian sense to be termed apomorphic, as the possession of an ectosomal skeleton and microscleres are primitive characters (cf. the distribution of these characters among other Haplosclerid genera and among the Poecilosclerida).

Haliclona hogarthi Hechtel, 1965

Haliclona permollis; De Laubenfels, 1932: 121; 1936a: 40; 1936b: 444; 1949: 11; 1957: 159; Wells, et al., 1960: 209; Little, 1963: 40. [Non: *Isodictya permollis* Bowerbank, 1866: 278.]
Haliclona hogarthi Hechtel, 1965: 20, text-fig. 1, pl. 2 fig. 1.
Haliclona (*Reniera*) *aquaeductus*; Wiedenmayer, 1977a: 87, pl. 13 figs. 4–5, text-fig. 114. [Non: *Reniera aquaeductus* Schmidt, 1862, cf. also Griessinger, 1971, and Wiedenmayer, 1977b.]
[Non: *Spongia cinerea* Grant, 1827 (*Reniera c.*, *Adocia c.* or *Haliclona c.* of authors).]
[Nec: *Isodictya peachii* Bowerbank, 1866, *I. simulo* Bowerbank, 1866, and *I.varians* Bowerbank, 1866, synonymy suggested by Wiedenmayer, 1977a.]

[Nec: *Haliclonia permollis*; De Laubenfels, 1950 : 48 = *Reniera tubifera* George & Wilson, 1919.]

CURAÇAO: ZMA POR.3497 (St.Jorisbaai, on mangroves, 18.XI.1958, coll. J.H. Stock, 58); 3637 (Piscadera Baai, inner bay, mangrove forests, 14.XI.1975, coll. E. Westinga); 3711 (St.Jorisbaai, S coast, on mangroves, 23.X.1968, coll. Hummelinck, *1641*); 3850 (Piscadera Baai, N part, on sewer, 31.X.1963, coll. Hummelinck, *1503A*); 4020 (Piscadera Baai, entrance E, 0.5 m, on mangroves, 11.XII.1963, coll. Hummelinck, *1465*); 4043 (Piscadera Baai, NW, entrance small inlet, on *Rhizophora* and *Ulva*, 29.X.1963, coll. Hummelinck, *1495*); 4266 (Schottegat, Baai van de Hoop, on mangroves, 1.XI.1905, coll. J. Boeke).
BONAIRE: ZMA POR.3703, 4239, 4241 (Lac, 300 m E of Palu Calbas, on *Thalassia*, 11.VIII.1967, coll. Hummelinck, *1569, 1575A*); 3928, 4045 (Lac, SW, on *Avicennia*, 19.IX.1967, coll. Hummelinck, *1555*); 3988, 4261 (Lac, Puitu, S, 0–0.5 m, on *Rhizophora*, 10.VIII.1967, coll. Hummelinck, *1577*).
ARUBA: ZMA POR.4154 (Lagoen Boekoeti, E of Oranjestad, calcareous debris and mud, 0–1 m, coll. Hummelinck, *1003*); 4237 (Spaans Lagoen, on *Rhizophora*, 1.I.1949, coll. Hummelinck, *1008a*).
LA DÉSIRADE: ZMA POR.3774 (Grande Anse, near bridge, tidal zone, reefs, on *Geodia*, 23.I.1964, coll. Hummelinck, *1437A*).
FLORIDA: ZMA POR.4071 (Key Biscayne, mangrove swamp, 31.VIII.1963, coll. Hummelinck, *1412*); 3765 (Key Biscayne, N point, on *Rhizophora*, 1.XI.1963, coll. Hummelinck, *1410A*); 4005, 4068 (Key Biscayne, N point, on *Thalassia*, 1.XI.1963, coll. Hummelinck, *1410*).

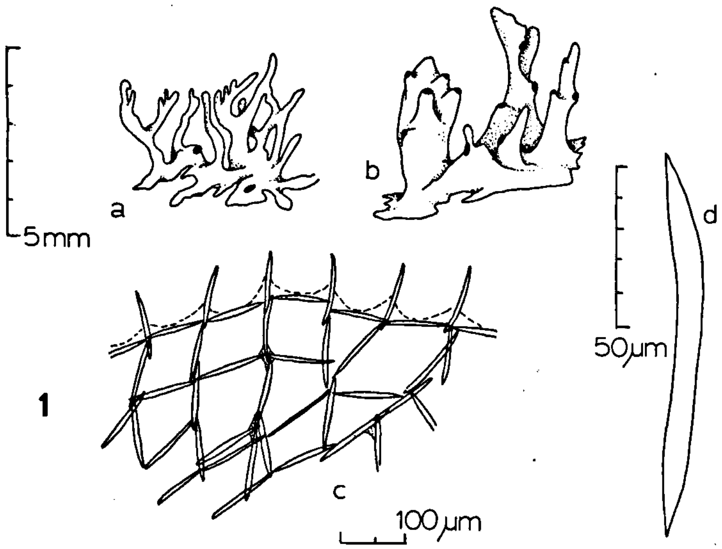

FIGURE 1. *Haliclona hogarthi*, a and b: different habits, c: perpendicular section of peripheral skeleton, d: spicule

General diagnosis: (Fig. 1, Pl. I 1–2)

Shape, size and consistency: Tubuliform, ramose or massively encrusting. Tubuli up to 5 cm high, ramose branches up to 10 cm long. Tubuli and ramose branches 3–15 mm in diameter, often hollow along their entire length. Encrusting forms with rounded lobes. Oscules apically in tubuliform and lobate habit, on the side of branches in ramose forms, 1–4 mm in diameter. Consistency soft and weak, easily torn. Ramose forms collapse when lifted out of the water.
Colour: pink (alive), light brown or brownish white in spirit.
Ectosome: no specialisation. The surface is microhispid because of single spicules protruding beyond the exopinacoderm, which tears to shreds if the specimens are dried.
Choanosome: The skeleton is a regular, unispicular reticulation of single spicules in which primary lines and interconnecting spicules can be distinguished only by their orientation. In some specimens a few vague multispicular tracts are found. Spicules: oxea, mostly perfectly fusiform, occasionally hastate, of moderate size: 100–*131.5*–164 µm by 3–*5.5*–8.5 µ.

Ecology: This species seems to prefer mangrove roots (*Rhizophora* and *Avicennia*) and turtle grass fields (*Thalassia*) in bays and lagoons.

Distribution: Aruba, Curaçao, Bonaire, La Désirade, Florida; Jamaica (HECHTEL, 1965), Bahamas (WIEDENMAYER, 1977a), Bermuda (DE LAUBENFELS, 1950), North Carolina (WELLS, et al., 1960), Gulf Coast (LITTLE, 1963), Pacific coast of Panamá, California (DE LAUBENFELS, 1936b).

Haliclona hogarthi is without doubt quite closely related to *Haliclona permollis* (Bowerbank, 1866) and *Haliclona mediterranea* Griessinger, 1971. I have taken the view that the West Indian form is specifically different from the Mediterranean and the Northern Atlantic one, but the evidence for this is hard to put into words. The tubular habit is rare in Northern Atlantic *H. permollis*, quite typical in Mediterranean *H. mediterranea* and rare again in West Indian *H. hogarthi*. Extremely ramose specimens seem common in the latter, but rare in both other forms. These characters, however, are hardly distinctive and doubt remains. WIEDENMAYER (1977a) united all under the name *Haliclona aquaeductus* (Schmidt, 1862), but GRIESSINGER (1971) claims this species to be generically and even familially distinct from *H. mediterranea* on the basis of a slide of SCHMIDT's holotype (cf. also above discussion of the genus *Reniera*).

Haliclona molitba De Laubenfels, 1949

Haliclona molitba De Laubenfels, 1949: 9; 1950: 40, fig. 17; Wiedenmayer, 1977a: 81, pl. 11 figs. 4–5.
Liosina monticulosa; De Laubenfels, 1950: 54, fig. 24. [Non: *Pachychalina monticulosa* Verrill, 1907.]

Curaçao: ZMA POR.4268 (Piscadera Baai, S-part, 4th buoy, 31.X.1963, coll. P. Wagenaar Hummelinck, *1470*); 4027 (Piscadera Baai, middle part SW, *Rhizophora*, 13.XII.1963, coll. Hummelinck, *1473*).

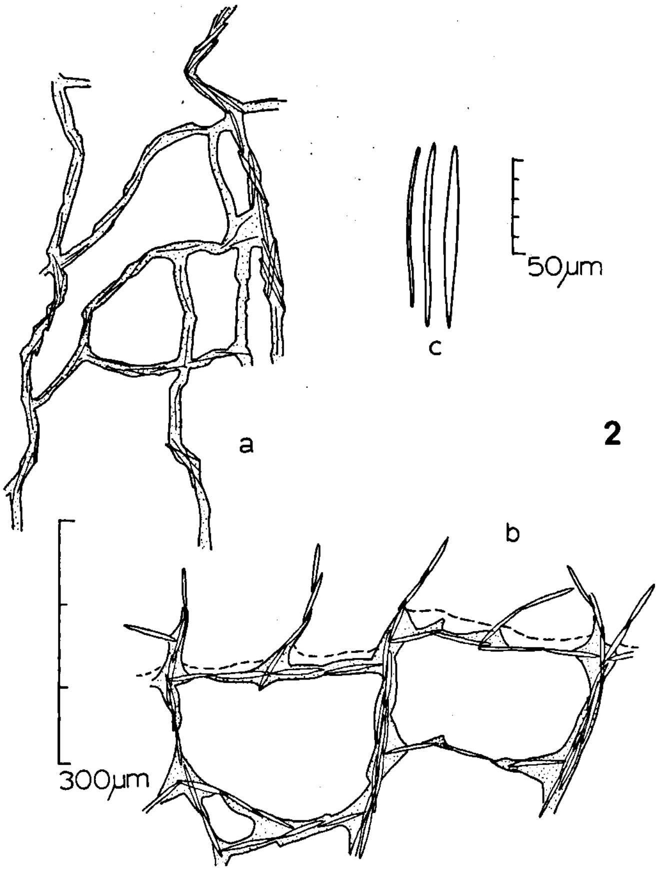

Figure 2. *Haliclona molitba*, a and b: different parts of the skeleton (note differences in spongin content (dotted areas) and spicule size), c: spicules.

BONAIRE: ZMA POR.4259 (Lac, Playa Mangel Altu, 600 m N of Sorobon Pt., 1.5–1 m, *Thalassia*, 23.VIII.1967, coll. Hummelinck, *1594*).

General diagnosis: (Fig. 2, Pl. I 3)

Shape, size and consistency: Flatly to massively encrusting with osculiferous lobes. Lobes up to 2–3 cm high, oscules 1–3 mm in diameter. Consistency is soft, easily torn, but resilient.

Colour: apparently light violet (DE LAUBENFELS, 1950; WIEDENMAYER, 1977a); in spirit it is beige to semi-transparent.

Ectosome: no dermal specialization, the surface being microhispid due to protruding skeletal fibres.

Choanosome: The skeleton in typical specimens is an irregular reticulum of spongin fibres with only a central core of thin spicules. In other specimens the spicules are larger and the spongin is less dominating. Both types of skeleton may intergrade within the same individual. The skeletal fibres are always characterized by their crooked, angular appearance. Fibre diameters may vary from 5 to 50 µm, the loose irregular meshes are 30–300 µm in diameter, the coring of the fibres is 0–8 spicules per cross section. Spicules are oxea 54–*89.0*–112 by 0.5–*2.1*–3.5 µm, the thinner forms often flexuous.

Ecology: On *Rhizophora*-roots and among *Thalassia* in shallow bays and lagoons.

Distribution: Curaçao, Bonaire; Bermuda (DE LAUBENFELS, 1950), Bahamas (DE LAUBENFELS, 1949; WIEDENMAYER, 1977a).

The skeleton of this species is comparable to Mediterranean and Atlantic *Haliclona limbata* (Montagu, 1818) (cf. GRIESSINGER, 1971, as *Chalinula limbata*) and *Haliclona palmata* (Ellis & Solander, 1786) from the temperate North Atlantic. Particularly striking is the similarity in skeletal variation of *H. molitba* and *H. limbata* in which both spongin-dominated and spicule-dominated fibres occur. From the Northern Atlantic species *H. molitba* differs in life colour (violet as opposed to brownish).

DE LAUBENFELS (1950) described *Liosina monticulosa* (Verrill, 1907) from Bermuda. A portion of the specimen is incorporated in the British Museum (N. H.), reg.no. 1948.8.6.24, and a slide made from it revealed that it had a skeleton quite similar to that of *H. molitba*. The only difference noted was life colour (described as scarlet). In view of the fact that the specimen was completely traversed by a dense mass of hydroids, life colour is hardly trustworthy in this case. Verrill's species had spicules much longer than the thin strongylote ones of De Laubenfels' specimen.

DISCUSSION OF THE GENUS *Haliclona*

A third species answering to the revised diagnosis of the genus given above is reported from the West Indies, i.e. *Haliclona crassiloba;* De Laubenfels, 1950. A slide of the holotype of *Spongia crassiloba* Lamarck, 1814 is present in the slide collection of the British Museum (N. H.), reg.no. 1954:2:20:69. From this and from Topsent's (1930) redescription it appears that it is very similar to *Amphimedon complanata* Duchassaing, 1850 (cf. description below), though not certainly conspecific, as it is in all probability not West Indian in origin. In any case, De Laubenfels' specimen is not conspecific with it, nor with *Amphimedon complanata.* It is very limp, shaggy in habit, full of eggs; the skeleton consists of primary lines (1-2 spicules) encased in spongin, interconnected by single spicules, also encased in spongin. The skeletal lines are very wavy and irregular, not unlike those of, for instance, *Haliclona montagui* (Bowerbank, 1866) or *H. loosanoffi* Hartman, 1958 from temperate waters. De Laubenfels' specimen is a true *Haliclona,* which needs a new name.

All other *Haliclona* species reported for the West Indies, not mentioned above, are considered to belong to other genera. Below these are tabulated; transfers are by the present author unless otherwise stated:

Haliclona compressa (Duch. & Mich., 1864) = *Amphimedon compressa* (cf. Wiedenmayer, 1977a)
Haliclona rubens (Pallas, 1766) = *Amphimedon compressa* (cf. Wiedenmayer, 1977a)
Haliclona viridis (Duch. & Mich., 1864) = *Amphimedon viridis* (cf. Wiedenmayer, 1977a)
Haliclona complanata (Duchassaing, 1850) = *Amphimedon complanata* (cf. Wiedenmayer, 1977a)
Haliclona erina De Laubenfels, 1936b = *Amphimedon erina*
Haliclona doria De Laubenfels, 1936b = *Xestospongia subtriangularis* (Duch. & Mich., 1864)
Haliclona subtriangularis (Duch., 1850) = *Xestospongia subtriangularis* (cf. Wiedenmayer, 1977a)
Haliclona longleyi De Laubenfels, 1936a = *Xestospongia subtriangularis*

Haliclona calcinea Burton, 1954 = *Orina calcinea*
Haliclona spiculosa; Burton, 1954 = *Siphonochalina* cf. *coriacea* Schmidt, 1868
[Non: *Siphonochalina spiculosa* Dendy, 1891]
Haliclona tenerrima Burton, 1954 = *Orina tenerrima*
Haliclona variabilis; De Laubenfels, 1950 = *Niphates erecta* Duch. & Mich., 1864 (cf. WIEDENMAYER, 1977a)
[Non: *Pachychalina variabilis* Dendy, 1891]
Haliclona pellasarca De Laubenfels, 1934 = Petrosiidae, genus novum
Haliclona podatypa De Laubenfels, 1934 = *Pachypellina podatypa*

Genus **Reniera** Nardo, 1833

Definition (emended herein): Haliclonidae with an irregular ectosomal tangential spiculation supporting the exopinacoderm.

GRIESSINGER'S (1971) concept of *Reniera* is accepted here, although his diagnosis of the genus is too vague to be of use in classing West Indian Haplosclerids in it. *Reniera* is here used to accomodate a group of *Haliclona*-like species which in the dry state keep their exopinacoderm intact, stretched between the conules of the choanosomal primary lines. The exopinacoderm is carried by irregularly strewn tangential spicules lying inbetween pores or pore-fields. This state is perhaps intermediate between conditions found in *Haliclona* and *Adocia*. The above given definition brings the West Indian representatives probably close to GRIESSINGER'S *Reniera arenata*-group. *Reniera tubifera* George & Wilson, 1919 and two new species conform to it.

Reniera curaçaoensis n.sp.

Holotype: ZMA POR.3662, Santa Martha Baai, CURAÇAO, bottom of entrance channel, 4 m, encrusting calcareous algae, 4.XI.1975, coll. students Prof. Stock. Paratype: ZMA POR.3672, Piscadera Baai, Curaçao, on mangrove roots, 14.XI.1975, coll. students Prof. Stock.

Additional material:
CURAÇAO: ZMA POR.4344 (Piscadera Baai, NE, *Rhizophora,* 11.XII.1963, coll. P. Wagenaar Hummelinck, *1485*; 4345 (Piscadera Baai, Entrance E. *Rhizophora,* 28.IX.1963, coll. Hummelinck, *1464*); 4342 (Piscadera Baai, S-part, 4th buoy, 31.X.1963, coll. Hummelinck, *1470*).

Description: (Fig. 3, Pl. I 4)
Shape, size and consistency: Incrustations of 5–10 mm in thickness, with occasional tubular or hollow-fistular elevations of 10–15 mm high and 8 mm in diameter. Lateral expansion apparently indefinite. Consistency soft, weak, easily torn. Dried specimens are fragile, easily crumbled into a white powder.

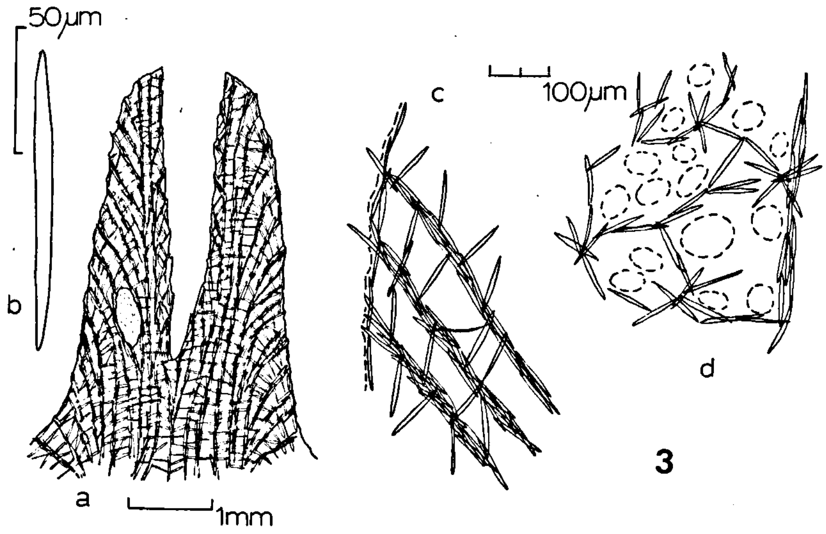

FIGURE 3. *Reniera curaçaoensis* n.sp., a: perpendicular section through tubular elevation, b: spicule, c: detail of perpendicular section of peripheral skeleton, d: tangential view of ectosome.

Colour: purple or bluish purple alive, drab to purplish drab in spirit, greyish white in dry condition.

Ectosome: Surface microhispid, but covered by a dermis, which can be detached only with difficulty and not without taking some of the choanosome. Dermis pierced by fields of pores overlying small subdermal spaces. Fields of pores surrounded by scattered tangential spicules or vague short spicule tracts originating from the small conules.

Choanosome: Incrusting parts have characteristic sinuous paucispicular tracts interconnected irregularly by single spicules. Primary lines about 30 µm in width, up to 3 or 4 spicules per cross section. Upright fistules or tubuli contain strong primary tracts running over part or whole of their length giving off branches radiating towards the periphery. Secondary tracts vague, crossing the primary lines at right angles. Primary tracts up to 55 µm in diameter, with 2–10 spicules per cross section, branches up to 20 µm and up to 4 spicules per cross section. Meshes 100–250 µm in diameter. Spongin scarce. Spicules: oxea, sometimes hastate or stylote 108-*126.8*-140 µm by 3-*5.0*-6.5 µm.

Ecology: Occurring in lagoons on mangrove roots and coralline algae.

Distribution: Curaçao.

The new species does not seem to have close relatives. *Reniera tubifera* is also purplish, but its surface is much smoother and its choanosomal skeleton has some spongin.

Reniera carmabi n.sp.

Holotype: ZMA POR.4341, Curaçao, Piscadera Baai, on poles of Hilton Hotel Landing, below MLWS, 1976, coll. H. Rink.

Additional material:
Curaçao: ZMA POR. 4343 (Piscadera Baai, NE, small bay, on *Rhizophora*, 25.XI. 1963, coll. P. Wagenaar Hummelinck, *1487;* a tiny fragment resembling the holotype in structure).

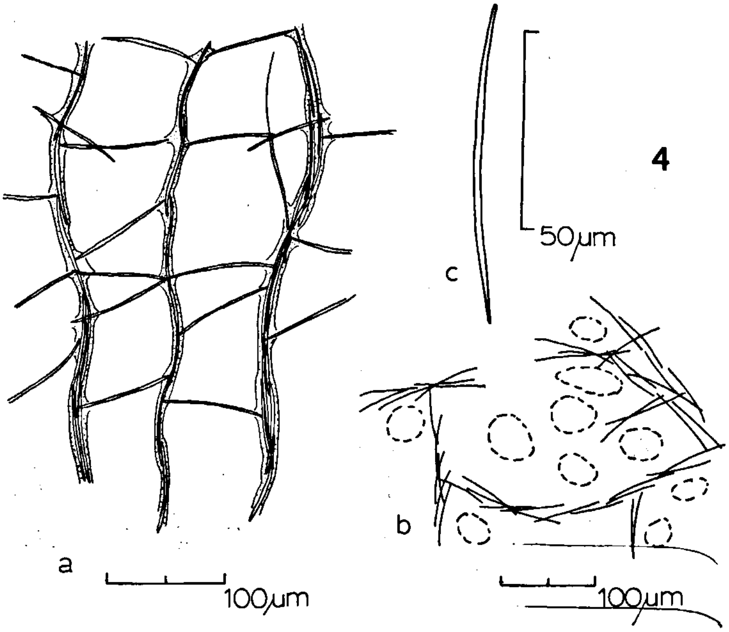

Figure 4. *Reniera carmabi* n.sp., a: choanosomal skeleton, b: tangential view of ectosome, c: spicule.

Description: (Fig. 4, Pl. II 1)

Shape, size and consistency: Thin (about 2 mm) incrustation on worm tubes. Total surface about 25 sqcm. Consistency soft, easily torn. Oscules not apparent.

Colour: a distinctive blue alive, beige in spirit.

Ectosome: A definite dermis is present, but it is hard to detach. Pores are irregularly distributed (not in fields), 40-70 µm in diameter. Dermal membrane charged with vague tangential spicule tracts and loose spicules, not clearly separated from the underlying choanosome.

Choanosome: a ladder-like reticulum of primary fibres, 15 µm in diameter with 3–4 spicules per cross section, and interconnecting single spicules. Spicules wholly encased in a spongin sheath. Reticulum sinuous, somewhat like the condition found in the previous species. Spicules of diverse shape, straight, curved, flexuous, always strongly acerate (not hastate), of slender shape, 80–*87.0*–96 by 1.0–*2.4*–3.0 µm.

Ecology: In bays and lagoons.

Distribution: Curaçao.

Etymology: The species is named after the CARMABI, Caraïbisch Marien-Biologisch Instituut, Curaçao.

This species does not seem to have close relatives among Atlantic or Mediterranean Haliclonids. The combination of an elaborate dermis charged with tangential spicules, a spongin-rich skeleton with very slender spicules and a blue colour is distinctive and unusual.

Reniera tubifera George & Wilson, 1919

Reniera tubifera GEORGE & WILSON, 1919: 145, pl. 57 fig. 12, 58 fig. 15, 59 fig. 16, 66 fig. 55.
Adocia tubifera; HARTMAN, 1958: 71; WELLS, et al., 1960: 210, fig. 17.
Haliclona permollis: DE LAUBENFELS, 1947: 48; 1950: 46, fig. 20.

NORTH CAROLINA: ZMA POR. 40 (Bogue Sound, off Morehead City, U.S.A., dredged 3–5 m, 1.IX.1963, coll. J.H. Stock).

Diagnosis: (Fig. 5, Pl. II 2)

Shape, size and consistency: Repent ramose with upright osculiferous tubes. Length of branches indefinite, diameter of tubes 5–10 mm, of oscules 2 mm. Consistency limp, soft.

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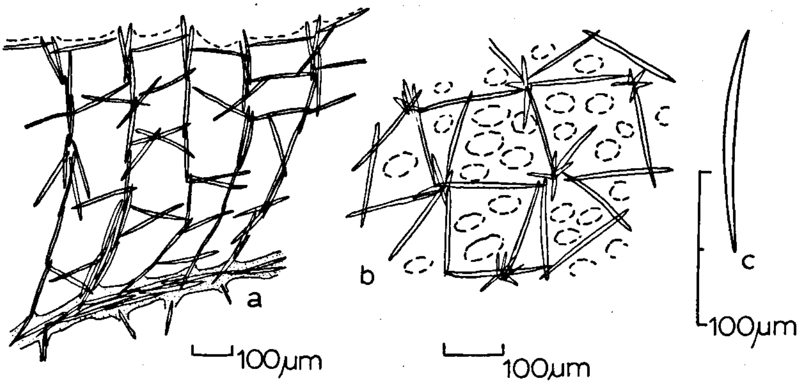

FIGURE 5. *Reniera tubifera*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

Colour: purple.
Ectosome: an incomplete tangential reticulation, not continuous or stretched tautly over endings of skeletal primary lines (as in *Adocia*).
Choanosome: predominantly a typical renieroid skeleton of primary lines of 1–2 spicules and interconnecting single spicules. Occasionally multispicular tracts enclosed in spongin occur. Skeleton dense, spicules thin: 120–140 by 2–6 µm.

Ecology: Not known.

Distribution: North Carolina; Bermuda (DE LAUBENFELS, 1950 as *Haliclona permollis*).

DE LAUBENFELS' (1950) material is assigned to the present species, primarily on the basis of skeletal resemblance, as the growth form of his specimen was massive-tuberculate without definite tubes. A portion of his material is preserved in the British Museum (N.H.), reg. no. 1948.8.6.18. Its skeleton is strikingly similar to that of *Reniera tubifera*. The distribution of this species, so far, is very limited, confined to the subtropical Western Atlantic.

DISCUSSION OF THE GENUS *Reniera*

GRIESSINGER'S (1971) account of the Mediterranean *Reniera*-species is difficult to apply to the West Indian fauna. Within the *Haliclona-Adocia* group of species there are next to a group of typical *Haliclona* and typical *Adocia* some species which seem to be intermediate between both with regard to their ectosomal characters. These species so far do not seem to be diverse in the sense of GRIESSINGER's three *Reniera*-groups (viz. *R. arenata*-group, *R. fulva*-group and *R. aquaeductus*-group), but rather seem to be close to only one, i.e. the *R. arenata*-group.

Reniera as a genus name is still presenting problems (even if we disregard DE LAUBENFELS' (1957) incomplete attempt to suppress it) because the type species *Reniera aquaeductus* Schmidt, 1862, is ill known. Doubts exist over the genuineness of the type specimen preserved in the Strassbourg Museum (cf. TOPSENT, 1925: 714). SCHMIDT's (1862) description of the species mentions a unispicular reticulum as the basic skeletal plan, while TOPSENT (loc. cit.) and GRIESSINGER (1971) in their redescriptions mention multispicular primary lines. SCHMIDT's description strongly points to what is now known as *Haliclona mediterranea* Griessinger, 1971, and many authors (e.g. VOSMAER, 1935: pl. 60 fig. 3) identified this species under the name of *Reniera* (*Haliclona*) *aquaeductus*. Only the spicule size of SCHMIDT's specimen (extrapolated from his (1868) pl. 7 fig. 6) is somewhat higher than normally found in *Haliclona mediterranea*, and thus forms the thin basis for GRIESSINGER's assumption that both are generically distinct. Unfortunately, additional specimens similar to the Strassbourg specimen have never been found or described since, so *Reniera* as a genus name rests on a very unstable base.

WIEDENMAYER (1977a) used *Reniera* as a subgenus of *Haliclona* for species with a unispicular skeleton with scarce spongin, based on his assumption that *Reniera aquaeductus* was conspecific with what is known as *Haliclona mediterranea*. I did not follow him, as GRIESSINGER made it amply clear that his *H. mediterranea* is not generically distinct from *Haliclona oculata* (Pallas, 1766), the type species of *Haliclona*. The best course for the present seems to follow GRIESSINGER in his concepts of *Haliclona* and *Reniera*.

Reniera teligera Topsent (1889) is probably an *Adocia*, close to *A. implexiformis* Hechtel (1965). *Reniera fistulosa* (Bowerbank, 1886) as described from the West Indies by TOPSENT (1889) is not recognizable; redescription is necessary to reveal its identity.

Genus **Adocia** Gray, 1867

Definition: Haliclonidae with a distinct ectosomal, tangential, unilayered reticulum of single spicules bound at the nodes by spongin. No microscleres.

Adocia implexiformis Hechtel, 1965

Adocia neens; De Laubenfels, 1936a: 67, pl. 12 fig. 1. [Non: *Reniera neens* Topsent, 1918: 536.]
Adocia implexiformis Hechtel, 1965: 27, pl. 2 fig. 2, text-fig. 2.
? *Reniera teligera* Topsent, 1889:50.

Curaçao: ZMA POR.3681, 3766 (Piscadera Baai, NW, entrance of narrow bay, on *Rhizophora* and *Ulva*, 29.X.1963, coll. P. Wagenaar Hummelinck, *1495*); 3636 (near Carmabi, reefs, 14.XI.1975, coll. students Prof. Stock); 3680 (near Carmabi, 10 m, reefs, XI.1975, coll. students Prof. Stock); 3863 (Piscadera Baai, NW, narrow bay, on shells and *Rhizophora*, 29.X.1963, coll. Hummelinck, *1494*); 3914 (Piscadera Baai, NW, entrance of bay, 0–1 m, on stones and *Ulva*, 25.XI.1963, coll. Hummelinck, *1497*); 4346 (Piscadera Baai, near entrance, SE, *Rhizophora*, 17.XII.1963, coll. Hummelinck, *1466*); 3699 (Fuikbaai, E-corner, 2 m, muddy stone debris, 5.X.1968, coll. Hummelinck, *1644*).
Bonaire: ZMA POR.3718 (Lac, Awa di Palu Grande, N, 0–0.25 m, sand, 30.VIII. 1967, coll. Hummelinck, *1602B*); 4031 (Lagoen, SW, on *Avicennia*, 19.IX.1967, coll. Hummelinck, *1565*).
Puerto Rico: ZMA POR.3524 (San Cristóbal Reef, near La Parguera, in the sand, 3 m, 10.II.1963, coll. J.H. Stock, PR.60); 4247 (Isla Magueyes, near Parguera on *Rhizophora*, 17.IX.1963, coll. Hummelinck, *1417*); 3503 (Isla Magueyes, mangrove forest, 5.II.1963, coll. Stock, PR.40).

General diagnosis: (Fig. 6, pl. II 3)

Shape, size and consistency: Massive-lobate with numerous thick-walled oscules on lobal apices; often many thin, blind fistules are present. Size up to 15 cm in lateral expansion and up to 4 cm high. Consistency soft, fragile, easily torn.
Colour: reddish or bluish purple alive, beige to off-white in spirit.
Ectosome: a detachable, tangential, unispicular isotropic reticulation of single spicules with nodal spongin, supported by a larger meshed choanosomal reticulation of paucispicular tracts. Subdermal cavities numerous.
Choanosome: uni- to paucispicular lines connected by single spicules. Spongin scarce. Spicules oxea, blunt or sharply pointed, with occasional styles; size: 108-*142*-216 by 3.5–*5.9*–10 µm.

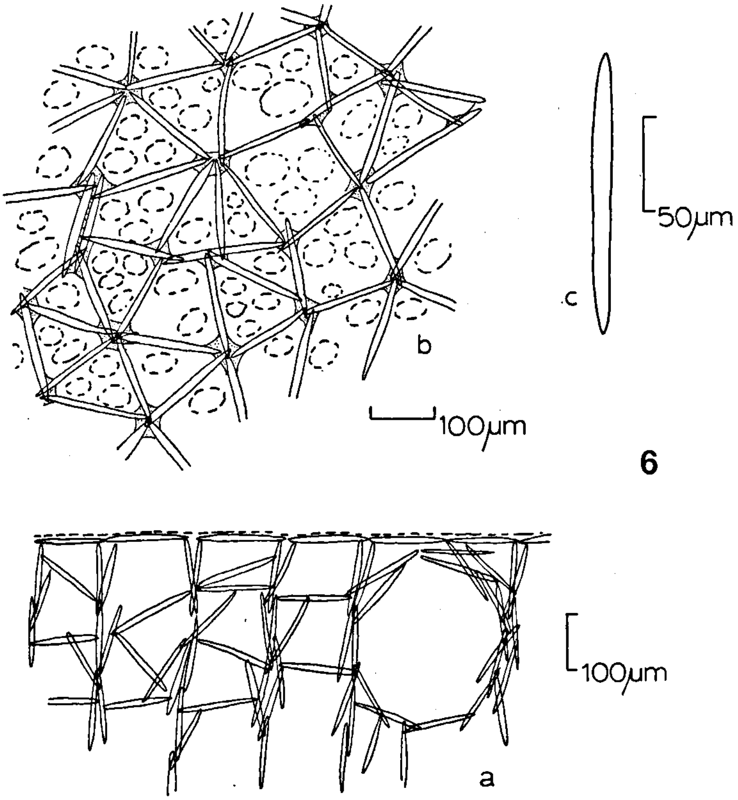

FIGURE 6. *Adocia implexiformis*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

Distribution: Curaçao, Bonaire, Puerto Rico; Jamaica (HECHTEL, 1965), Florida (DE LAUBENFELS, 1936a, as A. *neens*).

Ecology: The majority of the specimens originated from mangrove forests, in accordance with HECHTEL's observations; some specimens have been found on the reefs or on intertidal rocks.

Adocia neens sensu DE LAUBENFELS (1936a) is assigned to this species after examination of a slide of his material in the British Museum (N.H.), reg.no. 1936.7.8.4, and on the basis of colour. DE LAUBENFELS' remarks about its dermal protoplasmic reticulation is somewhat cryptic, but the ectosomal anatomy of *A. implexiformis* fits the general description given by De Laubenfels: the tangential dermal skeleton encloses fields of pores (?= "protosplasmic reticulation"), and the skeleton itself seems to be walled in by a multispicular larger meshed reticulation, which after careful examination appears to be a subdermal supporting system.

DISCUSSION OF THE GENUS *Adocia*

Reniera tubifera George & Wilson, 1919 (also purple or pink) was transferred to *Adocia* by Hartman (1958), but incorrectly in my opinion, as is argumented above.

Adocia albifragilis Hechtel (1965) is described as a thin white incrustation. It may turn out to be conspecific with *A. implexiformis*. In all probability Little's (1963) *A. neens* is referable to Hechtel's species. *Reniera teligera* Topsent, 1889, is difficult to recognize, but could very easily be conspecific with *A. implexiformis;* if this is proven, then *teligera* has priority over *implexiformis*.

Strongylophora amphioxa De Laubenfels, 1950, is here transferred to *Adocia*. A portion of the holotype is preserved in the British Museum (N.H.), reg.no. 1948.8.6.23. It is a soft sponge, with a detachable dermal skeleton, grey in colour. The spiculation consists of oxea of two size categories, 200/6 µm and 105/5 µm. This character fits the genus *Menanetia* Topsent, 1896, but in my opinion this genus is synonymous with *Adocia*. *Strongylophora* is of different consistency and spiculation.

Adocia carbonaria (Lamarck, 1814) is transferred to *Pellina* Schmidt, 1870.

Genus **Sigmadocia** De Laubenfels, 1936

Definition: Haliclonidae with a distinct (though often incomplete) ectosomal tangential, unilayered reticulum of single spicules bound at the nodes by spongin. Microscleres sigmata.

Sigmadocia coerulea Hechtel, 1965

Haliclona coerulescens; De Laubenfels, 1936b: 444. [Non: *Reniera coerulescens* Topsent, 1918.]
Sigmadocia coerulea Hechtel, 1965: 30, pl. 3 fig. 4, text-fig. 5.

Curaçao: ZMA POR.3710 (St.Jorisbaai, S-coast, on mangrove roots, 23.X.1968, coll. P. Wagenaar Hummelinck, *1641*); 3980 (St. Jorisbaai, S-coast, SE, *Thalassia*, 23.X.1968, coll. Hummelinck, *1643*).

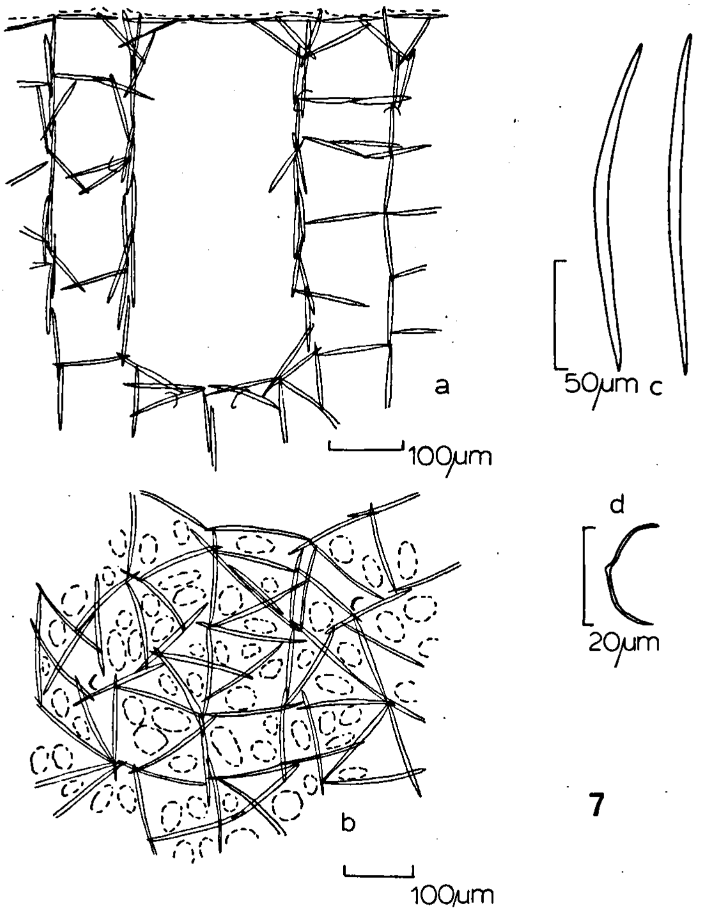

Figure 7. *Sigmadocia coerulea*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: oxea, d: sigma.

PUERTO RICO: ZMA POR.3348 (Cayo Caracoles, off Parguera, S-coast, mangrove roots, 12.II.1963, coll. J.H. Stock, PR.65); 3738 (Mata de la Gata, on *Rhizophora*, 12.IX.1963, coll. Hummelinck, *1419*).

General diagnosis: (Fig. 7, Pl. II 4)

Shape, size and consistency: Massive (with volcanoe-shaped oscular lobes) to irregularly ramose; fistular outcrops common. Oscules with slightly raised collar. Ramose specimens have slightly compressed branches of up to 2 cm in diameter and up to 10 cm in length. Lobate specimens are 2–4 cm in thickness. consistency soft, limp, easily torn.

Colour: blue alive, light beige in spirit.

Ectosome: tangential unispicular reticulum, often somewhat irregular or obscured, never showing the neatness of *Adocia*. Fields of pores, 25 µm in diameter, over entrances to subdermal canals (400–500 µm in diameter), which penetrate the choanosome at right angles to the surface.

Choanosome: cavernous, skeleton consisting of primary lines with 2–4 spicules per cross section, and interconnecting single spicules; often this plan is obscured, the choanosome having a confused subisodictyal reticulation of single spicules. Sigmata moderately rare, seldom abundant.

Oxea: 137–*161*–198 by 3–*5.3*–8 µm. Sigmata: 12–*21.4*–29 µm.

Ecology: This species is known from mangrove roots and intertidal rocks.

Distribution: Curaçao, Puerto Rico; Jamaica (HECHTEL, 1965), Panamá (also Pacific coast, DE LAUBENFELS, 1936b).

Haliclona coerulescens sensu DE LAUBENFELS (1936b) was found to be conspecific with the present species after examination of DE LAUBENFELS' specimen, USNM reg.no. 22240 (kindly sent on loan by Dr. K. RUETZLER). Apparently he overlooked the moderately rare sigmata and the incomplete tangential dermal skeleton.

Sigmadocia piscaderaensis n.sp.

Holotype: ZMA POR. 3666 (CURAÇAO, Piscadera Baai, inner bay, on mangrove roots, 14.XI.1975, coll. students Prof. Stock; a fragment of a massive sponge with the tendency to form volcano-shaped oscular lobes). Paratype: ZMA POR.3676 (same data as the holotype; fragments of a massive sponge).

Additonal material:
CURAÇAO: ZMA POR.4024 (Piscadera Baai, entrance W, 1 m, *Thalassia*, 14.XII.1963, coll. P. Wagenaar Hummelinck, *1463A*); 3745, 3925, 4050 (Piscadera Baai, Boca W, on *Rhizophora*,

14.XII.1963, coll. Hummelinck, *1460*); 4047 (Piscadera Baai, inner bay, near Carmabi, 1-1.5 m, 30.III.1970, coll. Hummelinck, *1671A*); 3847 (Piscadera Baai, Boca W, on *Rhizophora*, 14.XII.1963, coll. Hummelinck, *1461*).

Description: (Fig. 8, Pl. III 1)

Shape, size and consistency: Massive sponges with the general habit like that of *S. coerulea*, though ramose forms have not been found. Fistular outcrops common. Consistency soft, limp, easily torn. All specimens are fragmented.
Colour: greyish yellow to greyish light brown alive, light brown in spirit.
Ectosome: irregular, ill-developed tangential unispicular reticulum with large oval pores, 150–250 µm in diameter. Perpendicular subdermal canals absent or obscured.
Choanosome: crumb-of-bread like, irregular, with many loose spicules strewn at random; vague multispicular tracts present. Extremely numerous sigmata. Oxea: 165–*186.5*–216 by 5–*7.2*–9.5 µm. Sigmata: 7.5–*9.6*–12 µm.

Ecology: Growing on mangrove roots and in seagrass beds.

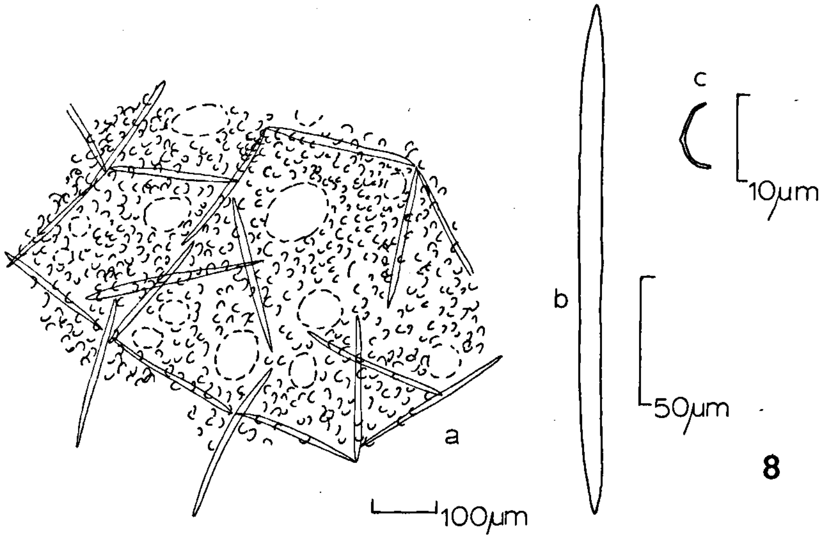

FIGURE 8. *Sigmadocia piscaderaensis*, n.sp., a: tangential view of ectosome, b: oxea, c: sigma.

Distribution: The new species is known only from Piscadera Baai, Curaçao.

Etymology: Named after its type locality.

Although *Sigmadocia piscaderaensis* is very similar to *S. coerulea*, two characters separate it sharply: life colour, described as greyish yellow or greyish light brown (as compared to blue in *S. coerulea*), and the small size of the sigmata (twice as small as those of *S. coerulea*). Other less striking differences are the more confused choanosome, the larger megascleres, and the great abundance of the microscleres in *S. piscaderaensis*. The new species, by its ill-developed ectosomal skeleton, approaches the genus *Gellius* very closely. However, until the relationships of *Sigmadocia, Adocia, Reniera* and *Gellius* have been investigated, I prefer to keep the present species in *Sigmadocia*.

DISCUSSION OF THE GENUS *Sigmadocia*

A third West Indian *Sigmadocia* has been described by WIEDENMAYER (1977a: 111). *S. recondita* is characterized by dark purplish life colour, spongin rich, fairly stout skeletal fibres and large sigmata (30 µm on the average), thus differing strongly from both above described species. WIEDENMAYER's species needs comparison to *Niphates* or *Gelliodes* of the family Niphatidae.

Reniera seems to be close to *Sigmadocia*, the only difference being the presence of sigmata in the latter. In other Haplosclerid genera this character is variable, so both might prove to be synonymous. For the time being, however, I prefer to keep them separate. *Gellius* Gray, 1867 differs from *Sigmadocia* in the absence of a tangential dermal skeleton. Many described *Gellius*-species may prove to be *Sigmadocia*.

DISCUSSION OF THE FAMILY HALICLONIDAE

The family Haliclonidae is here defined in such a way, that it includes, next to *Haliclona, Reniera, Adocia* and *Sigmadocia*, already treated above, also *Gellius* Gray, 1867, *Orina* Gray, 1867, and *Toxadocia* De Laubenfels, 1936. Of these the latter is not represented in the West Indian fauna, in spite of DE LAUBENFELS' (1936a) reference of the type species of *Toxadocia*, i.e. *Gellius abbreviatus* Topsent, 1918, as a West Indian species. Apparently, DE LAUBENFELS confused San Thomé (= São Tomé, West Africa), on which TOPSENT'S 1918 paper is based, with St. Thomas (Virgin Islands, West Indies); this is also clear from his designation of specimens of *Sigmadocia coerulea* to *Reniera coerulescens* Topsent, 1918, and of specimens of *Adocia implexiformis* to *Reniera neens* Topsent, 1918.

Gellius is represented in the West Indies by an unpublished specimen in the British Museum (N.H.), reg.no. 1937.11.26.16a (labeled *Haliclona flagellifera*, Turneffe Island, British Honduras, coll. J. H. Borley). It is characterized by a *Haliclona*-type of skeleton with paucispicular primary lines and interconnecting single spicules; oxea measure about 150 by 3 µm, the large, strongly convoluted (flagelliform) sigmata measure 60 µm. It is not certainly conspecific with *Gellius flagellifer* Ridley & Dendy, 1887, as the megascleres are smaller than those of the type specimen.

Orina is represented by *Haliclona tenerrima* Burton, 1954 (Turneffe Island). The type specimen has been examined in the British Museum (N.H.), reg.no. 1938.6.30.42. It is characterized by a lobate, though amorphous habit, a unispicular tangential ectosomal skeleton, and a *Haliclona*-type of choanosomal skeleton. Spicules are oxea: 240 by 5.5 µm, sigmata: 10 µm, and toxa: 30–75 µm.

Haliclona calcinea Burton, 1954 (British Museum (N.H.), reg.no. 1938.6.30.31), is referred to *Orina* with hesitation as the spiculation is indeed that of this genus, but the skeletal architecture is quite confused, and a tendency towards the development of a dermal crust as in *Pellina* and *Oceanapia* is observed. The skeleton is quite unlike that of *Orina tenerrima*, mentioned above.

Family **NIPHATIDAE** n. fam.

Definition: Haplosclerida with an ectosomal paratangential (three-dimensional) multispicular reticulation of fibres or tracts, and with a choanosomal reticulation of multispicular fibres or tracts. Microscleres, if present, sigmata.

This family is erected to receive the chalinid sponges with multispicular skeletal fibres or tracts; it includes the genera *Amphimedon, Niphates, Siphonodictyon, Cribrochalina, Hemigellius* and *Haliclonissa*, and probably also *Microxina*.

Genus **Amphimedon** Duch. & Mich., 1864

Synonym: *Pachychalina* Schmidt, 1868.

Definition: Niphatidae with an optically smooth surface, caused by the relatively inconspicuous choanosomal primary fibres. Ectosomal reticulation of uniform mesh size. Spongin dominating. No microscleres.

Type species: *Amphimedon compressa* Duch. & Mich., 1864 (per De Laubenfels, 1936).

Amphimedon is here restored to generic rank, following the course taken by Wiedenmayer (1977), who used the name for a subgenus of *Haliclona.* The possession of a tangential reticulation of sorts found in this group of species is thought to be of such weight, that it is proposed here to consider it a separate genus and to remove it out of the Haliclonidae into the Niphatidae.

Amphimedon compressa Duch. & Mich., 1864

Amphimedon compressa Duchassaing & Michelotti, 1864: 78, pl. 17 fig. 2.
Amphimedon arborescens Duchassaing & Michelotti, 1864: 79, pl. 14 fig. 2.
Spongia rubens; Duchassaing & Michelotti, 1864: 41, pl. 10 fig. 1.[Non *Spongia rubens* Pallas, 1766]
Haliclona compressa; Wiedenmayer, 1977a: 82, pl. 12 figs. 3–4, text.-fig. 112.
Haliclona rubens; Pomponi, 1976: 220; Green, 1977: 86, fig. 7.
For additional synonyms, cf. Wiedenmayer, 1977a.

Lectotype (per Wiedenmayer, 1977a): ZMA POR.863 (*Amphimedon compressa* Duch. & Mich., 1864, St. Thomas). Paralectotype: Mus.Turin POR.no. 35 (St. Croix). Schizoparalectotype: BMNH reg.no. 28.1.12.42.

Redescription of the lectotype: (Pl. III 2)

Flabelliform, 13 x 7 x 2.5 cm, with rows of oscules on the upper and side rims, diameter 2–6 mm; a few oscules are present on the flattened parts. Surface smooth on the flattened parts, tuberculate and ridged on the rims. Consistency: hard (dry state). Colour: dark brown. The smooth surface is caused by the presence of an incomplete irregular, but definite, tangential reticulum overlying the choanosomal canals. Meshes of the dermal skeleton 100–200 µm. Diameter of the choanosomal canals about 1 mm or less. On the rim the dermal reticulum is absent, the surface presenting coarse tubercles and ridges separating the choanosomal canals. Choanosomal skeleton a tight meshed, fairly irregular reticulum of ascending and interconnecting spongin fibres. Ascending fibres 50–80 µm in diameter, cored by 15 or more spicules, secondary fibres irregular, 20–30 µm in diameter. Oxea: 140–167 / 3.5–5.5 µm.

Lectotype of *Amphimedon arborescens* Duch. & Mich., 1864: ZMA POR.878 (St. Thomas). Paralectotypes: BMNH reg.no. 28.11.12.40–41 (Turin specimen apparently lost).

The holotype of *A. arborescens* var. *ensiformis* Duch. & Mich., 1864, is in the Turin Museum, POR.39.

Redescription of the lectotype of *Amphimedon arborescens*: (Pl. III 3).
Three branches, blackish brown in colour, 27 cm high and 1.5 cm in diameter, with a common base of 3.5 cm high. Oscules scattered over branches and base, 3–6 mm in diameter. Branch apices somewhat broadened and flattened, shaggy, surface smooth, caused by a fairly continuous ectosomal reticulum, which covers the terminations of the choanosomal canals. Ectosomal reticulum microtuberculate, irregular; meshes 150–300 µm. Choanosomal skeleton a reticulum of radial-plumose ascending fibres, 70–110 µm in diameter, and irregular interconnecting fibres, 10–20 µm in diameter. Coring of ascending fibres 10–20 spicules per cross-section. Spicules 134–155 / 2.5–5 µm.

Redescription of *Spongia rubens*; Duch. & Mich., 1864, ZMA POR.2254, St. Thomas: (Pl. III 4)
Two branches, reddish brown in colour, 20 cm long, with a common base. Oscules scattered, 2–4 mm in diameter, flush with the surface. Ectosomal reticulum irregular, meshes 100–300 µm in diameter formed by fibres 30–50 µm in diameter. Choanosomal skeleton with radiating ascending fibres, showing a tendency to become fascicular, 40–110 µm in diameter, cored by 8–18 spicules per cross-section; interconnecting fibres 30–50 µm, cored by 1–12 spicules per cross-section. Many loose spicules and a great proportion of smaller growth stages among them. Oxea: 116–145 / 4–6 µm.

St. Martin: ZMA POR.3489 (Little Bay, 2 m, 3.II.1959, coll. J. H. Stock, 188).
Anguilla: ZMA POR.4357 (Crocus Bay, 2 m, 20.IV.1978, coll. S. Weinberg).
Puerto Rico: ZMA POR.3341 (8.7 km S of Parguera, shelf edge, 20–35 m, 23.II.1963, coll. Stock, PR.103); 3321 (Margarita Reef, SW of Parguera, 6–8 m, 2.II.1963, coll. Stock, PR.25); 3506 (Punta Cadena, NW of Mayagüez, 3 m, 28.I.1963, coll. Stock).

General diagnosis: (Fig. 9, Pl. IV 1–2)
Shape, size and consistency; Ramose to flabelliform, up to 45 cm high. Branches circular in cross-section, 1.5 cm in diameter. Oscules mostly flush with the surface, scattered over the branches, 2–8 mm in diameter. In flabelliform specimens the oscules are concentrated on the rims. Surface superficially smooth, microscopically hispid, occasionally ridged and tuberculate. Consistency toughly spongy, compressible, not easily torn.
Colour: pinkish to brownish red alive; this colour persists in spirit and in the dry state.
Ectosome: an irregular, often incomplete paratangential reticulation of spongin fibres cored by spicules covers most of the surface, obscuring the terminations of the choanosomal canals (cf. also Wiedenmayer, 1977a: pl. 13 fig. 3). Mesh width 100–300 µm, fibre diameter 20–90 µm.
Choanosome: cavernous, with a regular system of canals with a diameter of about 1 mm at the surface. Skeleton a tight meshed, radially-plumose

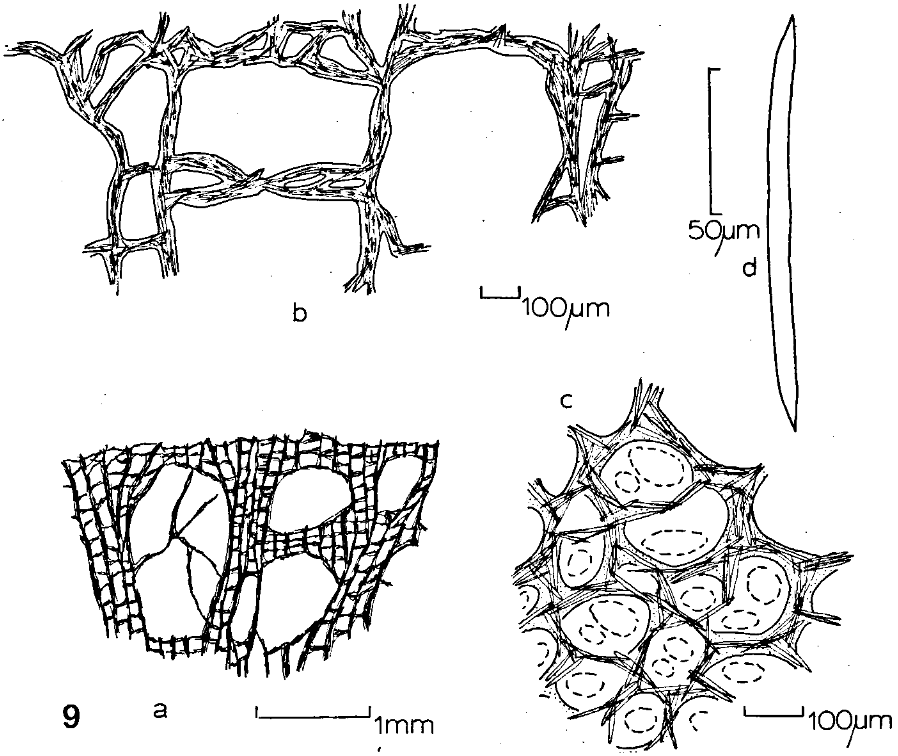

FIGURE 9. *Amphimedon compressa*, a: perpendicular section, b: detail of perpendicular section of peripheral parts of the skeleton, c: tangential view of ectosome, d: spicule.

reticulum of pronounced ascending fibres interconnected by quite irregular secondary fibres. Ascending fibres rich in spongin, 30–110 µ in diameter, cored by 1–12 spicules per cross section. Spicules oxea, with a few strongylote and stylote forms; size (only full-grown spicules measured): 116–*146.5*–174 by 2.5–*4.8*–7.5 µm.

Ecology: Confined to the reef community, 2–35 m.

Distribution: St. Thomas, St. Martin, Anguilla, Puerto Rico; Guadeloupe, St. Barthélemy, St. Croix, Tortola, Vieques, Hispaniola, Cuba, Bahamas (Carter, 1882 as *Chalina rubens;* Wiedenmayer, 1977a as *Haliclona compressa*), Florida (De Laubenfels, 1936a as *Haliclona subtriangularis*; Storr, 1964 as *Haliclona rubens*), México (Green, 1977 as *Haliclona rubens*).

WIEDENMAYER (1977a) convincingly argued that *Spongia rubens* Pallas, 1766 is unrecognizable and should not be associated with the present species, well known since DUCH. & MICH.'s (1864) descriptions. *Amphimedon compressa* is now well established by several type specimens. It is remarkable, that this common species was not found on the Curaçao reefs so far.

Amphimedon viridis Duch. & Mich., 1864

Amphimedon viridis DUCHASSAING & MICHELOTTI, 1864: 81, pl. 16 figs. 2–3.
Haliclona viridis; POMPONI, 1976: 218, figs. 1–3.
For further synonymy cf. WIEDENMAYER, 1977a: 83.

Lectotype (per DE LAUBENFELS, 1950): BMNH reg.no. 28.11.12.36 (portion of a Turin specimen, Mus.Turin POR.no. 40). Paralectotype: BMNH reg.no. 28.11.12.35 (portion of a Turin specimen, also Mus.Turin POR.no. 40). Since it cannot be ascertained from which Turin specimen the lectotype was taken, the Turin specimens must both be designated paratypes.
Type locality: ST. THOMAS.

CURAÇAO: ZMA POR.3591 (Awa di Oostpunt, 21 m, 17.III.1974, coll. J.H. Stock); 3597 (Barbara Beach, on sandy bottom, 2 m, 6.XI.1975, coll. students Prof. Stock); 3629 (Awa di Oostpunt, 0.5 m, 17.III.1974, coll. Stock); 3696 (Fuikbaai, on stones in muddy environment, 2 m, 5.X.1968, coll. P. Wagenaar Hummelinck, *1694*); 3960 (on *Millepora*, 1883, coll. S.J. Mertens); 4027 (Piscadera Baai, middle part SW, on *Rhizophora*, 13.XII.1963, coll. Hummelinck, *1473*).
MARGARITA: ZMA POR.4065 (Estación Punta de Piedras, on poles, 12.I.1964, coll. Hummelinck, *1447*); 4358 (Punta Mosquito, beach worn, 29.V.1978, coll. S. Weinberg & J. H. Stock).
MARTINIQUE: ZMA POR.4151 (Anse de l'Âne, Trois Islets, sand and rocks, 10.II.1964, coll. Hummelinck, *1439*).
GUADELOUPE: ZMA POR.4365 (Port Louis, 1 m, sandy, V.1978, coll. S. Weinberg).
PUERTO RICO: ZMA POR.4012 (Mata de la Gata, off Magueyes, on *Rhizophora*, 12.IX.1963, coll. Hummelinck, *1419*); 4265 (Isla Magueyes, on *Rhizophora*, 17.IX.1963, coll. Hummelinck, *1447*).
FLORIDA: ZMA POR.3896 (Virginia Key, NE-coast, 0.5–1.5 m, *Thalassia* bed, 4.IX.1963, coll. Hummelinck, *1408*); 4010 (Key Biscayne, N-point, *Thalassia* bed, 1.IX.1963, coll. Hummelinck, *1410*); 4264 (E of Soldier Key, 2 m, sand flat with sea grass, 5.IX.1963, coll. Hummelinck, *1413*); 3691 (Key Biscayne, NE-tip, beachrock, 7.IX.1963, coll. Hummelinck, *1411*).

General diagnosis: (Fig. 10, Pl. IV 3)

Shape, size and consistency: Rounded masses or repent thick branches, often with volcanoe-shaped oscular elevations, though oscules may also be flush. Thickness 2 cm or more; conical elevations 1.5–2 cm high; diameter of repent branches about 2 cm. Oscules 3–8 mm in diameter, with thin edges, which may be raised into a collar. Surface superficially smooth, microhispid. Consistency fairly soft, fairly easily torn.

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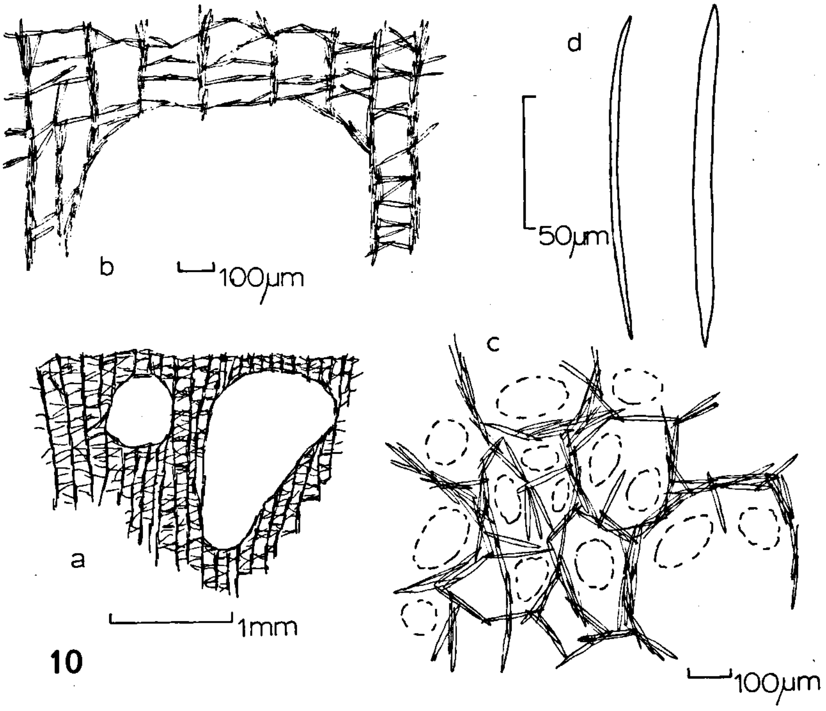


FIGURE 10. *Amphimedon viridis*, a: perpendicular section, b: detail of perpendicular section of peripheral parts of the skeleton, c: tangential view of ectosome, d: spicules.

Colour: (dark) green alive and in spirit.

Ectosome: Like in *A. compressa* an incomplete paratangential skeletal reticulation is present, although many choanosomal primaries protrude beyond it. Meshes of dermal reticulum 100–600 µm in diameter, fibres 25–70 µm in diameter. Dermal pores 40–120 µm in diameter.

Choanosome: cavernous, with many subdermal cavities. Skeletal fibres contain little spongin, when compared to *A. compressa*. The reticulum is small meshed (80–200 µm), and fairly irregular. Ascending fibres 20–100 µm in diameter, consisting of 3–10 spicules per cross-section cemented by spongin; interconnecting fibres 5–20 µm in diameter, often indistinct, consisting of 1–5 spicules per cross-section. Loose spicules abound. Oxea acerate, occasionally hastate, strongylote or stylote; size variations remarkably great: 115–*153.0*–180 by 2–*6.8*–12 µm.

Ecology: This species seems to favour lagoons, but is otherwise quite euryoecious (mangroves, sea grass fields, rocks, reefs).

Distribution: St.Thomas, Curaçao, Margarita, Martinique, Guadeloupe, Puerto Rico, Florida; Bahamas (DE LAUBENFELS, 1949; WIEDENMAYER, 1977a), Bermuda (DE LAUBENFELS, 1950), North Carolina (WELLS et al., 1960), Gulf Coast (LITTLE, 1963), Indo Pacific waters (BURTON, 1937 as *Hemihaliclona viridis*; DE LAUBENFELS, 1954).

The skeletal architecture of *Haliclona erina* De Laubenfels, 1936b is similar to that of *A. viridis* (slides of the type specimen, USNM 22245, were kindly sent on loan by Dr. RUETZLER). Points of difference are a stiffer consistency, the ramose habit and the thickness of the spicules (average 10 µm). *H. erina* is here assigned to *Amphimedon*, although both green species are not typical for the genus. For the time being BURTON's (1937) Indian Ocean record of the species and DE LAUBENFELS' (1954) Pacific record are considered valid; future studies will have to decide, whether this species is truly cosmotropical.

Amphimedon complanata (Duchassaing, 1850)

Spongia complanata DUCHASSAING, 1850: 26; DUCHASSAING & MICHELOTTI, 1864: 37.
Spongia fusca DUCHASSAING & MICHELOTTI, 1864: 38.
Spongia manus DUCHASSAING & MICHELOTTI, 1864: 39, pl. 5 figs. 1–2.
Pachychalina variabilis DENDY, 1887: 504; 1890: 353, pl. 58 fig. 3, 60 fig. 2.
Haliclona (*Amphimedon*) *complanata*: WIEDENMAYER, 1977a: 86 (with additional synonyms).
? *Spongia crassiloba* LAMARCK, 1814: 374, redescribed as *Chalina crassiloba* by TOPSENT, 1930: 21, pl. 2 figs. 4–5.

It is uncertain whether or not DUCHASSAING's (1850) material was included in the DUCH. & MICH. (1864) material. If so, then the only extant type material is a fragment incorporated in the BMNH reg.no. 28.11.12.63.
The only extant type specimen of *Spongia fusca* is ZMA POR.2086; of *S. manus* there is a specimen in Turin (Mus.Turin POR.no. 113), designated lectotype herein, a fragment of it in London, BMNH reg.no. 28.11.12.78, designated schizolectotype herein, and a specimen in Amsterdam (ZMA POR.2095), designated paralectotype herein.

Redescription of the lectotype of *Spongia fusca* Duch. & Mich., 1864, ZMA POR.2086, ST. THOMAS: (Pl. IV 4)
Massive to flabelliform (not ramose). Oscules on the rims small (0–3 mm in diameter), flush with the surface; those on the sides are few in number, have raised collars and are larger (about 4 mm). Surface irregular, rough. Ectosomal paratangential reticulation only present in a few spots. Choanosomal skeleton trabecular, regular. Ascending fibres 30–50 µm, all cored with 4–7 thin spicules, interconnecting fibres 10–30 µm, mostly uncored, 1–4 spicules if

cored. Meshes rectangular, 50–300 µm. Spicules strongylote, thin, very uniform in size: 70–75 / 0.5–1 µm. The skeletal characteristics are similar to those of *Spongia complanata.*

Redescription of the paralectotype of *Spongia manus* Duch. & Mich., 1864 (ZMA POR.2095), St. Martin: (Pl. V 1)

Ramose, upright branches, 15 cm high, 1 cm in diameter. Tendency to become flabelliform. Oscules numerous, 2–3 mm in diameter, scattered all over. No ectosomal reticulation could be found, the surface being uniformly microhispid. Choanosomal skeleton regularly trabecular. Ascending fibres 40–70 µm in diameter with a tendency to become fasciculate, cored by 0–8 spicules per cross-section (often uncored). Interconnecting fibres 8–20 µm in diameter cored by 0–3 spicules (mostly uncored). Meshes rectangular or rounded, 70–300 µm in diameter. Spicules thin, hastate oxeas, sometimes flexuous, 70–93 / 1–1.5 µm. No interstitial spicules.

New Providence: ZMA POR.4045 (between Hog Island and Athol Island, 2–3 m, sandy area with *Thalassia* and some *Syringodium,* 16.VIII.1949, coll. P. Wagenaar Hummelinck, *1149*; piece of branch).

General diagnosis: (Fig. 11, Pl. IV 4, Pl. V1)

Shape, size and consistency: Massive to ramose sponges with a strong

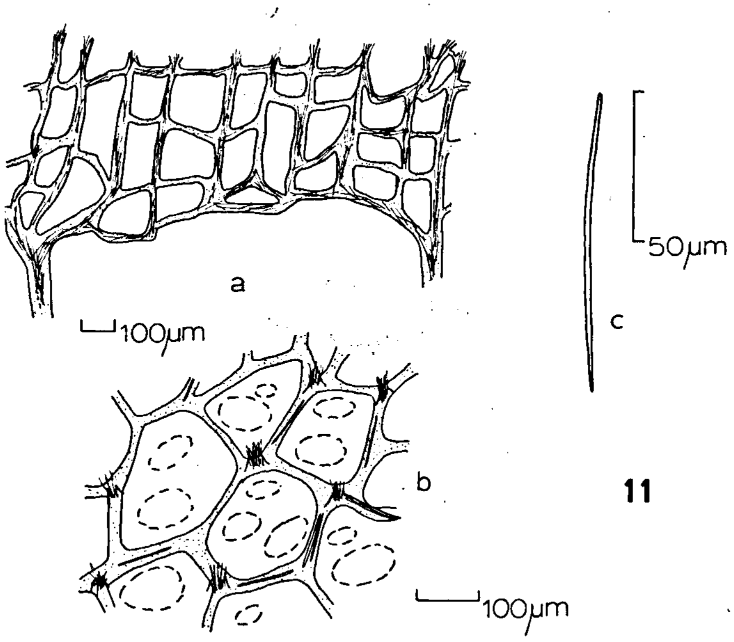


Figure 11. *Amphimedon complanata,* a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

tendency towards a flabelliform habit. Oscules 2–4 mm. Size up to 15 cm high. Consistency fairly hard in dry condition.
Colour: apparently dark purple to black (cf. DUCH. & MICH., 1864: pl. 5); more definite life colour observations are lacking; (dark) brown in dry condition.
Ectosome: surface smooth to microhispid. Paratangential reticulum sometimes weakly developed.
Choanosome: skeleton regular to somewhat confused, with spongin dominating. Ascending fibres 30–70 µm, cored by 0–8 spicules per cross section; interconnecting fibres 8–30 µm, cored by 0–4 spicules per cross section (often uncored). Meshes rectangular, 50–300 µm in diameter. Spicules thin, strongylote: 70–120 / 0.5–3 µm.

Ecology: The only available data point to occurrence in sea grass fields. It is apparently quite rare.

Distribution: St.Thomas, St.Martin, New Providence; Guadeloupe, Tortola, Bahamas (DENDY, 1887, 1890, as *Pachychalina variabilis*).

I agree with WIEDENMAYER (1977a), that *Pachychalina variabilis* Dendy, 1887 is synonymous with the present species, although the spicules (examined in a slide made from one syntype, BMNH reg.no. 1887.4.26.15, kindly sent on loan by Miss S. M. STONE), are longer and thicker (120 / 3 µm) than in the DUCH. & MICH. specimens. However, the skeletal fibres (dominated by spongin) and the habit are quite similar, so there is little doubt that these specimens are all conspecific.

Spongia crassiloba Lamarck, 1814 seems to be quite close to the present species, although spicules (judging from a slide of the holotype kept in the British Museum (N.H.), reg.no. 1954.2.20.69) are quite rare in the fibres. This, and the fact that the origin of LAMARCK's specimen was Indo Pacific, makes me reluctant to synonymize *A. complanata* with it.

DISCUSSION OF THE GENUS *Amphimedon*

The three species mentioned above are the only certain members of this newly resurrected genus in the West Indies; very probably also *Haliclona erina* De Laubenfels is an *Amphimedon*. WIEDENMAYER (1977a) also named *Haliclona pellasarca* De Laubenfels, 1934 as a member, but I examined the holotype (and only specimen) of this species (USNM 22336, kindly sent on loan by Dr. K. RUETZLER), and found it to be widely different from *Amphimedon* (cf. below section on Nepheliospongiidae).

Pachychalina Schmidt (1868) is here considered to be synonymous with *Amphimedon* rather than with *Niphates* Duch. & Mich., 1864, as WIEDENMAYER (1977a) suggested. The type species, *P. rustica* Schmidt, 1868, is ill known; from the redescription of TOPSENT (1938) it is gathered, that its skeleton is similar to that of *Amphimedon*, although a tangential ectosomal skeleton was not found. As has been shown above, this is not uncommon in West Indian *Amphimedon* species. PULITZER-FINALE & PRONZATO (1978) redescribed *P. rustica* from the Mediterranean; from this and from a personal communication of Dr. PULLITZER-FINALE, I feel confident, that *P. rustica* is congeneric with West Indian *Amphimedon*.

Amphimedon is a name unused for over a century, and one might well ask whether it should not be suppressed as a *nomen oblitum* in favour of *Pachychalina*. However, *Pachychalina* has very probably been compromised in older literature, to such an extent that it is doubtful whether it can be regarded as a well-established genus in the sense of the I.C.Z. (recognizably described in the past 50 years by at least five different authors and in at least ten different publications). I propose to apply the priority rule and use *Amphimedon* as a senior synonym of *Pachychalina*.

It is to be expected that many described species of *Chalina* and *Pachychalina* from Indo Pacific waters will be found to belong to *Amphimedon*. Several *Pachychalina* species reported from the West Indies, e.g. those of VERRILL (1907) and WILSON (1902) are perhaps also to be referred to *Amphimedon* (*Pachychalina monticulosa* Verrill, 1907 and *P. millepora* Verrill, 1907 are good examples), but their further identity is hard to assess from their description.

Of the recovered DUCH. & MICH. *Amphimedon*-species, excepting those mentioned above, *A. variabilis* is referred to the Keratose genus *Dysidea* Grant, 1835 (cf. VAN SOEST, 1978), *A. nolitangere* is referred to the Poecilosclerid genus *Neofibularia* Hechtel, 1965 (cf. HARTMAN, 1967), and *A. ferox* to the Axinellid genus *Ectyoplasia* Topsent, 1930 (cf. WIEDENMAYER, 1977a). The remaining species, *A. dilatata* and *A. leprosa* are not represented by extant type specimens and should be pronounced unrecognizable.

Genus **Niphates** Duch. & Mich., 1864

Definition: Niphatidae in which the paratangential ectosomal reticulation of fibres or tracts is obscured by protruding tufts of the choanosomal primaries; microscleres rare sigmata.

Type species: *Niphates erecta* Duch. & Mich., 1864.

Niphates erecta Duch. & Mich., 1864

Synonymy: cf. Wiedenmayer (1977a: 96). In addition:
Haliclona variabilis; Pomponi, 1976: 221, fig. 4–6.
Gelliodes ramosa; Alcolado, 1976: 4.

Lectotype (per Wiedenmayer, 1977a): ZMA POR. 1633, St.Thomas.
Paralectotype: Mus. Turin POR. no.51.

Redescription of the lectotype: (Pl. V 2)

Two branches of 15 cm long, now fragmented. Diameter 1.5–2 cm, oscules 4–7 mm, scattered over the branches. Surface conulose. Consistency fragile. Ectosomal reticulation absent in most places. Main skeleton with primaries 50–90 µm in diameter, cored by up to 18 spicules per cross-section; fascicules of primaries 150–220 µm in diameter; connecting fibres 40–90 µm, cored by up to 15 spicules. Skeletal meshes 100–400 µm in diameter. Spicules: magascleres oxeote, 154–*171.4*–186 by 5.0–*5.3*–5.5 µm; microscleres sigmata, 14–*16*–19 µm.

St. Thomas: ZMA POR.1428 (Duch. & Mich. material labeled incorrectly "*Hyrtios proteus*", probably belonging to one of the described *Niphates*-species).
Curaçao: ZMA POR.2680 (1883, no further data); 3304 (Barbara Beach, 3 m, 17.I.1974, coll. J. H. Stock, 74–104); 3305 (500 m W of Piscadera, reefs, 40 m, 22.III.1974, coll. Stock, 74–151); 3306 (500 m W of Piscadera, 32–40 m, 19.XII.1973, coll. Stock, 73–39); 3314 (500 m W of Piscadera, 20–28 m, 26.XI.1973, coll. Stock, 73–23); 3315 (500 m W of Piscadera, 10–18 m, 26.XI.1973, coll. Stock, 73–17), 3518 (near Carmabi, 10–25 m, 10.XII.1975, coll. E. Westinga); 3614, 3621 (Blauwbaai, 15–20 m, XI.1975, coll. S. Weinberg & E. Westinga); 3634 (Barbara Beach, 3 m, 18.I.1974, coll. Stock); 3642 (outside of Jan Thiel Baai, 23–32 m, 16.XI.1975, coll. students Prof. Stock); 3644 (near Carmabi, 18–20 m, 14.XI.1975, coll. students Prof. Stock); 3646 (Piscadera Baai, near 1st buoy, 40 m, 22.III.1974, coll. Stock); 3647 (Blauwbaai, 20–30 m, XI.1975, coll. Weinberg & Westinga); 3648 (near Carmabi, 11–14 m, 16.XI.1975, coll. students Prof. Stock); 3653 (near Carmabi, 18–20 m, 14.XI.1975, coll. students Prof. Stock); 3877 (500 m W. of Piscadera, 35 m, 13.XI.1975, coll. students Prof. Stock).
Bonaire: ZMA POR.3733 (Lac, Secu di Sorobon, 250 m N of Sorobon Point, 0.1–0.5 m, 21.VIII.1967, coll. P. Wagenaar Hummelinck, *1566*).
Colombia: ZMA POR.3944 (Carthagena, XII.1921, coll. J. Metzelaar).

General diagnosis: (Fig. 12, Pl. V 2–4)

Shape, size and consistency: Ramose, with single, solid branches up to 30 cm long, 2 cm in diameter. Branches mostly undivided over most of their length, rarely grouped into anastomosing complexes. Apically the branches may develop digitations. Surface optically smooth to extremely conulose-spinous; this often occurs patchlike in the same specimen. In conulose-spinous areas the dermal skeleton is obscured or absent. Oscules distributed irregularly, 2–7 mm in diameter, mostly flush with the surface, sometimes with slightly raised rim. Consistency: stiffly, spongy, tough, but easy to cut. Almost invariably heavily infested with *Parazoanthus*.

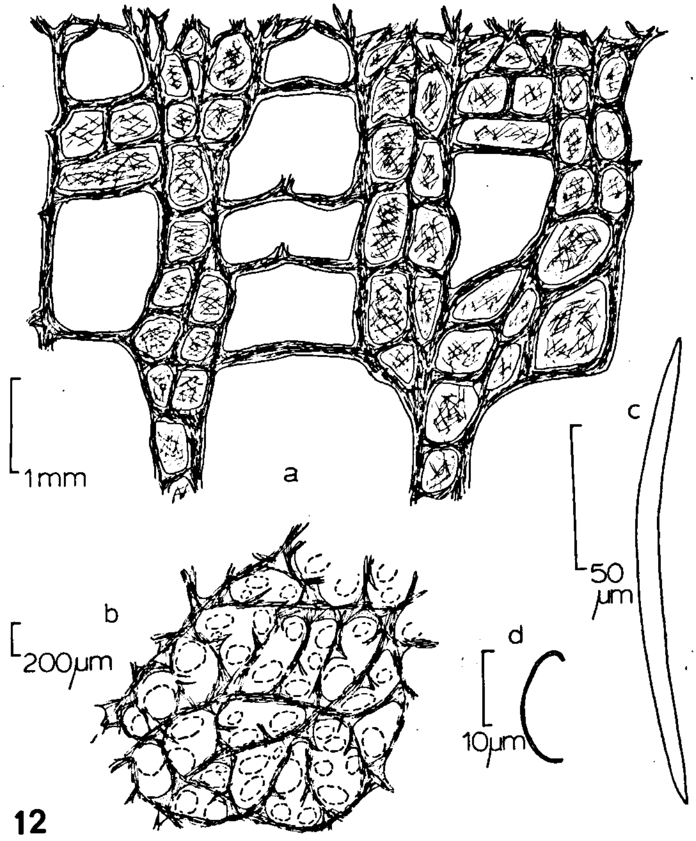


FIGURE 12. *Niphates erecta*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: oxea, d: sigma.

Colour: light purple, pinkish purple, lilac, greyish brown or drab alive; light brown in spirit.
Ectosome: Ectosomal skeleton a polygonally meshed, paratangential reticulum of multispicular fibres, similar to those of the choanosome. Ectosomal skeleton often incomplete, obscured or ill-developed. Pores 70–150 µm.
Choanosome: The basic skeletal plan is irregularly radiating, the longitudinal primary fibrofascicles give off individual primaries deviating to the periphery. Fascicles up to 400 µm in diameter. Primaries 55–100 µm in diameter (cored by 6–20 spicules per cross-section). Lying at distances of 200–450 µm near the periphery. Interconnecting fibres barely narrower than the primaries, 50–80 µm in diameter, cored by 4–15 spicules. Meshes rounded to angular. Spongin strongly developed, completely enveloping the spicule core. Megascleres: oxeote to strongylote forms, mostly slightly curved; rarely centrotylote modifications are found; size: 154–*180.0*–232 by 2.5–*5.9*–9 µm. Many thin growth stages are present. Microscleres: thin sigmata, often absent, 12–*15.6*–19 µm.

Ecology: Known only from the reef community.

Distribution: St. Thomas, Curaçao, Bonaire, Colombia; Barbados (HECHTEL, 1969, as *Gelliodes ramosa*), Tortola, Vieques, Jamaica (HECHTEL, 1965, as *Gelliodes areolata*), Cuba (ALCOLADO, 1976, as *Gelliodes ramosa*), Bermuda (DE LAUBENFELS, 1950, as *Haliclona variabilis*), México (GREEN, 1977, as *Gelliodes areolata*).

WIEDENMAYER's (1977a) excellent treatment of this species leaves little doubt over its identity. It is one of the most common forms on the Curaçao reefs.

A peculiar feature of this species and of the genus is the rarity or absence in many specimens of the microcleres. In the present collection 5 out of 22 samples contained sigmata, which is rather in accordance with HECHTEL's (1965) data (1 out of 6). No regional distribution of sigmata-bearing individuals is found, as 2 out of 19 samples from Curaçao contained sigmata.

Niphates digitalis (Lamarck, 1814)

Tuba pavonina DUCHASSAIN & MICHELOTTI, 1864: 50, pl. 9 fig. 1.
Dasychalina cyathina; POMPONI, 1976: 222, fig. 5.

Gelliodes cyathina; ALCOLADO, 1976: 4.
For further synonyms cf. WIEDENMAYER, 1977a: 97.

Redescription of the lectotype of *Tuba pavonina* Duch. & Mich., 1864: ZMA POR.2413, ST. THOMAS (designation by WIEDENMAYER, 1977a): (Pl. VI 1)

Flabelliform mass of four anastomosing tubes and one closed fistule. Size 9 cm high, 1–2 cm thick. Individual tubes are not cone-shaped but equally wide over their whole length. Apical vents 5–15 mm in diameter, thick-walled. Surface conulose, porose. Ectosomal skeleton only found on the base of the sponge. Main skeleton with meshes of 100–300 µm in diameter, primaries up to 100 µm in diameter (cored by up to 10 spicules), connectives 40–60 µm in diameter (cored by up to 7 spicules). Oxea: 180–*189.0*–198 by 6–*6.4*–7 µm. No microsleres.

ST. THOMAS: ZMA POR.2408 (DUCH & MICH. specimen labeled "*Tuba digitalis*"); 2677 (DUCH & MICH. specimen labeled "*Spongia occidentalis*"; this is not a name used by DUCH. & MICH., so apparently some mistake has been made; the specimen is of the *pavonina*-form).

General diagnosis: (Pl. VI 1–2)

As the present material only contains old, dry DUCH. & MICH. specimens, I have to rely on WIEDENMAYER's (1977a: 97) extensive descriptions for many details of this species.

Shape, size and consistency: Typical specimens are tapering cups, up to 19 cm high, up to 14 cm in diameter. The apical vent, with sharp rim, is mostly laterally flattened. Outer surface fairly smooth to extremely conulose or spinous. Oscules on the inside of the cup. Specimens of the fo. *pavonina* are anastomed flabelliform masses of tubes with round apical vents, and the same surface characters as the typical form. Apical vents in fo. *pavonina* are 3–8 mm, thick-walled. Consistency firm, spongy.

Colour: light bluish to greyish green, occasionally purplish grey (WIEDENMAYER, 1977a).

Ectosome: paratangential reticulation of fibres often ill developed or present only locally.

Choanosome: skeleton irregularly radial-plumose as in *N. erecta.* The inner cup wall shows distinct longitudinal fibrofascicules. Megascleres oxea: 174–*183.7*–198 by 5–*6.1*–7 µm. Microscleres thin sigmata 17–*18.7*–22 µm (found only in the typical specimen, noth in both *pavonina*-forms).

Ecology: Known only from reef localities and rocky platforms (WIEDENMAYER, 1977a).

Distribution: St. Thomas; Guadeloupe, St. Martin, St. Croix, Tortola, Vieques (DUCH. & MICH., 1864, as *T. digitalis, T. pavonina, T. incerta, T. crispa*), Cuba, Bahamas (CARTER, 1882, as *Tuba vaginalis* including var. *villosa;* WIEDENMAYER, 1977a), Florida (DE LAUBENFELS, 1936a, and POMPONI, 1976, as *Dasychalina cyathina*).

WIEDENMAYER's treatment of *Tuba pavonina* Duch. & Mich. as a growth form of this species is adopted here, as his observations of young *N. digitalis* (lobate with apical thick-walled oscules) make this a likely assumption. I consider the occurrence of sigmata in the present typical specimen and its absence in both *pavonina* – specimens insufficient grounds for upholding both as different species in view of the rarity of microcleres within the whole genus. Also WIEDENMAYER did not find any microscleres in his specimens of the typical form. *N. digitalis* fo. *amorpha* Wiedenmayer (1977), however, is treated as a separate species for reasons given below.

Niphates amorpha Wiedenmayer, 1977

Niphates digitalis fo. *amorpha* WIEDENMAYER, 1977a: 98, pl. 19 fig. 4.

SABA: ZMA POR.4062 (W of Fort Bay, 0–3 m, rocks, 6.X.1963, coll. P. Wagenaar Hummelinck, *1120A*).
PUERTO RICO: ZMA POR.3969 (18°15′ N, 67°13.5′ W. 40–50 fthm, bottom muddy sand, incrusting on *Ircinia strobilina* (Lamarck, 1814), 21.II.1963, coll. J.H. Stock).

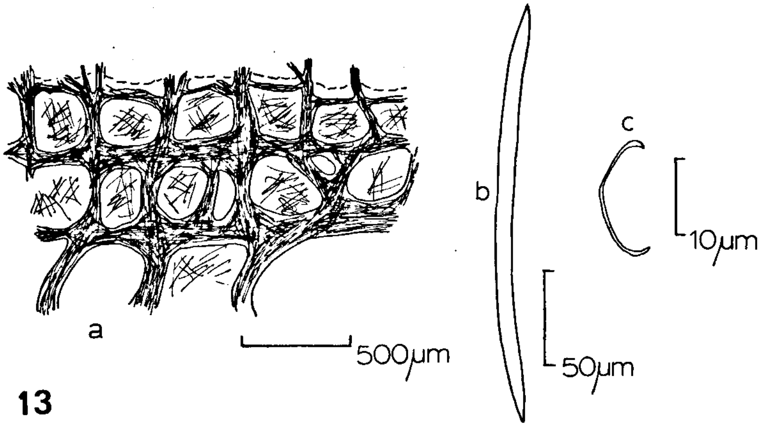
General diagnosis: (Fig. 13, Pl. VI 3)

Shape, size and consistency: Massive incrustation, about 1 cm thick, with lateral repent outcrops. Oscules of two types: rounded with raised collars, or somewhat meandering, flush openings with irregular outline. Surface microhispid, not spinous or conulose. Consistency: tough, resilient.

Colour: purplish grey alive (WIEDENMAYER, 1977a), light brown in spirit.

Ectosome: paratangential reticulation almost continuous; meshes irregular.

Choanosome: cavernous; main skeleton without fibrofascicles, but with unusually thick primary fibres, 50–300 μm in diameter (cored by 20 or more spicules); interconnecting fibres 30–100 μm in diameter, becoming thinner near the periphery (cored by up to 17 spicules). Megascleres oxea, somewhat longer than in other species: 183–*210.5*–252 by 4–*6.2*–7 μm. Miscroscleres: thin sigmata, 12–*15.4*–18 μm (only found in the Puerto Rican specimen).



13

FIGURE 13. *Niphates amorpha*, a: perpendicular section of peripheral skeleton, b: oxea, c: sigma.

Ecology: According to WIEDENMAYER (1977a) this form is limited to areas with strong currents; this conforms with the origin of the Saba-specimen, but the Puerto Rican specimen originated from muddy sand bottom at greater depth.

Distribution: Saba; Puerto Rico; Bahamas (WIEDENMAYER, 1977a).

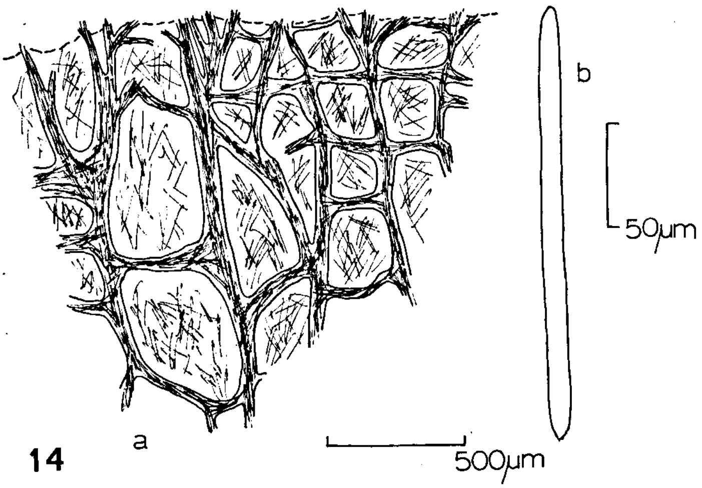
WIEDENMAYER treated this form as a growth form of *N. digitalis*, but failed in my opinion to give substance to his decision. As far as skeletal similarity and other morphological features are concerned, there is no way to decide whether it is a growth form of *N. erecta* or *N. digitalis*. In view of this, and of its own special characters (incrusting habit, fairly continuous ectosomal reticulum, and unusual thickness of the primary fibres) it is proposed here to treat it as a distinct species, pending further information on its biology and ecology.

Niphates alba n.sp.

Holotype: ZMA POR.3942, PUERTO RICO, 8.7 km S of La Parguera, 20–35 m, shelf edge, 23.II.1963, coll. J.H. Stock, 107.

Description: (Fig. 14, Pl. VI 4, VII 1)

· Shape, size and consistency: A cut-off, solitary branch of 23 cm long by 2–3 cm in diameter. The surface is undulate, the outline of the specimen is



14

FIGURE 14. *Niphates alba* n.sp., a: perpendicular section of peripheral skeleton, b: spicule.

irregular. It has a clathrous appearance, due to numerous irregularly shaped subdermal cavities roofed over by a thin dermal membrane. Microhispid, rough to the touch, but no spines or conules. Oscules are of two types: a few larger ones are pit-like, about 5 mm in diameter, but most of the surface is riddled with small holes about 2 mm in diameter. Consistency: stiff, barely compressible.

Colour: greyish white alive, creamy white in spirit.

Ectosome: Ectosomal skeleton with meshes of 150–500 µm surrounding large pores of 150–300 µm. Brushes of spicules fan out from the choanosomal primaries. Ectosomal meshes often irregularly subdivided by thin fibres with only 2–3 spicules per cross-section.

Choanosome: Irregularly radially-plumose with fibre fascicules of up to 220 µm in diameter. Primary fibres 70–100 µm in diameter cored by up to 15 spicules per cross-section, interconnecting fibres 30–75 µm, cored by 4–14 spicules per cross-section. Spicules predominantly strongyles with a few hastate oxea and stylote modifications; size; 169–*190.9*–2–2 by 5.5–*6.8*–9 µm.

Ecology: Reefs.

Distribution: Puerto Rico.

The ramose habit of the new species has been compared to *Niphates erecta* (extensively described above). The surface of *N. alba* is smooth, though irregular; spines or conules are absent. White specimens of *N. erecta* are not known.

DISCUSSION OF THE GENUS *Niphates*

All West Indian species known to belong to *Niphates* are represented in the present material, but some of WILSON's (1902) *Pachychalina*-species may also belong here (*P. mollis, P. aurantiaca* and *P. dura*). Furthermore, as mentioned above, VERRILL's (1907) *P. cellulosa* and *P. elastica* may also belong in this genus. The identity of all these species is unknown, as their descriptions are insufficient for allocation.

Of the DUCH. & MICH. specimens of *Niphates* and those of *Tuba* not referable to other genera (cf. below, section on *Callyspongia*), *N. erecta* and *N. venosa* are still represented by type specimens, both being conspecific and united under *N. erecta; N. thomasiana* is not represented by type specimens, but is here also assigned to *N. erecta* on the basis of its depiction (cf. DUCH. & MICH., 1864: pl. 22 fig. 1); *Tuba crispa, T. pavonina, T. incerta* and *T. digitalis* are represented by type material and considered to be all *N. digitalis,* be it that *T. pavonina* is regarded a separate growth form of this species. The remaining *Tuba* specimens are either assigned to *Callyspongia,* or when not represented by type specimens, regarded unrecognizable (cf. below section on *Callyspongia*).

Genus **Cribrochalina** Schmidt, 1870

Definition: Niphatidae in which the paratangential ectosomal reticulation is obscured by spicule brushes standing erect on the surface, producing an optically smooth, lipostomous surface. Pronounced choanosomal ascending fibres, and narrow elongated meshes, with peripheral condensation.

Type species: *Cribrochalina infundibulum* Schmidt, 1870 (= *C. vasculum* (Lamarck, 1814)).

Cribrochalina spiculosa (Dendy, 1890) n. comb.

Siphonochalina spiculosa DENDY, 1890: 354, pl. 58 figs. 2–2a, pl. 62 fig. 3. [Non: *Haliclona spiculosa;* Burton, 1954 = *Siphonochalina* cf. *coriacea* Schmidt, 1870.]

PUERTO RICO: ZMA Por.3984 (8.7 km S of La Parguera, 20–35m, shelf edge, 23.II.1963, coll. J.H. Stock, 105).

Diagnosis: (Fig. 15, Pl. VII 2–3)

Shape, size and consistency: Tube shaped with a broad base narrowing towards the apex, 8 cm high, 3 cm in diameter at the apex. Cup walls

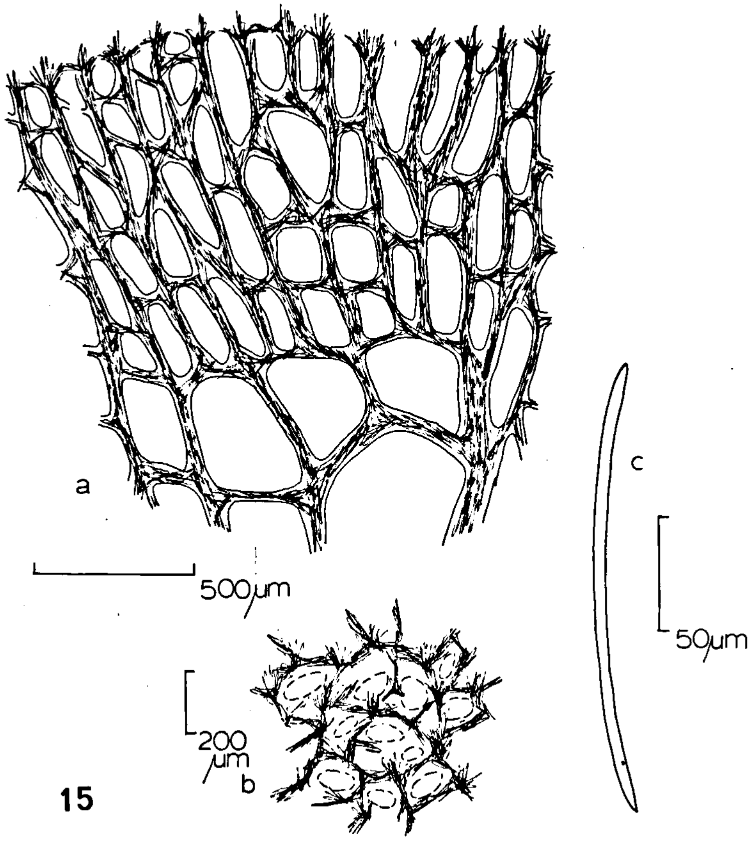


FIGURE 15. *Cribrochalina spiculosa*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

annulated. Rim sharp. Outer surface velvety smooth, with regularly distributed pores obscured, but just visible underneath the fine ectosomal reticulation. Inner surface microhispid, with many small oscules, 1–3 mm in diameter. Vent extends right down into the base. Consistency elastic, compressible.

Colour: Purplish alive, creamy white in spirit.

Ectosome: Ectosomal skeleton of irregular fibres with perpendicular brushes fanning out from the choanosomal primaries. Pores large: 70–300 µm in diameter.

Choanosome: Main skeleton radially plumose. Primary fibres lying at distances of 60–150 µm, diameter 50–90 µm cored by up to 15 spicules. Interconnecting fibres almost equally thick and also profusely cored. Meshes predominantly elongate. Peripheral condensation distinct. Spicules: oxea 163–*187.4*–209 by 6–*7.3*–9 µm.

A second specimen from the same locality (ZMA POR. 4439) is considered to belong to the same species on the basis of skeletal characteristics, although its habit is radically different from the specimen described above. It is an elongate plate (in the shape of a tennis racket), 17 cm long, 8 cm high, 1 cm thick. One side is quite smooth and annulated, without oscules; the other side is microhispid and regularly pitted by flush oscules, 2–4 mm in diameter. Consistency toughly resilient. Colour: light purple alive, yellowish brown in spirit. The specimen agrees closely in skeletal characters with ZMA POR.3984, and is considered an atypical growth form.

Ecology: Known from the reefs.

Distribution: Puerto Rico; Bahamas (DENDY, 1890).

Compared to *C. vasculum* (Lamarck, 1814) (specimens studied in the British Museum (N.H.), reg.no. 28.5.12.171 and 28.5.12.44 (Crawshay Collection, West Indies), reg.no. 1934.11.23.la (Wheeler coll., Bermuda), and a slide from SCHMIDT's type specimen of *C. infundibulum*, reg. no. 70.5.3.134), the present species is much more compressible, due to its more open skeletal network. Basic characters, however, are comparable, and I make the transfer from *Siphonochalina* to *Cribrochalina* with confidence.

DENDY's (1890) material is preserved in the British Museum (N.H.), reg.no. 1877.5.21.1722. The specimen is a cluster of tubes now light brown in colour (dry state). The skeletal characters agree to such an extent with those of the present specimen, that conspecificity is quite likely. DENDY's material, however, has smaller spicules (136/ 6 µm), but this is thought to be of minor importance.

DISCUSSION OF THE GENUS *Cribrochalina*

WIEDENMAYER (1977a, 1977b) put *Cribrochalina* into his family Nepheliospongiidae and associated it with *Petrosia* and *Xestospongia.* I do not agree with this, because the skeletal architecture with strong, spongin rich primary fibres in radial arrangement is quite different from that of *Xestospongia* and *Petrosia,* where there is a pronounced tendency to produce an isotropically meshed skeleton. In fact, *Cribrochalina* is very similar to typical 'Chalinid' genera as *Amphimedon* and *Niphates,* except for its closer meshed skeleton and ectosomal spicule brushes.

Agelas albolutea Duch. & Mich., 1864 (the only type material left is a small piece in the British Museum (N.H.), reg.no. 1928.11.12.1a) is upheld as a separate species of *Cribrochalina* by WIEDENMAYER (1977a: table 50), but the justification for this seems to be very thin, as the only noteworthy difference with *C. vasculum* is the flabelliform habit (cf. DUCH. & MICH., 1864: 77).

Cribrochalina cretacea Schmidt, 1870, redescribed by TOPSENT (1920) and transferred – incorrectly in my opinion – to *Xestospongia* by WIEDENMAYER (1977a), is a separate, though ill known species of *Cribrochalina,* characterized by a white lamella-shaped habit and a hard consistency in the dry state.

Cribrochalina dura Schmidt, 1870, is extensively redescribed by WIEDENMAYER (1977a); it is a ramose species.

DISCUSSION OF THE FAMILY NIPHATIDAE

No representatives of *Gelliodes* and *Siphonodictyon* have been found in the present material, though both are represented in the West Indies.

Gelliodes Ridley, 1884 is represented by *G. leucosolenia* De Laubenfels, 1934, from deep water off Puerto Rico. The type and only specimen (USNM 22378, kindly sent on loan by Dr. RUETZLER) is a tiny piece of soft consistency, not at all unlike *Gelliodes fibulata* (Carter, 1881) (the type species of *Gelliodes*) and *G. licheniformis* sensu Ridley & Dendy, 1887. The identity of *G. leucosolenia* must remain uncertain. *Gelliodes* can only barely be distinguished from *Niphates*; there is less spongin in the former and its interconnecting fibres are few, in stead of which there is a single-spicule reticulation in between primary fibres. The validity of these characters remains to be checked against generic variation.

Siphonodictyon Bergquist (1965) is here assigned to the Niphatidae. The skeletal architecture as described and discussed by BERGQUIST (1965), RUETZLER (1971) and WIEDENMAYER (1977a) reminds of *Cribrochalina,* though spongin is reported to be present only in small quantities. Four West Indian species of this genus are known: *S. siphonum* (De Laubenfels, 1949), *S. coralliphagum* Ruetzler (1971), *S. cachacrouense* Ruetzler (1971), and *S. brevitubulatum* Pang (1973). All four are reported to excavate corals.

Family **CALLYSPONGIIDAE** De Laubenfels, 1936

Definition: Haplosclerida with a two-dimensional tangential ectosomal reticulation of sparsely or uncored spongin fibres, and a choanosomal reticulation of primary spongin fibres cored by two or more spicules, or uncored, and interconnecting fibres cored by a single spicule or uncored. Microscleres, if present, toxa.

Genus **Callyspongia** Duch. & Mich., 1864

Definition: Callyspongiidae with a beautifully regular ectosomal tangential reticulation of primary and secondary (sometimes tertiary) spongin fibres.

Type species: *Callyspongia fallax* Duch. & Mich., 1864.

I will not completely follow WIEDENMAYER (1977a) in dividing *Callyspongia* into two genera (*Callyspongia* and *Spinosella*), but will use two identical subgeneric names instead, the motivation for which will be given below. *Callyspongia* is characterized by the possession of a high proportion of spongin. There may be peripheral condensation of the choanosomal skeleton (e.g. in *C. fallax* and *C. eschrichti* Duch. & Mich., 1864) and fasciculation of the primary fibres (e.g. *C. vaginalis* (Lamarck, 1814) and *C. plicifera* (Lamack, 1814).

Subgenus **Callyspongia** Duch. & Mich., 1864

Definition: *Callyspongia* with rectangular choanosomal meshes, without fibrofascicules.

Callyspongia (Callyspongia) fallax Duch. & Mich., 1864

Ceraochalina vanderhorsti ARNDT, 1927: 154, pl. 2 figs. 1,4, text-figs. 16–18.
Callyspongia repens LITTLE, 1963: 42, figs. 11, 13.
Further synonymy cf. WIEDENMAYER, 1977a, excepting *Siphonochalina ceratosa* Dendy, 1890, which is here transferred to *Dactylia.*

LECTOTYPE Mus. Turin POR.No. 84, with schizolectotype in BMNH, reg. no. 28.11.12.5. As WIEDENMAYER (1977a, on the authority of HARTMAN) thought this to be lost a redescription of the lectotype (kindly sent on loan by Dr. O. ELTER) is given here.

Redescription of the lectotype of *Callyspongia fallax* Duch. & Mich., Mus. Turin POR.no. 84, ST. THOMAS: (Fig. 16, pl. VII 4)

Repent, lobate mass of 12 cm long, 2 cm in diameter. Oscules on summit of lobate swellings, up to 10 mm in diameter. Surface smooth, consistency firm, barely compressible in the dry state. Ectosomal skeleton with large meshes of 200–400 µm, small meshes of 40–400 µm; primary fibres 30–50 µm in diameter, secondary fibres 7–25 µm. Choanosomal skeleton with square or rectangular meshes. Peripheral condensation of the choanosomal reticulation is caused by the subdivision of subdermal meshes into smaller meshes by vertical secondary fibres; mesh size not significantly increasing from the periphery inwards: 150 µm – 180–150–210–280–160–200–400–280–200–, etc. Primary fibres 40–80 µm (cored by 3–7 spicules), distance of the primaries 400–600 µm. Secondary fibres 20–40 µm (cored by 1 spicule). Spicules strongylote: 60–80 / 1–3 µm.

Redescription of the holotype of *Ceraochalina vanderhorsti* Arndt, 1927, ZMA POR.590, Caracas Bay, CURAÇAO, 5.V.1920, coll. C.J. van der Horst.

Lobate mass of 7 × 3 × 4 cm, with apical oscules 3–9 mm in diameter. Consistency firm, resilient. Colour dark brown in spirit. Ectosomal meshes 450–500 µm (large) and 140–280 µm (small); primary fibres 35–50 µm, secondary fibres 5–25 µm in diameter. Ectosomal skeleton less regular than that of the type of *C. fallax.* Dermal pores in fields, 20–70 µm in diameter. Choanosomal skeleton: mesh size in cross-section from the periphery inwards: 90 µm – 140 – 210 – 240 – 240 – 180 – 290 – 240 – 350, etc. Meshes rectangular. Primary fibres 40–60 µm in diameter (cored by 3–7 spicules), distance primaries 300–500 µm; secondary fibres 15–35 µm (cored by 1 spicule, rarely 2). Strongylote spicules: 55–67 / 0.5–1 µm.

CURAÇAO: ZMA POR. 3534 (Coraaltabak, washed ashore, X.1905, coll. Fisheries Investigations Curaçao); 3607 (near Carmabi, reefs, 11–14, on *Porites,* 16.XI.1975, coll. students Prof. Stock); 3632 (outside Lagoon Jan Thiel, in cave, 2 m, 16.XI.1975, coll. students Prof. Stock).
BONAIRE: ZMA POR.3586 (Boca Washikemba, cast ashore, 16.V.1930, coll. P. Wagenaar Hummelinck).
FLORIDA: ZMA POR.3783 (E. of Elliott Key, 2–6 m, on *Favia fragum,* in sandy area, 5.IX.1963, coll. Hummelinck, *1414*).
VIEQUES: ZMA POR.626 (DUCH & MICH. specimen labeled *'Callyspongia bullata"* (Lamarck, 1814)).

General diagnosis: (Fig. 16, Pls. VII 4, VIII 1)

Shape, size and consistency: Lobate, repent mass with a tendency to form upright, short, anastomosing tubes. Individual lobes frequently 2–3

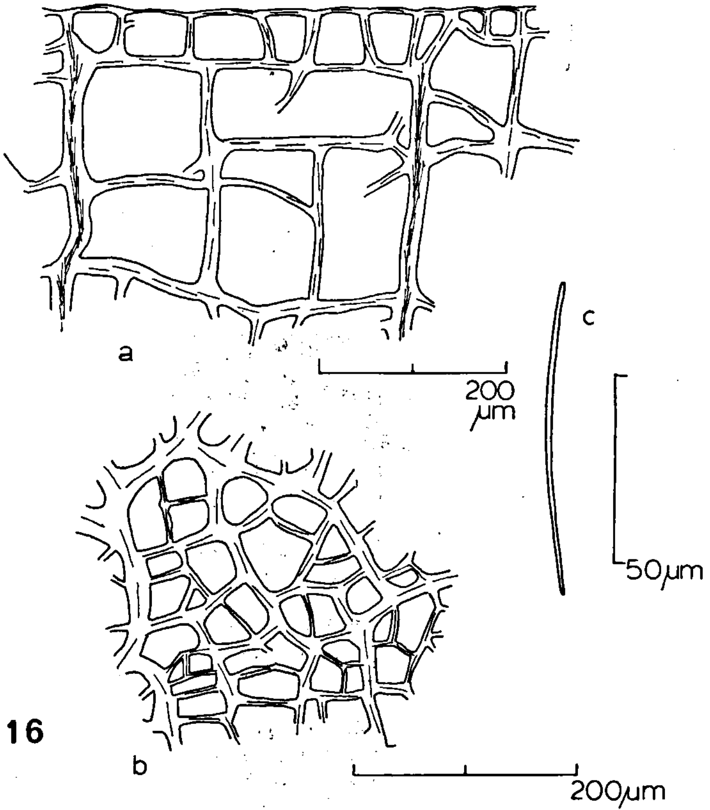


FIGURE 16. *Callyspongia (Callyspongia) fallax*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicule.

cm in diameter, tubes up to 4 cm high. Longitudinal expansion 10 cm or more. Oscules and vents apical, up to 12 mm in diameter, flush or with thin collars. Surface smooth. Consistency firmly spongy, tough in the dry state. Colour: "cream with purple spots", "purplish yellow" alive; light brown in spirit.

Ectosome: Ectosomal tangential skeleton with triangular or rectangular large meshes of 200–700 µm in diameter; within these a secondary reticulation makes meshes of 40–290 µm in diameter. Primary fibres forming the large meshes are 25–80 µm in diameter; secondary fibres forming the small

meshes are 5–40 µm in diameter. The ectosomal skeleton is genuinely separate, one-layered, strictly tangential (not part of the peripherally condensed choanosomal skeleton as WIEDENMAYER contented).
Choanosome: In cross-section the choanosomal skeleton is very regularly rectangular, with secondary fibres connecting the ascending fibres at strictly right angles. Peripheral condensation is mostly found in one or two subdermal mesh layers, primarily by secondary fibres subdividing these meshes parallel to the ascending fibres, but also by a shorter distance of connecting fibres in these, as might be concluded from the following series of measurements of mesh size from the periphery inwards of different specimens:

70 – 210 – 270 – 190 – 350 – 420 µm, etc.
110 – 200 – 210 – 260 – 190 – 300 µm, etc.
90 – 140 – 210 – 240 – 240 – 180 µm, etc.
80 – 220 – 270 – 170 – 150 – 240 µm, etc.
80 – 300 – 210 – 140 – 200 – 160 µm, etc.

Primary fibres running longitudinally through the axial part of lobes bend regularly outward to the periphery, at times splitting into two, though never forming fascicules. Primary fibres 35–90 µm in diameter (cored by 0–7 spicules per cross-section), lying at distances of 300–600 µm. Connecting fibres: 15–64 µm in diameter (cored by 0–2 spicules per cross-section, mostly 1). Spicules invariably short, thin, flexuous strongylote forms, 54–*67.7*–87 by 0.5–*1.64*–3.5 µm wide.

Ecology: Occurring only on reefs.

Distribution: St. Thomas, Curaçao, Bonaire, Vieques, Florida; Grenada (CARTER, 1882, as *Patuloscula procumbens*), Tortola (DUCH. & MICH. 1864), Puerto Rico (WILSON, 1902 as *Siphonochalina procumbens*), Bahamas (WIEDENMAYER, 1977a).

WIEDENMAYER (1977a) emphasized the wrong characters in this species, as will be discussed below (cf. Discussion on *Callyspongia*). *Callyspongia repens* Little (1963) was found to be synonymous with *C. fallax* after examination of the type specimen, USNM 23551 (kindly sent on loan by Dr. RUETZLER). LITTLE probably used DE LAUBENFELS' (1949) concept of *C. fallax* (= *C. tenerrima*) as the basis for his decision to describe his material as new. Apparently, DE LAUBENFELS was responsible for the confusion of this species with related forms as *C. tenerrima* and *C. armigera* by later authors.

Callyspongia (Callyspongia) eschrichti Duch. & Mich., 1864

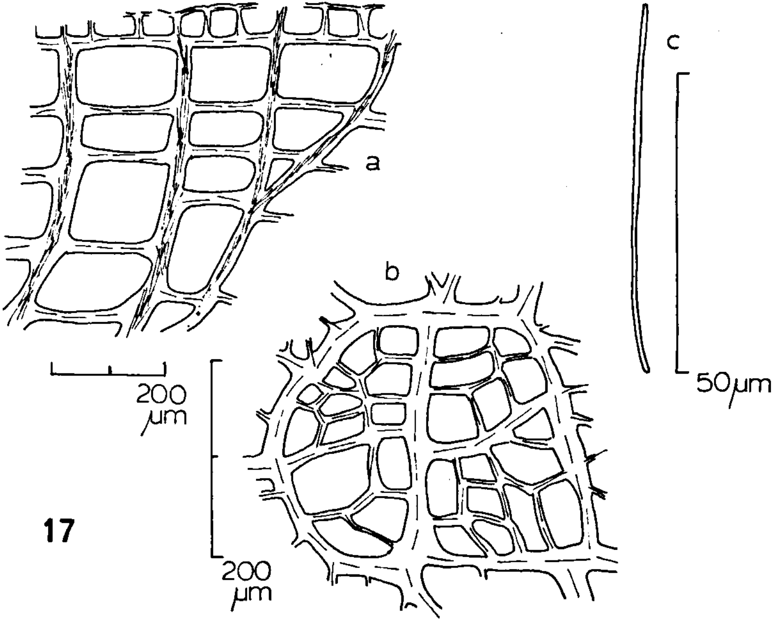
Callyspongia eschrichti DUCHASSAING & MICHELOTTI, 1864: 56, pl. 12 fig. 1. [Non: *Tuba eschrichti* sensu CARTER, 1882: 365 = *C. plicifera?* Nec: *Spinosella vaginalis* fo. *eschrichti*; WIEDENMAYER, 1977a: 103, text-fig. 122 C = probably heavily spined *C. (Spinosella) vaginalis*.

Siphonochalina stolonifera WHITFIELD, 1901: 47, pls. 1–3.

Lectotype (per WIEDENMAYER, 1977a): ZMA POR.620, ST. THOMAS. Paralectotypes: ZMA POR.623, Mus. Turin POR.No. 44 and 45.

Redescription of the ZMA-type material, ZMA POR.620, 623 (both from ST. THOMAS): (Fig. 17, Pl. VIII 2–3)

The lectotype consists of three basally connected tubes of 6, 5 and 2.5 cm long. The wall of the tubes consists of irregularly ramified spines, which tend to anastomose with those of the neighbouring tube. Diameter of the tubes hard to measure, without spines about 1.5–2 cm, with spines about 3–4 cm.



17

FIGURE 17. *Callyspongia (Callyspongia) eschrichti*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicule.

Apical vents 16, 9 and 9 mm in diameter, with slightly raised collar in which no fibrofascicles are apparent. Inner tube wall smooth with scattered oscules.

Spinal skeleton without macroscopical fibrofascicles. The paralectotype consists of a single tube, 9 cm long, 2–4 cm in diameter, with an apical vent of 14 mm in diameter. Further characteristics are similar to those of the holotype.

Ectosomal skeleton a tangential reticulation of spongin fibres forming larger (250–450 µm in diameter) and smaller (60–150 µm in diameter) meshes. Primary fibres 30–47 µm in diameter (cored by one spicule), secondary fibres 12–25 µm (cored by one spicule).

Choanosomal skeleton: In a perpendicular section some peripheral condensation is apparent; mesh size from the surface inwards: 110 – 80 – 300 – 280 – 250 – 400 µm, etc. Reticulation rectangular without fasciculation of the primary fibres. Primary fibres 55–75 µm in diameter (cored by 3–7 spicules), secondary fibres 20–47 µm in diameter (cored by 1 spicule). Spicules: hastate to strongylote oxea, 60–*66.0*–76 by 1.5–*2.44*–3.5 µm.

Ecology: No data.

Distribution: St. Thomas; Bermuda (WHITFIELD, 1901).

WIEDENMAYER (1977a) considered the present species as a growth form of *C. (Spinosella) vaginalis* (Lamarck, 1814). I do not agree at all; the structure of the skeleton is almost identical to that of *C. fallax*, put into a separate genus by WIEDENMAYER. If it is a growth form, then it must be assigned to *C. fallax* (cf. also BURTON's (1934b) synonymyzation of *C. fallax* and *C. eschrichti)*. Both the habit and the spicule size are sufficiently different to uphold both as different species. WHITFIELD's (1901) *Siphonochalina stolonifera* seems to be a repent form of the present species.

Callyspongia (Callyspongia) pallida Hechtel, 1965

Callyspongia pallida HECHTEL, 1965: 36, pl. 3 fig. 5, text-fig. 6.
Callyspongia fallax fo. *debilis* WIEDENMAYER, 1977a: 95, pl. 19 fig. 3, text-fig. 118.

CURAÇAO: ZMA POR. 3855 (Piscadera Baai, Boca W, 1–1.5 m, sandy bottom, 5.I. 1964, coll. P. Wagenaar Hummelinck, *1458*); 3802, 3926 (Piscadera Baai, Boca W, *Rhizophora*, 14.XII.1963, coll. Hummelinck, *1460*); 3927, 3932 (Piscadera Baai, Boca W, N part SW,

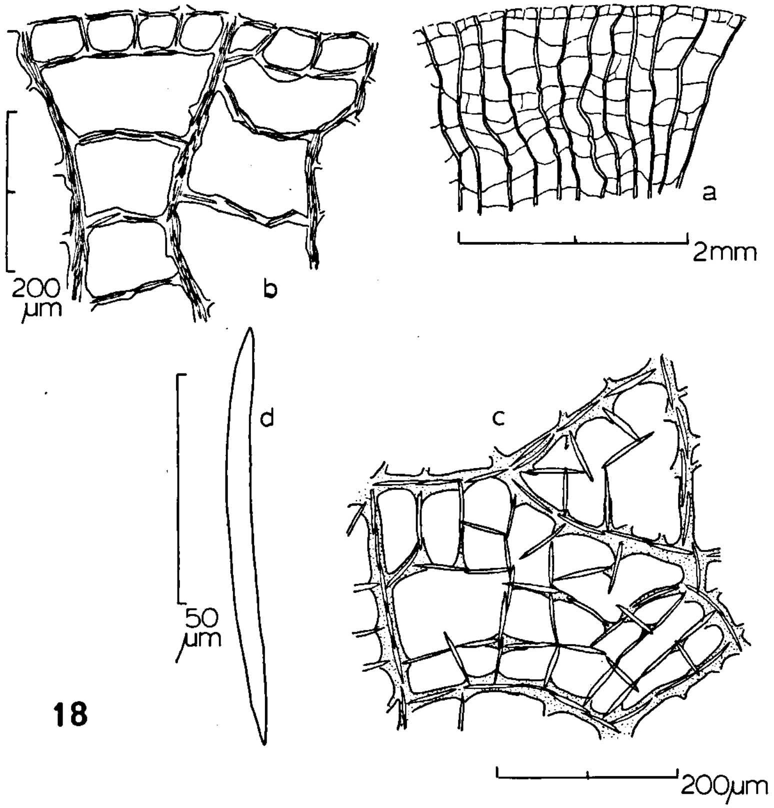
Rhizophora, 11.XII.1963, coll. Hummelinck, *1479*); 3974 (Piscadera Baai, SE part NW, *Rhizophora*, 18.XII.1963, coll. Hummelinck, *1469*); 4321 (Piscadera Baai, Boca W, *Rhizophora*, 14.XII.1963, coll. Hummelinck, *1461*); 3791, 3970 (Piscadera Baai, SE point, NE, rocky bottom with *Rhizophora*, 18.XII.1963, coll. Hummelinck, *1468*); 3633 (Piscadera Baai, inner bay, on *Rhizophora*, 14.XI.1975, coll. students Prof. Stock); 4021 (Piscadera Baai, entrance E, 0.5 m, *Rhizophora*, 11.XII.1963, coll. Hummelinck, *1465*); 3767 (Piscadera Baai, entrance SE, *Rhizophora*, 17.XII.1963, coll. Hummelinck, *1466*); 3910 (Piscadera Baai, outer bay, on poles, 0–1 m, 14.X.1967, coll. Hummelinck, *1620*); 3771 (Piscadera Baai, NE, rocky bottom with *Rhizophora*, 11.XII.1963, coll. Hummelinck, *1485*); 3903 (Piscadera Baai, near Enoch, *Rhizophora*, 2.II.1949, coll. Hummelinck, *1028A*); 3851 (Piscadera Baai, middle SE, *Rhizophora*, 13.XII.1963, coll. Hummelinck, *1475*); 3753 (Spaanse Water, N of Jan Sofat, *Rhizophora*, 17.XI.1968, coll. Hummelinck, *1629*); 3665 (Playa Forti, Westpunt, 4 m, on dead gorgonians, 2.XI.1975, coll. students Prof. Stock).
BONAIRE: ZMA POR.3840 (Lac, Binnenklip, sand, calcareous algae and stones, 2.5 m, 10.III.1970, coll. Hummelinck, *1568A*).

General diagnosis: (Fig. 18, Pl. VIII 4)

Shape, size and consistency: Clusters of small, semiglobular, osculiferous lobes, 1–2 cm across and high. Some specimens show a tendency to a repent-ramose habit, others may be more massively encrusting. Surface smooth to pilose. Consistency softly spongy, fairly easily torn.
Colour: pale brownish yellow alive, light brown in spirit.
Ectosome: Ectosomal skeleton ill-developed in most specimens. If present, it is an irregular reticulation of thin spongin fibres forming triangular or rectangular meshes. Large meshes 200–700 µm in diameter, small meshes 40–350 µm. Primary fibres 10–30 µm, secondary fibres 5–20 µm in diameter (often consisting of a row of spicules only without spongin).
Choanosome: Little or no flesh. Peripheral condensation ill-developed or absent. The course of primary and secondary fibres is irregular, wavy, though basically the skeletal plan is like that of *C. fallax*. Relatively high ratio of spicules to spongin. Primary fibre diameter 16–60 µm (cored by 2–9 spicules), lying at distances of 280–700 µm; secondary fibre diameter 10–50 µm (cored by 1 or 2 spicules). Spicules typically oxeote (not strongylote), thicker than in *C. fallax* and *C. eschrichti*, 60–*74.4*–92 by 0.5–*3.45*–5.5 µm.

Ecology: This species is typically an inhabitant of sheltered bays and lagoons, where it encrusts mangrove roots, stones, molluscs, etc. It is one of the most abundant species of the Piscadera Baai mangroves.

Distribution: Curaçao, Bonaire; Jamaica (HECHTEL, 1965), Bahamas (WIEDENMAYER, 1977a).



18

Figure 18. ***Callyspongia (Callyspongia) pallida,*** **a: perpendicular section, b: detail of perpendicular section of peripheral skeleton, c: tangential view of ectosomal skeleton, d: spicule.**

The present material has been assigned to Hechtel's (1965) species on the basis of shape, consistency and spicule size. The identification with Wiedenmayer's (1977a) *C. fallax* forma *debilis* is less certain, as the life colour of his specimens was pale purple, and the spicules were thinner (80–90 / 1 µm). However, these features are subject to considerable variation; the striking resemblance in habit renders it likely that the synonymy is correct. Wiedenmayer considers this species as a growth form of *C. fallax*; in view of the observed – mostly consistent – differences (habit, colour, irregular skeleton, ill-developed ectosomal skeleton, spicule size) this seems unlikely.

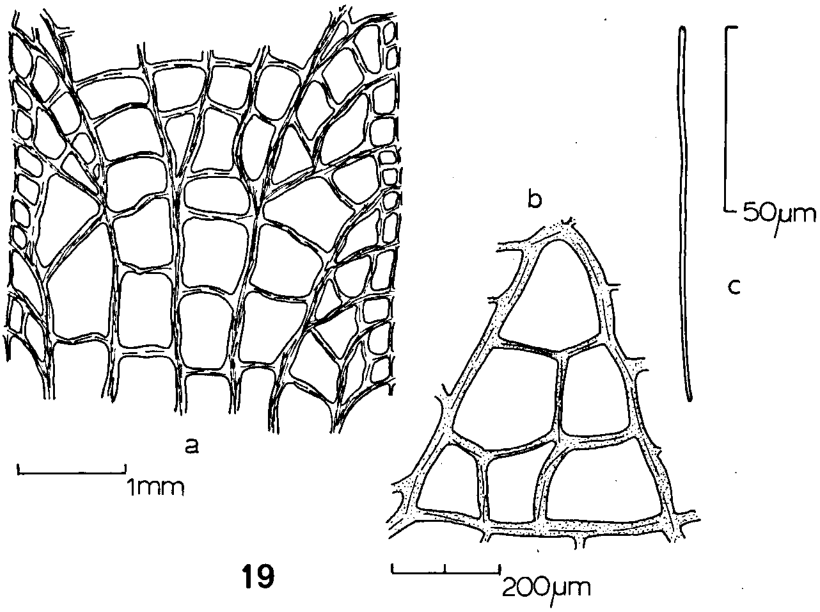
Callyspongia (Callyspongia) strongylophora Hartman, 1955.

Callyspongia tenerrima; BURTON, 1954: 225. [Non: *C. tenerrima* Duch. & Mich., 1864.]
Callyspongia strongylophora HARTMAN, 1955: 168, figs. 1–3, 6.

PUERTO RICO: ZMA POR.3485, 3525 (18°15′ N, 67°13.5′ W, muddy sand, 40–50 fthm, dredged, 21.II.1963, coll. J. H. Stock, PR.86, 93).

General diagnosis: (Fig. 19, Pl. IX 1)

Shape, size and consistency: A tangled mass of irregularly anastomosing and dividing branches, 2–4 mm in diameter. Longest single branch 23 cm long. Oscules somewhat irregular in outline, in rows on the branches, 1–3 mm in diameter. No distinct basal mass (branches rooted on *Oceanapia oleracea*). Surface slightly rough, with much sand and foreign material adhering. Consistency resilient, compressible, but easily torn.
Colour: yellow-drab in spirit.



19

FIGURE 19. *Callyspongia (Callyspongia) strongylophora,* a: perpendicular section of branch, b: tangential view of ectosomal skeleton, c: spicule.
]

Ectosome: Well developed tangential reticulum. Large meshes 500–700 µm, small meshes 80–200 µm, primary fibres 25–30 µm, secondary fibres 6–12 µm in diameter.
Choanosome: Little or no flesh. No peripheral condensation of the skeleton. Meshes angular. The skeletal plan is similar to that of *C. fallax*, and only an occasional fusion of primary fibres is found. Primary fibres 30–90 µm in diameter (cored by 4–11 spicules), secondary fibres 18–35 µm in diameter (cored by 1, occasionally 2 spicules). Spicules thin, strongylote, 83–*88.0*–93 by 0.5–*1.27*–2.5 µm.

Ecology: Found on sandy mud bottom at larger depths beyond the reefs.

Distribution: Puerto Rico; Yucatán (HARTMAN, 1955), British Honduras (BURTON, 1954).

This species was synonymized with *Callyspongia tenerrima* Duch. & Mich., 1864 by WIEDENMAYER (1977a). He may be right, but we have no real way of knowing as the type material is lost. However, the recent material described by WIEDENMAYER as *Spinosella tenerrima* is not conspecific with the present material. To avoid unnecessary confusion I propose to reserve DUCH. & MICH.'s name for WIEDENMAYER's *S. tenerrima* material, and to keep HARTMAN's name for the species described above.

DISCUSSION OF THE SUBGENUS *Callyspongia*

Only one West Indian species of this subgenus was not represented in the present material, viz. *Callyspongia arcesiosa* De Laubenfels, 1936. The holotype (USNM 22525, kindly sent on loan by Dr. RUETZLER) is an intricate mass of thin irregular repent branches with peculiar thin fistular outcrops. The skeleton is much more delicate, tighter meshed, than *C. fallax*. An unpublished specimen in the British Museum (N.H.), reg.no. 32.10.20.33–34 (labeled *"Callyspongia subarmigera"*, Corbison Bay, Antigua, coll. J. H. Mansele), is also referable to this species.

My interpretation of the subgenus more or less covers WIEDENMAYER's concept of *Callyspongia*, although emphasis is here placed on the absence of fibrofascicles and rectangular skeletal meshes. WIEDENMAYER's observations on distinct differences in dermal and peripheral skeleton are thought to be of minor importance. I do not regard *Siphonochalina* Schmidt, 1868 synonymous with the present subgenus; ectosomal and choanosomal features are quite different in both. *Patuloscula* Carter, 1882, however, is a clear synonym of *Callyspongia.*

WIEDENMAYER (1977a) assigned *Callyspongia eschrichti* Duch. & Mich., *C. strongylophora* Hartman and *C. pallida* Hechtel to his genus *Spinosella,* but I fail to see any generic differences between these species and *C. fallax.*

Of the DUCH. & MICH. *Callyspongia* species, *C. fallax, C. eschrichti* and *C. bullata* are still represented by original material; of the remaining species, *C. inflata* is unrecognizable, and *C. tenerrima* is with some hesitation considered synonymous with *Hircinia purpurea* Hyatt, 1877 and *Aplysina cauliformis* Carter, 1882 (cf. WIEDENMAYER, 1977a) and referred to the subgenus *Spinosella.*

Subgenus **Spinosella** Vosmaer, 1885

Definition: *Callyspongia* with choanosomal fibrofascicles and a choanosomal tertiary lacework of finer fibres.

Type species: *Tuba sororia* Duch. & Mich., 1864.

Callyspongia (Spinosella) vaginalis (Lamarck, 1814)

Spongia villosa PALLAS, 1766: 242.
Spongia aculeata; ESPER, 1796: pl. 7A. [Non ?: *S. aculeata* Linnaeus.]
Spongia bursaria LAMARCK, 1814: 433.
Spongia vaginalis LAMARCK, 1814: 436.
Tuba bursaria; DUCHASSAING & MICHELOTTI, 1864: 48.
Tuba lineata DUCHASSAING & MICHELOTTI, 1864: 47.
Tuba megastoma DUCHASSAING & MICHELOTTI, 1864: 48.
Tuba subenervia DUCHASSAING & MICHELOTTI, 1864: 52.
Tuba sororia DUCHASSAING & MICHELOTTI, 1864: 46, pl. 8 fig. 1.
Tuba tortolensis DUCHASSAING & MICHELOTTI, 1864: 51, pl. 9 fig. 3.
Tuba irregularis DUCHASSAING & MICHELOTTI, 1864: 53.
Tuba vaginalis DUCHASSAING & MICHELOTTI, 1864: 52.
Spinosella vaginalis; WIEDENMAYER, 1977a: 101, pl. 23 fig. 2, text-fig. 122 A, B (and additional synonyms).
Spinosella villosa; WIEDENMAYER, 1977a: table 50.
Callyspongia vaginalis; POMPONI, 1976: 227; ALCOLADO, 1976: 4; GREEN, 1977: 91, fig. 11.

Redescription of the lectotype (per WIEDENMAYER, 1977a) of *Tuba megastoma* Duch. & Mich., 1864, ZMA POR.2412, ST. THOMAS: (Pl. IX 2) (Paralectotype: Mus.Turin POR.no. 122).

Two flattened, partly coalescing tubes (18 cm long, 3.5 cm in diameter), with one short side-tube (2 cm long, 1 cm wide). Apical vents about 7 mm, thick-walled. Surface crudely conulose. Ectosomal skeleton with large meshes of 200–300 µm in diameter, small meshes 50–80 µm in diameter; primary fibres about 25 µm, secondary fibres uniformly 5 µm in diameter. Choanosomal skeleton; fibrofascicles about 350 µm, individual primary fibres 50–80 µm (cored by 2–5 spicules), secondary fibres 35–60 µm (cored by 1–2 spicules), tertiary fibres 8–20 µm in diameter (cored by 1–2 spicules). Oxea: 74–84 / 2.5–3.5 µm.

Redescription of the lectotype (per Wiedenmayer, 1977a) of *Tuba irregularis* Duch. & Mich., 1864, ZMA POR.2410, Vieques: (Pl. IX 3) (Paralectotype: Mus.Turin POR.no. 78).

Irregular flabelliform mass of coalescing tubes with partly anastomosing pseudatria. Remarkable for its thick-walled non-spinous vents. Outer surface conulose to smooth. Size 17 × 10 × 9 cm, vents 0.5–4.5 cm in widest expansion, walls 5–10 mm thick. Ectosomal skeleton with large meshes of 350 µm, small meshes of 40–100 µm in diameter; primary fibres 25 µm, secondary fibres 10 µm in diameter. Choanosome: remarkably irregular; fibrofascicles up to 200 µm, individual primary fibres 60–80 µm (cored by 0–4 spicules), secondary fibres 25–60 µm (cored by 0–2 spicules), tertiary fibres 5–15 µm in diameter (cored by 0–1 spicule). Oxea: 60–72 / 1–2 µm.

Redescription of the paralectotype (designation herein) of *Tuba sororia* Duch. & Mich., 1864, ZMA POR.2415, St. Thomas: (Pl. IX 4) (Lectotype Mus.Turin POR.no. 126, paralectotypes Mus.Turin POR.no. 118, BMNH reg.no. 28.11.12.108 and 28.11.12.108; all designated herein)

Flabelliform mass of 10 coalescent tubes with only apical vents separated, 17 cm wide, 9 cm high, 2 cm thick. Strongly and evenly conulose, conules up to 3 mm high. Vents 6–13 mm wide. Ectosomal skeleton: large meshes 300 µm, small meshes 50–100 µm in diameter; primary fibres 18–25 µm, secondary fibres 10 µm in diameter. Choanosomal skeleton: subdermal tangential fibrofascicles forming surface conules. Main skeleton radiating. Fibrofascicles up to 180 µm, individual primary fibres 50–90 µm (cored by 2–8 spicules), secondary fibres 25–45 µm (cored by 1–2 spicules), tertiary fibres 12–18 µm (cored by 1 spicule). Oxea: 64–*70.2*–76 by 1–*1.5*–2 µm.

Curaçao: ZMA POR.1950, 1951, 1952 (Caracas Bay, 5.V.1920, coll. C. J. van der Horst, cf. Arndt (1927) as *Spinosella sororia*); 3308 (Piscadera Baai, 2 m, 19.XI.1973, coll. J. H. Stock, 73–9); 3313 (500 m W of Piscadera, 10–18 m, 21.XI.1973, coll. Stock, 73–14); 3483 (Piscadera Baai, 8 m, 21.X.1958, coll. Stock, 54); 3486, 3487 (Blauwbaai, reefs, 3 m, 17.X.1958, coll. Stock, 41); 3577 (near Carmabi, 15–30 m, 10.XII.1975, coll. E. Westinga & P. Hoetjes); 3600 (Blauwbaai, 20–30 m, XI.1975, coll. S. Weinberg & E. Westinga); 3601 (500 m W of Piscadera, 15 m, 13.XI.1975, coll. students Prof. Stock); 3609 (near Carmabi, 11–14 m, 16.XI.1975, coll. students Prof. Stock); 3875 (500 m W of Piscadera, 35 m, 13.XI.1975, coll. students Prof. Stock); 3878 (St. Michielsbaai, 2–4 m, 10.XI.1975, coll. students Prof. Stock).
Bonaire: ZMA POR.3527 (1948, coll. P. Wagenaar Hummelinck).
Tobago: ZMA POR, 3545 (Buccoo Bay, 16.I.1955, coll. Hummelinck, *1385*).
St. Martin: ZMA POR.2411 (Duch. & Mich. material of *Tuba bursaria*).
St. Thomas: ZMA POR.2676 (coll. Rahder, no further data).
Vieques: ZMA POR.2416 (Duch & Mich. material of *Tuba vaginalis*).
Puerto Rico: ZMA POR.3302 (shelf edge off Parguera, 3.III.1963, coll. Stock, PR.121).
Cuba: ZMA POR.3584 (no further data).
“West Indies”: ZMA POR.3564 (on *Millepora*, no further data).
“Central America”: ZMA POR.2678 (no further data).

General diagnosis: (Fig. 20, Pl. IX 2–4, X 1)

Shape, size and consistency: The basic shape of this species is a cluster of long erect tubes, tapering only slightly. Almost invariably the tubes have a wide, thin-walled vent (pseudatrium), and its outer walls are strongly conulose. The tubes show a considerable tendency to anastomose and this may lead eventually to hollow, fan shaped specimens. Size of tubes: up to 25 cm high, up to 5 cm in diameter. Size of flabelliform specimens: up to 18 cm high, 21 cm in widest expansion, up to 3 cm in thickness. Vents up to 2.5 cm in diameter. Conules about 3 mm high, about 5 mm apart. Surface of outer walls smooth between conules. Consistency very spongy when alive and in spirit, incompressible when dry. Sponge walls often riddled with *Parazoanthus*.

Colour: Grey alive, brown in spirit and in dry condition.

Ectosome: Tangential reticulation of spongin fibres forming small triangular meshes of 50–100 µm in diameter within large polygonal meshes of 200–350 µm in diameter. Primary fibres 18–30 µm (cored by 1 spicule),

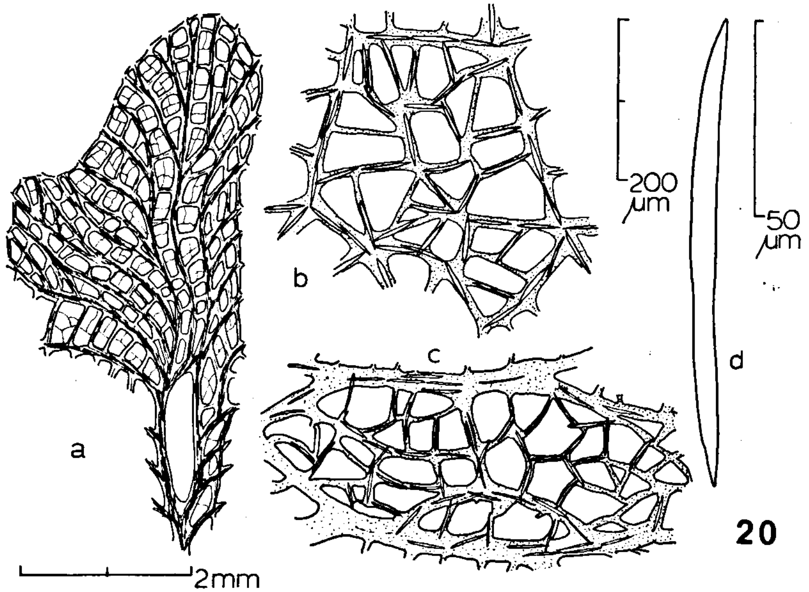


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FIGURE 20. *Callyspongia (Spinosella) vaginalis*, a: perpendicular section, b and c: tangential view of ectosomal skeleton in different parts of the sponge, d: spicule.

secondary fibres 5–12 µm (cored by 1 spicule). Ectosome carried by tangential subdermal fibrofascicles.
Choanosome: Reticulation of fasciculated primary fibres, fascicles 150–350 µm, individual primary fibres 35–80 µm (cored by 0–14 spicules), secondary connecting fibres 15–60 µm (cored by 0–3 spicules), and tertiary interlacing fibres 5–20 µm in diameter (cored by 0–1 spicule). Fibrofascicles often anastomosing and diverging, producing a fairly irregular, though longitudinally radial-plumose skeleton. Conules are produced by fibrofascicles diverging towards the periphery. Spicules:oxea, somewhat curved, 60–*90.4*–144 by 1.0–*3.2*–7.0 µm; dermal oxea tend to be larger than those of the choanosome.

Ecology: Reef dweller.

Distribution: Vieques, St. Thomas, Curaçao, Bonaire, Tobago, St. Martin, Puerto Rico, Cuba; Guadeloupe (DUCH. & MICH., 1864), St. Croix, Tortola, Jamaica (HECHTEL, 1965), Bahamas (DENDY, 1890; WIEDENMAYER, 1977), Florida (SCHMIDT, 1870, as *Siphonochalina papyracea;* STORR, 1964; POMPONI, 1976).

According to WIEDENMAYER (1977a) PALLAS' (1766) *Spongia villosa* (with synonyms given *Spongia bursaria* Lamarck, *Tuba bursaria* sensu Duch & Mich., *Tuba megastoma* Duch. & Mich., and *Tuba tortolensis* Duch. & Mich.) is a species distinct from the present one. There is no doubt, in my opinion, that *Tuba bursaria* sensu Duch. & Mich. is a growth form (flabelliform, laterally flattened) of *Callyspongia vaginalis.* In Pl. X1 two small side tubes are present, which have not merged into the main specimen. It is very likely, that *Tuba bursaria* represents the ultimate result of the anastomosing of individual tubes into a flabelliform sponge with one continuous vent.

Less certain, though still quite likely, is the identity of the DUCH. & MICH. material with *Spongia villosa* Pallas, and *Spongia bursaria* Lamarck. It is striking, that PALLAS (1766: 242) also mentions tubaeform specimens in his description of *S. villosa.* Technically speaking, it is inescapable to consider *S. villosa* a senior synonym of *Callyspongia vaginalis.* Other names must be considered too. ESPER (1794) described *Spongia aculeata* (L.) in a way reminiscent of *Spongia villosa* Pallas (stating these were synonyms), but doubts remains over the identity of the original material of LINNAEUS' *S. aculeata.*

Another of ESPER's specimens described under *Spongia foliacea* has been redescribed by EHLERS (1870: 21) in a way reminiscent of the presently discussed species. EHLERS made *S. foliacea* the type species of a new genus, *Platychalina,* which might, if the specific identity of *S. vaginalis* and *S. foliacea* should ever be established, replace *Spinosella* Vosmaer as a subgenus of *Callyspongia.*

Callyspongia (Spinosella) vaginalis forma **armigera** Duch. & Mich, 1864

Tuba armigera DUCHASSAING & MICHELLOTI, 1864: 48, pl. 8 fig. 3.
For further synonymy cf. WIEDENMAYER, 1977a: 114.
Callyspongia fallax; GREEN, 1977: 91, fig. 10.

Lectotype: Mus.Turin POR.no. 75, St. Thomas (designation herein). Paralectotype: ZMA POR.2407. Schizoparalectotypes: BMNH reg.no.28.11.12.93–94.

Redescription of the paralectotype, ZMA POR.2407, ST. THOMAS: (Pl. X 2)

Ramose, solid (now broken into three pieces). Branches ramified, 12 cm long, 1.5 cm in diameter, somewhat compressed. Oscules scattered over branches, 3–6 mm in diameter. Surface conulose (conules 1–3 mm high), smooth in between. Ectosomal skeleton: Large meshes 250 µm, small meshes 60–100 µm, primary fibres 18–25 µm, secondary fibres 8–12 µm in diameter. Choanosomal skeleton: Fibrofascicles 200 µm, primary fibres 40–70 µm (cored by 1–4 spicules), secondary fibres 25–35 µm (cored by 1–3 spicules), tertiary fibres 6–15 µm in diameter (cored by 0–1 spicules). Oxea: 99–*104.0*–108 by 1.5–*3.2*–4.5 µm.

Ecology: Reef dweller.

Distribution: St. Thomas; Vieques, Jamaica (HECHTEL, 1965, as *Callyspongia fallax*), Antilles & Florida (SCHMIDT, 1870, as *Cladochalina armigera*), Bermuda (DE LAUBENFELS, 1950, as *Callyspongia vaginalis* pro parte), México (GREEN, 1977, as *C. fallax*), Venezuela (CARTER, 1882).

WIEDENMAYER's (1977a) view that this sponge represents a growth form of *C. vaginalis* is taken over, as the skeletal features of the paralectotype fall within the variation of that species. Ultimately, I think, it should be shown that intermediate growth forms exist.

Callyspongia (Spinosella) plicifera (Lamarck, 1814)

Synonymy: cf. WIEDENMAYER (1977a: 105). In addition:
Callyspongia plicifera; POMPONI, 1976: 225, figs. 8–9.

CURAÇAO: ZMA POR.4347 (500 m E of Carmabi, 10–15 m, reefs, 1.IV.1976, coll. E. Westinga & P. Hoetjes); 3924 (500 m W of Piscadera, 10 m, 21.I.1974, coll. J. H. Stock, 74–113); 3293 (500 m W of Piscadera, 10–18 m, 21.XI.1973, coll. Stock, 73–15); 3871 (500 m W of Piscadera, 15 m, 13.XI.1975, coll. students Prof. Stock); 3943 (1883, no further data).
ST. THOMAS: ZMA POR.2414 (Duch. & Mich. material of *Tuba plicifera*).
BAHAMAS: ZMA POR.3519 (don. Instituut voor Nijverheid en Techniek, no further data).

General diagnosis: (Fig. 21, Pl. X 3)

Shape, size and consistency: Vase-shaped or tubaeform with the outer surface characteristically provided with an elaborate system of meander-

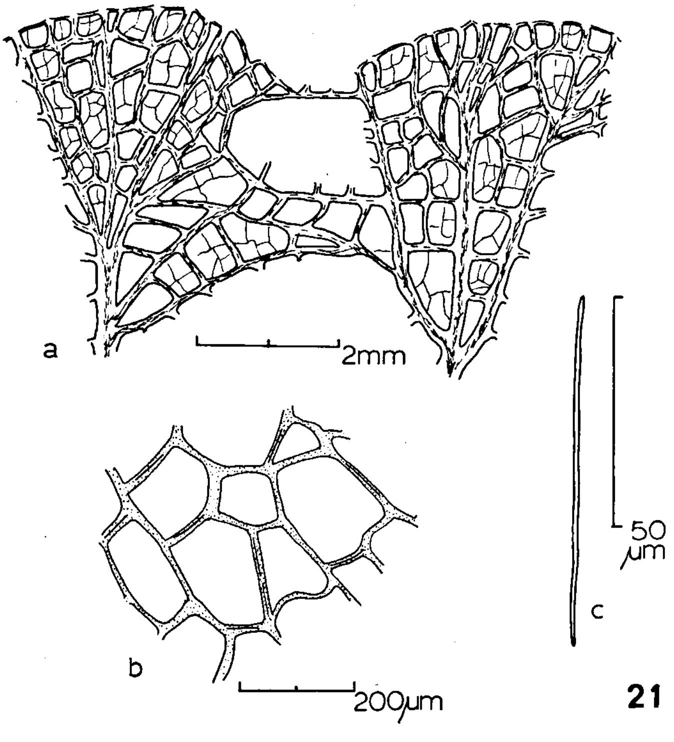


FIGURE 21. *Callyspongia (Spinosella) plicifera*, a: perpendicular section, b: tangential view of ectosomal skeleton, c: spicule.

ing grooves and/or rounded pits; in places or occasionally entirely smooth. Terminal vent somewhat constricted, with transparent, thin collar. Vases mostly solitary, but occasionally there are small side-tubes. Inner walls smooth, somewhat ridged lengthwise, with scattered oscules, 1–5 mm in diameter. Longitudinal fibrofascicles stand out clearly on inner wall and collar. Size: up to 27 cm in height, 13.5 cm in diameter; vent up to 6.5 cm in diameter. Pits and grooves 0.5–1 cm in depth, 0.5–1.5 cm in diameter. Consistency very spongy alive and in spirit, hard and incompressible when dry.
Colour: creamy white alive (blue specimens are also known), transparent brown in spirit.
Ectosome: Large meshes of ectosomal skeleton 700–1000 µm, small meshes 100–500 µm in diameter; primary fibres 60–100 µm (cored sparsely), secondary fibres 10–60 µm in diameter (cored sparsely).
Choanosome: Longitudinal fibrofascicles strongly developed, up to 550 µm in diameter, radiating towards the surface to form characteristic pits and grooves. Individual primary fibres 70–150 µm in diameter (cored by 0–5 spicules, mostly sparse), secondary connecting fibres 40–70 µm (cored by 0–2 spicules, mostly uncored), tertiary interlacing fibres 8–30 µm (mostly uncored, occasionally a single spicule is observed). Spicules thin, flexuous, strongylote: 60–*77.9*–91 by 1.0–*2.1*–2.5 µm.

Ecology: Reef dweller.

Distribution: Curaçao, St.Thomas, Bahamas; Grenada (CARTER, 1882), Guadeloupe, Tortola, Jamaica (DENDY, 1890, as *Spinosella maxima*; HECHTEL, 1965), Bahamas (WIEDENMAYER, 1977a), Florida (SCHMIDT, 1870; DE LAUBENFELS, 1936a, as *Patuloscula*; POMPONI, 1976).

This is a clearly defined species. The BMNH-fragments labeled *"C. eschrichti"* Duch. & Mich. (reg.no. 28.11.12.2–4) are conspecific with the present species, and not with *C. eschrichti.*

Callyspongia (Spinosella) tenerrima Duch. & Mich., 1864

Callyspongia tenerrima DUCHASSAING & MICHELOTTI, 1864: 57, pl. 10 fig. 3–4. [Non: *Callyspongia tenerrima*; BURTON, 1954: 225 = *C. strongylophora.*]

Hircinia purpurea HYATT, 1877 : 550 (in part, fide WIEDENMAYER, 1977a). [Non: *Hircinia purpurea* Whitfield, 1901.]
Aplysina cauliformis CARTER, 1882: 270. [Non: *Aplysina cauliformis*; WIEDENMAYER, 1977.]
Aplysina longissima CARTER, 1882: 271. [Non: *Verongia longissima*; Hechtel, 1965.]
Callyspongia fallax; DE LAUBENFELS, 1949, fide WIEDENMAYER, 1977.
[Non: *Callyspongia strongylophora* Hartman, 1955, synonymy suggested by WIEDENMAYER.]

"AMERICA": ZMA POR.2631 (no further data).

Diagnosis: (Fig. 22, Pl. X 4)

Shape, size and consistency: Ramose, basally encrusting by an anastomosed mass. Longest of the 8 branches of the present specimen 25 cm, diameter 6–15 mm. Habit erect, not tangled. Oscules in rows on the branches, 2–3 mm in diameter. Surface finely conulose. Consistency in dry condition stiff, incompressible.

Colour: "lavender" (WIEDENMAYER, 1977a), dark brown in the dry state.

Ectosome: Large meshes 700 µm, small meshes 150–200 µm, primary fibres 60–80 µm, secondary fibres 10–40 µm in diameter.

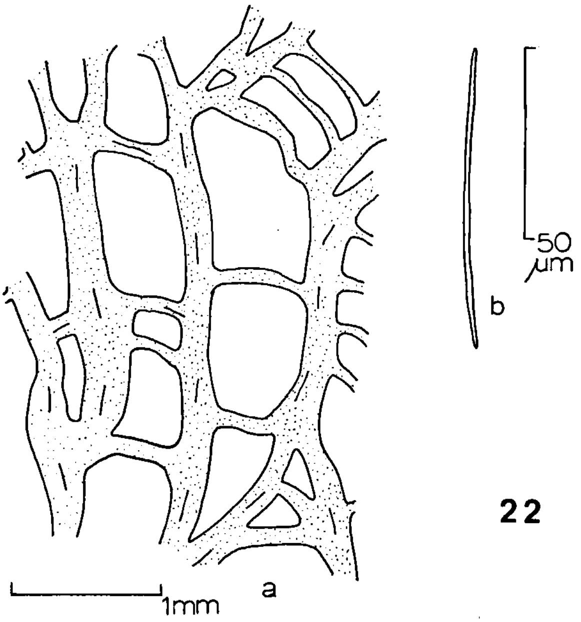


FIGURE 22. *Callyspongia (Spinosella) tenerrima*, a: choanosomal skeleton, b: spicule.

Choanosome: Axial fibrofascicles radiate towards the periphery. Fibrofascicles up to 250 μm, individual primary fibres 100–250 μm (cored by 0–8 spicules), secondary fibres and rare tertiary fibres 8–90 μm in diameter (cored sparsely by 0–2 spicules). Strongylote spicules thin, 70–*74.0*–78 by 0.5 μm.

Ecology: Found both on reefs and on rocky substrates in lagoons (fide WIEDENMAYER, 1977a).

Distribution: St. Thomas, Vieques (DUCH. & MICH., 1864), Bahamas (CARTER, 1882, as *Aplysina cauliformis* and *A. longissima*; WIEDENMAYER, 1977a), Florida (HYATT, 1877 as *Hircinia purpurea*).

As already pointed out above, WIEDENMAYER included *Callyspongia strongylophora* Hartman, 1955 in his *Spinosella tenerrima*. The two clearly belong to different subgenera on account of their skeletal plan, and moreover are easily distinguished by the tangled habit and greater delicacy of *C. strongylophora* against the stiffer, more erect and coarser condition of *C. tenerrima*. Their ecological preferences also seem to be quite different.

DISCUSSION OF THE SUBGENUS *Spinosella*

Of the 19 DUCH. & MICH. species of *Tuba*, four are no longer represented by original material, viz. *Tuba sanctaecrucis, Tuba conica, Tuba longissima* and *Tuba sagoti*. Of these, *Tuba longissima* is considered sufficiently well illustrated to be recognized as a separate species of *Callyspongia* (*Spinosella*) (cf. WIEDENMAYER, 1977a: 107). They are large, solitary yellow tubes, with coarse conulose outer surface. The remaining three must be considered unrecognizable.

Four *Tuba* species are referred to the genus *Niphates* (cf. above), viz. *Tuba crispa, Tuba pavonina, Tuba incerta,* and *Tuba digitalis.*

The eleven species left are all assigned to *Callyspongia* (*Spinosella*), viz. *Tuba sororia, T. lineata, T. megastoma, T. bursaria, T. tortolensis, T. vaginalis, T. subenervia* and *T. irregularis* (= all *Callyspongia* (*Spinosella*) *vaginalis*), *T. armigera* (= *Callyspongia* (*Spinosella*) *vaginalis* fo. *armigera*), *T. plicifera, T. scrobiculata* (= *Callyspongia* (*Spinosella*) *plicifera*).

DISCUSSION OF THE GENUS *Callyspongia*

WIEDENMAYER's subdivision of *Callyspongia* into two different genera, though defendable as far as West Indian representatives are concerned, was not based on a thorough study of related Indo-Pacific and Mediterranean species. Moreover, the emphasis he placed on characters of the peripheral skeleton was unfortunately chosen, as these are not diagnostic. His negation of the double ectosomal network in *Callyspongia fallax* is belied by the characteristics found in the lectotype of this species (cf. redescription above); it is quite comparable to the ectosome of *C. vaginalis*. A decision about generic divergence within the genus *Callyspongia* s.l. should be based on a world wide study of this group together with related "genera" (cf. section on Callyspongiidae below).

DISCUSSION OF THE FAMILY CALLYSPONGIIDAE

The family Callyspongiidae is here defined in such a way that it includes, next to *Callyspongia* s.l., also *Dactylia* Carter, 1885, *Toxochalina* Ridley, 1884, *Euplacella* Lendenfeld, 1887, and *Siphonochalina* Schmidt, 1868.

Toxochalina and *Euplacella* are not represented in the West Indies, so far. *Siphonochalina* is represented in the West Indies by a specimen reported by BURTON (1954) under the name *Haliclona spiculosa* (Dendy, 1887) (Turneffe Island, British Honduras, 2 m, B.M.N.H. 1938.6.30.22). It is a mass of erect sparsely branched tubes, with thin walls and frayed edges. It bears considerable resemblance to *Siphonochalina coriacea* Schmidt, 1868, although the spicules are smaller and thinner (30–105 by 0.5–1 μm) than those of Mediterranean material (GRIESSINGER, 1971: 100–135 by 3–5.5 μm). For the time being it is proposed to use the name *S. coriacea* for BURTON's material, although it may eventually require a new name. *Siphonochalina spiculosa* Dendy, 1887 is referred to the genus *Cribrochalina*. *Dactylia* is represented by the species described as *Siphonochalina ceratosa* Dendy, 1887. Although DENDY states, that its fibres contain tiny spicules, I have not been able to find any in his material (BMNH reg.no. 1877.4.26.22). The species nicely fits the redefinition of the genus given by BERGQUIST, MORTON & TIZARD (1971).

The group of genera similar to *Callyspongia* (viz. *Callyspongia, Toxochalina, Dactylia* and *Euplacella*) are in need of a critical revision as they seem to be only marginally distinct. *Toxochalina* is identical to *Callyspongia* but contains toxa; *Dactylia* is identical to *Callyspongia* but has no spicules; *Euplacella* is identical to *Callyspongia* but has small erect brushes of spicules on the ectosomal reticulation.

Family **PETROSIIDAE** n. fam.

Definition: Haplosclerida with an ectosomal skeleton consisting of an isotropic reticulation of single spicules or spicule tracts, and a choanosomal skeleton verging towards an isotropic reticulation of spicule tracts, in which primary and secondary tracts are indistinct.

WIEDENMAYER's family Nepheliospongiidae is here narrowed by exclusion of such genera as *Oceanapia* and *Calyx* which are put in a separate family (cf. below). Emphasis in the redefined family is placed on stony consistency and isotropically meshed skeleton. The association of this group of recent sponges with fossil genera like *Nepheliospongia* and *Heliospongia* is made on evidence, considered too thin for an inclusion into one family. (Dr. WIEDENMAYER, *in litteris*, is now inclined to think so, too).

Genus **Xestospongia** De Laubenfels, 1932

Definition: Petrosiidae in which the choanosomal skeleton is isotropic to confused and lacks spongin. Only one spicule size.

Xestospongia muta (Schmidt, 1870)

For synonymy cf. WIEDENMAYER, 1977a: 115. In addition:
Xestospongia muta; ALCOLADO, 1976: 4.

CURAÇAO: ZMA POR.3578 (near Carmabi, 15–30 m, 10.XII.1975, coll. E. Westinga & P. Hoetjes, fragment of a large cup estimated to be 50 cm in diameter).
PUERTO RICO: ZMA POR.3337 (Punta Ensenada, NW of Rincón, 4 m, 27.I.1963, coll. J. H. Stock, PR.1); 3339 (18°15′ N, 67°13.5′ W, 40–50 fthm, bottom muddy sand, 21.II.1963, coll. Stock, PR.85); 4348 (18°15′ N, 67°13.5′ W, 10–20 fthm, bottom muddy, 20.II.1963, coll. Stock).

General diagnosis: (Fig. 23, Pl. XI 1)

Shape, size and consistency: Persistently cup-shaped, with very thick walls. Up to 50 cm in diameter and up to 60 cm in height. Smaller

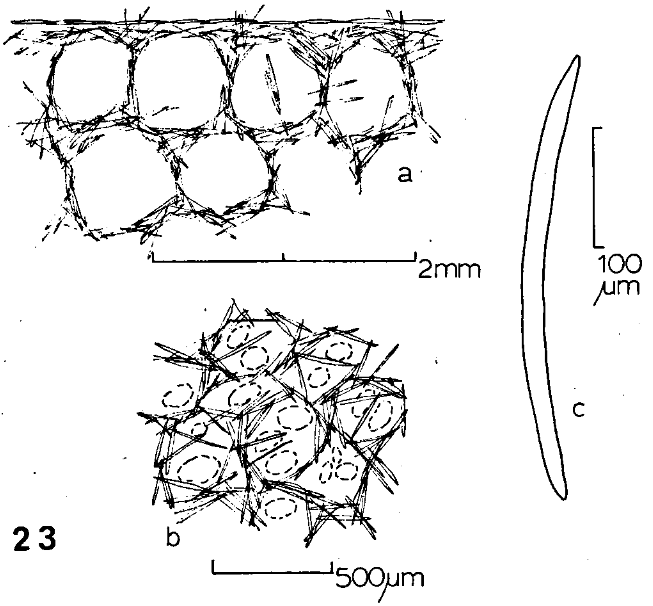


FIGURE 23. *Xestospongia muta*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

specimens may assume a cone shaped form, i.e. with the base broader than the top. Walls on the outside irregularly ridged and pitted. In between elevations the surface is smooth. Mostly without oscules, but there may be a few small openings (2–3 mm in diameter) which appear to be oscules. Inner wall without detachable dermis, rough, irregularly conulose. The detachable dermis ends on the inside rim of the vent. Wall up to 2.5 cm thick at the top, thicker halfway down. The atrial cavity extends to about half way the height of the cup. Consistency brittle, incompressible, easily crumbled or broken.

Colour: rose-purple (alive), light brown (in spirit).

Ectosome: detachable; it consists of an isotropic reticulation of spicule tracts, often ill defined, surrounding single large pores (up to 200 µm in diameter).

Choanosome: cavernous, with fairly large subdermal spaces. The main skeleton is a reticulation of spicule tracts, 60–100 µm in diameter, outlining rounded meshes 200–400 µm in diameter. No spongin; many loose spicules, which may be packed into confused, felt-like masses obscuring the reticulation. Spicules: slightly curved oxea and strongyles: 303–*380.3*–435 by 11–*18.8*–23 µm.

Ecology: Known from the reef community and from muddy sand bottom in deeper water.

Distribution: Curaçao, Puerto Rico; Cuba (ALCOLADO, 1976), Bahamas (WIEDENMAYER, 1977a), Florida (DE LAUBENFELS, 1936a, 1953).

The spicule sizes of the present specimens conform to those of SCHMIDT's type specimen (cf. redescription by TOPSENT, 1920), but differ rather strongly in thickness with those of WIEDENMAYER's specimens (average 8.3 µm, as compared to 18.8 µm in the present specimens). A local difference in spicule size was noted in the present material: Curaçao 11–16 µm, Puerto Rico 14–23 µm, so it is likely that thickness may vary in a regional sense. The lengths of the spicules are apparently fairly constant: Curaçao 360–435 µm, Puerto Rico 303–412 µm, Bahamas 290–430 µm (WIEDENMAYER, 1977a). Oxeote spicules were the dominant type in the present material (and in the type of SCHMIDT), whereas strongles were dominating in WIEDENMAYER's specimens.

Xestospongia wiedenmayeri n.sp.

Holotype: ZMA POR.3610, CURAÇAO, Piscadera Baai, North Islet, *Rhizophora*, 25.XI.1963, coll. P. Wagenaar Hummelinck, *1489*. Paratypes: ZMA POR.3670, 3920 (Piscadera Baai, North Islet, mud and sand bottom, 1–1.5 m, 26.IX.1967, coll. Hummelinck, *1621A*); 3901 (Piscadera Baai, near Enoch, tidal zone, *Rhizophora*, 2.II.1949, coll. Hummelinck, *1028A*).

Description: (Fig. 24, Pl. XI 2)

Shape, size and consistency: Massively and irregularly encrusting on *Rhizophora* and mollusc shells, with cylindrical elevations. Typically the surface consists of longitudinal ridges and fistules. The body is wholly or partly hollow. Cylinders up to 8 cm high, 4 cm in diameter. Surface smooth. Consistency extremely fragile, easily broken, incompressible.
Colour: dark brownish red (spirit).
Ectosome: a detachable, tangential halichondroid reticulation of single spicules.

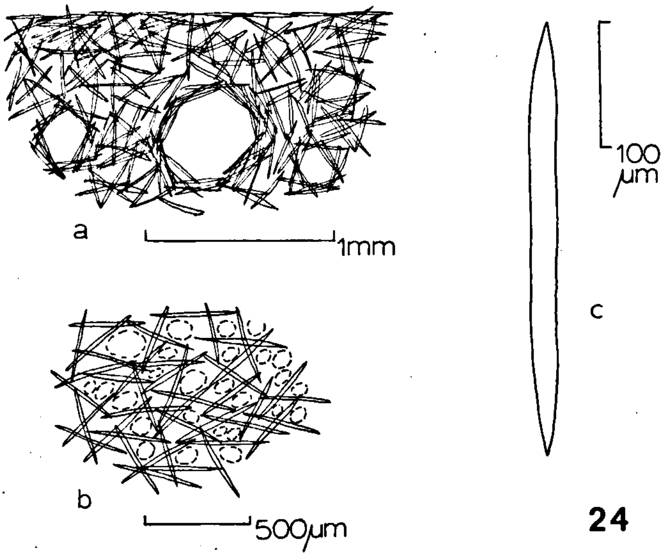


FIGURE 24. *Xestospongia wiedenmayeri* n.sp., a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

Choanosome: Little flesh, large proportion of confused single spicules. The vague reticulation is isotropic – confused, consisting mostly of single spicules. Tracts are rare and ill-defined. Spicules: oxea with some strongylote and stylote forms, 230–*348.7*–428 by 11.5–*15.3*–18 µm.

Ecology: The present material is only known from mangrove roots and muddy environments.

Distribution: Curaçao.

Etymology: Named after Dr. FELIX WIEDENMAYER, in honour of his important contributions to the knowledge of West Indian sponges.

The predominantly single-spicule reticulation readily distinguishes this form from *X. muta* and *X. tierneyi* (De Laubenfels, 1953). The habit approaches that of *X. tierneyi* (cf. redescriptions of WIEDENMAYER (1977)), a species known only from reef localities. Other points of difference are the predominantly oxeote, thick spicules of the present species, compared to the predominantly strongylote, thinner ones of *X. tierneyi* (185–*345*–465 by 3.5–*7.5*–11.5 μm, according to WIEDENMAYER).

Xestospongia portoricensis n.sp.

Holotype: ZMA POR.4349, PUERTO RICO, 4 km off Añasco River, N of Mayagüez, 10 m, sandy mud, 14.IX.1963, dredged by J. E. Randall, Inst. Mar. Biol. Univ. P. Rico, coll. P. Wagenaar Hummelinck, *1416*. Paratype: ZMA POR.3728, 4 km off Punta Cadena, N of Mayagüez, 90 m, muddy sand, 14.IX.1963, dredged by Randall, coll. Hummelinck, *1415*.

Description: (Fig. 25, Pl. XI 3)

Shape, size and consistency: The holotype consists of 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 was cut into five fragments by its

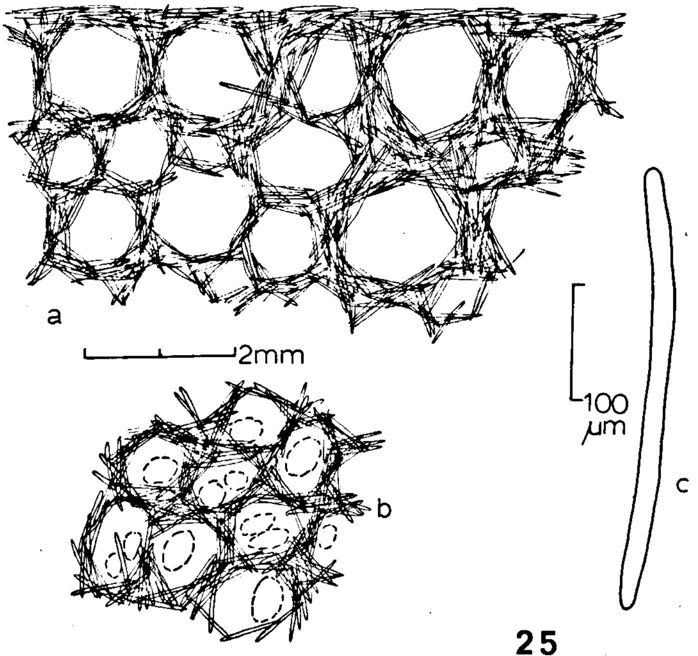


FIGURE 25. *Xestospongia portoricensis* n.sp., a: perpendicular section of peripheral skeleton b: tangential view of ectosome, c: spicule.

collector. Oscules are not apparent. Surface smooth, slightly rough to the touch. The conical elevations are solid, ending blindly. Consistency: stony hard, incompressible, not easily broken or cut. The paratype is a broken off fragment of a conical elevation of similar morphology as that of the holotype.
Colour: light brown in spirit.
Ectosome: not easily detachable; it comprises a tangential reticulation of spicule tracts and single spicules.
Choanosome: cavernous. Large canals, particularly subdermal ones, traverse the specimens from the top of the elevations down into the basal mass. The skeleton is an isotropic reticulation of thick spicule tracts (up to 200 µm in diameter), forming round meshes. Spicules: all full grown ones, without a single exception, are perfect strongyles; immature spicules may vary from oxea to strongyles. Size: 377–*408.5*–429 by 15–*17.4*–19 µm.

Ecology: Growing on flat sandy mud bottoms.

Distribution: Puerto Rico.

The present species stands out among the other West Indian *Xestospongia* species by its peculiar habit and its hard consistency. It is probably nearest to *X. muta,* which occurs in the same habitat (cf. ZMA POR.3339).

Xestospongia subtriangularis (Duchassaing, 1850)

Spongia subtriangularis Duchassaing, 1850: 26.
Thalysias subtriangularis Duchassaing & Michelotti, 1864: 85, pl. 17 fig. 1.
Thalysias subtriangularis var. *lyriformis* Duchassaing & Michelotti, 1864: 85, pl. 19 fig. 1.
Thalysias rugosa Duchassaing & Michelotti, 1864: 84, pl. 18 fig. 4.
Pachychalina rugosa var. *rubens* Arndt, 1927: 154, pl. 1 fig. 6.
Haliclona doria De Laubenfels, 1936: 458; Hechtel, 1965: 18 pl. 1 fig. 4; Green, 1977: 86, fig. 6.
Neopetrosia longleyi; Green, 1977: 88, fig. 8.
Xestospongia subtriangularis; Wiedenmayer, 1977a: 113, pl. 14 figs. 1–5, text-fig. 128 (with additional synonyms).

Redescription of the lectotype of *Thalysias subtriangularis* var. *lyriformis* Duch. & Mich. 1864, ZMA POR.2375 (designation herein), and paralectotype, ZMA POR.2376 (both from St. Thomas): (Pl. XI 4)

The lectotype is a flabellate mass of closely anastomosed tubes. Size 14 cm high, 14 cm wide, 1 cm in diameter, vents 2–3 mm in diameter. The paralectotype is a flabellate mass of individual tubes rising from a basal branch. Height 21 cm, width 22 cm; diameter of tubes 1–2 cm, of vents 2–4 mm. The surface is smooth, covered extensively with *Parazoanthus*. Ectosome: a predominantly tangential unispicular reticulation (though rather incomplete and irregular) in between slightly protruding skeletal tracts. Choanosome: microcavernous. The basic reticulation of ascending and interconnecting tracts is largely obscured by the superimposed isotropic reticulation of irregular spicule bundles and a ground mass of single spicules. Oxea hastate, slightly curved: 145–*161.3*–173 by 4.0–*5.4*–6.5 µm.

Redescription of the lectotype (per WIEDENMAYER, 1977a, only extant specimen) of *Thalysias rugosa* Duch. & Mich., 1864, ZMA POR.2372, ST. THOMAS (erroneously labeled at a later date as *"Thalysias coccinea"*, but original label still in the bottle): (Pl. XII 1)

Fairly compact mass, with some outcrops. Oscules scattered over one surface only. Size: 9 cm high, 7.5 cm in widest expansion. Oscules 2–5 mm in diameter, flush with the smooth surface. Ectosome: a tangential reticulation of spicule tracts outlining meshes of 150–220 µm in diameter. Choanosome: main skeleton an isotropic reticulation of vague irregular spicule tracts, with a ground mass of single spicules. Oxea 145 by 4–7 µm.

CURAÇAO: ZMA POR.1727 (Spaans Water, IV/V. 1920, coll. C.J. van der Horst, type of *Pachychalina rugosa* var. *rubens* ARNDT, 1927: 154, pl. 1 fig. 6); 1725 (Spaans Water, 17.IV.1920, coll. van der Horst, labeled *Pachychalina rugosa*, cf. ARNDT, 1927: 153, pl. 1 fig. 7, text-fig. 14).
BARBADOS: ZMA POR.4440 (Alleynes Bay, about 800 m off Holetown, 90–100 m, muddy sand, 19.II.1964, dredged by J.B. Lewis, coll. P. Wagenaar Hummelinck, *1442*).
PUERTO RICO: ZMA POR.3504 (Mata Gagada, off Parguera, 0–3 m, 8.II.1963, coll. J.H. Stock, PR.111); 3507 (San Cristóbal Reef, near Parguera, 3 m, 10.II.1963, coll. Stock, 59).
FLORIDA: ZMA POR.4003 (Key Biscayne, North Point, sandflat with *Syringodium* and *Thalassia*, 1.IX.1963, coll. Hummelinck, *1410*).

General diagnosis: (Fig. 26, Pl. XII 2)

Shape, size and consistency: Of varied shape: sprawling branches with upright, tubiform outcrops, stiffly branched bushes, or flabelliform to lamellate masses. Oscules may be flush with the surface or at the apex of smaller volcanoe-shaped elevations. Diameter of branches 1–2 cm, height of entire specimens up to 21 cm, lateral expansion up to 20 cm. Oscules 2–5 mm in diameter. Surface optically smooth, but slightly rough to the touch; quite lipostomous. Consistency hard, incompressible. Often thickly infested with *Parazoanthus*.

Colour: red, brown-red, brown, or greenish alive; light brown in spirit.

Ectosome: Tangential unispicular or plurispicular reticulum, often incomplete, in between protruding choanosomal fibre-brushes; meshes 150–200 µm. Spongin absent.

Choanosome: Basically, the choanosomal skeleton probably consists of a system of primary ascending tracts and secondary interconnecting tracts as commonly found in the three families treated above. This is mostly still

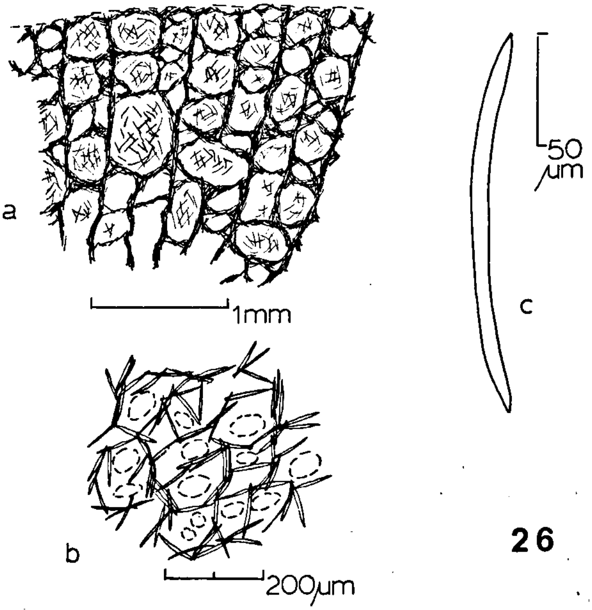


FIGURE 26. *Xestospongia subtriangularis*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicule.

apparent in peripheral regions, but tends to become obscured by a superimposed isotropic reticulation without definite orientation, producing rounded irregular meshes; these are found increasingly towards the interior. Spicule tracts paucispicular with little or no spongin. Many loose interstitial spicules (among them many smaller and thinner growth stages), which may occasionally lead to the loss of any reticulation. Spicules oxea, with rare strongylote or stylote modifications, of fairly uniform size (only full-grown spicules included): 121–*159.3*–186 by 3.5–*5.9*–8.5 μm.

Ecology: Found in a wide variety of habitats, including reefs, *Thalassia*-beds and sandflats.

Distribution: St. Thomas, Curaçao, Barbados, Puerto Rico, Florida; Antigua (Carter, 1882, as *Thalysias repens*), Guadeloupe, Tortola, Vieques (Duch. & Mich. 1864), Jamaica (Hechtel, 1965, as *Haliclona doria*), Bahamas (De Laubenfels, 1949, as *Haliclona longleyi;* Wiedenmayer, 1977a), México (Green, 1977), Panamá (De Laubenfels, 1936b as *Haliclona doria*).

Haliclona doria De Laubenfels (1936) is considered synonymous with the present species, although the author expressly stated that it was not conspecific with *"Thalysias subtriangularis"*; we know, however, that DE LAUBENFELS confused the latter species with *Amphimedon compressa* Duch. & Mich. (cf. WIEDENMAYER, 1977: 113). A portion of the type specimen of *Haliclona doria* (USNM 22228) was kindly sent on loan by Dr. RUETZLER. It shows the same skeletal characters as the present species, and its habit, consistency and colour also conform. *Haliclona doria* sensu Hechtel (1965) is also clearly conspecific with the present species. For a discussion of the relationship with other *Xestospongia* species cf. the Discussion of the genus below.

DISCUSSION OF THE GENUS *Xestospongia*

Xestospongia subtriangularis stands out among the remaining West Indian *Xestospongia* species by its spicule size (160 by 5 µm against 300–400 by 10–20 µm in the remaining species) and its radiate skeleton. It is not at all impossible, that it belongs into a genus of its own (which would be *Neopetrosia* De Laubenfels, 1949), contrary to the belief of BERGQUIST (1965) and WIEDENMAYER (1977a). A decision in this matter is postponed until a proper revision of *Xestospongia* and *Petrosia* has been made, as it is quite clear that many described *Petrosia* species are in reality *Xestospongia* (e.g. *Petrosia testudinaria* (Lamarck, 1814)).

Cribrochalina cretacea Schmidt, 1870, transferred to *Xestospongia* by WIEDENMAYER (1977a), does not seem to be a *Xestospongia* from TOPSENT's (1920) redescription. It is proposed here to leave this ill-known species in *Cribrochalina*.

Genus **Petrosia** Vosmaer, 1885

Definition: Petrosiidae with a tangential ectosomal unispicular reticulation and a basically lamellate-isotropic choanosomal skeleton of thick spicule tracks (i.e. choanosomal meshes arranged in planes parallel to the surface), and an interstitial unispicular reticulation. At least two distinct size categories of strongylote or oxeote spicules.

Petrosia weinbergi n.sp.

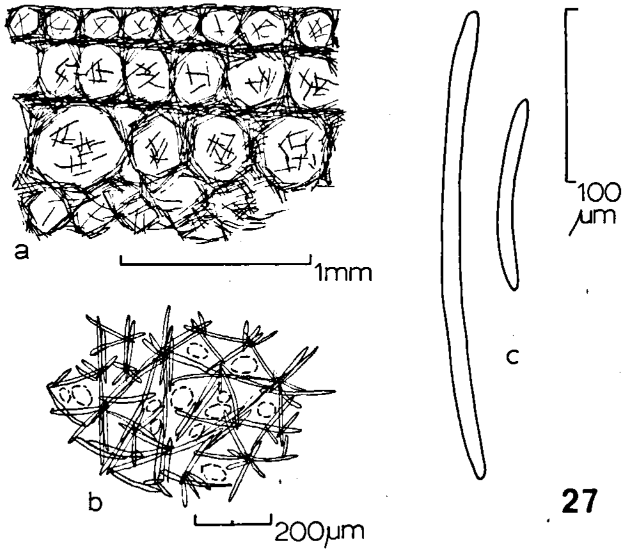
Holotype: ZMA POR.3670, CURAÇAO, 500 m W of Piscadera, 50 m, 7.XI.1975, coll. S. Weinberg. Paratype: ZMA POR.4441, PUERTO RICO, shelf edge of La Parguera, 20–35 m, 3.III. 1963, coll. J.H. Stock, PR.120.

Description: (Fig. 27, Pl. XII 3–4)

Shape, size and consistency: The holotype is a stony mass encrusting corals, 10 cm long, 2 cm high, 2 cm wide. The paratype is a lamellate piece of 23 cm long, 14 cm high and 0.8–1 cm in thickness, possibly growing horizontally on a vertical slope. Scattered oscules are 2–5 mm in diameter. The paratype has oscules only on one side. Surface smooth. Consistency hard, brittle. The holotype is infested with *Parazoanthus*.

Colour: dirty green alive, olive-brown in spirit.

Ectosome: An ectosomal network of tangential spicules, carried by a subdermal reticulation of stout spicule tracts forming meshes of about 400–500 µm in diameter. In perpendicular sections these form a distinct crust of about 200–300 µm in thickness. A smaller spicule category is concentrated in this dermal crust.



27

FIGURE 27. *Petrosia weinbergi* n.sp., a: perpendicular section of peripheral skeleton, b: tangential view of ectosome, c: spicules.

Choanosome: cavernous; in places a definite isotropic reticulation of thick spicule tracts is present forming round meshes, regularly arranged in planes parallel to the surface. The meshes are filled by a confused reticulation of single spicules. For the most this basic pattern is obscured by irregular masses of spicules. Spongin scarce. Spicules: oxea to strongyles, in two, possibly three categories: (29–*41.7*–58 by 1.5–*2.8*–4 µm), 76–*113.7*–151 by 4–*7.4*–12 µm, 222–*254.0*–281 by 7.5–*11.1*–14.5 µm. The spicule category given in brackets may perhaps represent smaller growth stages of the second category.

Ecology: Deeper reef slopes.

Distribution: Curaçao, Puerto Rico.

Etymology: Named after its collector, Dr. S. WEINBERG.

The present material is assigned to *Petrosia* on the basis of its distinct spicule categories and the tendency of its choanosome to be arranged in planes, though this is ill-defined. No matching descriptions are found in West Indian sponge literature.

DISCUSSION OF THE GENUS Petrosia

Two West Indian records of *Petrosia* are found in the literature, viz. *P. halichondrioides* Wilson, 1902, which has been assigned to the Homosclerophorid genus *Plakortis* Schulze (1880) by WIEDENMAYER (1977a), and *P. aulopora* sensu Wilson (1902), which is synonymous with *Xestospongia subtriangularis* (Duch. & Mich.).

Genus Strongylophora

Definition: Petrosiidae with a lamellate-isotropic choanosomal reticulation of spicule tracts. Spicules in at least two size categories. Microscleres strongylote, including peculiar sausage-shaped ones.

Strongylophora hartmani n.sp.

? *Strongylophora* spec.; HARTMAN in LEWIS, 1965: 1061.

Holotype: ZMA POR.4442, BARBADOS, Alleynes Bay about 800 m off Holetown, 90–100

m, muddy sand, 19.II.1964, dredged by J.B. Lewis of Bellairs Res. Inst., coll. P. Wagenaar Hummelinck, *1442*.

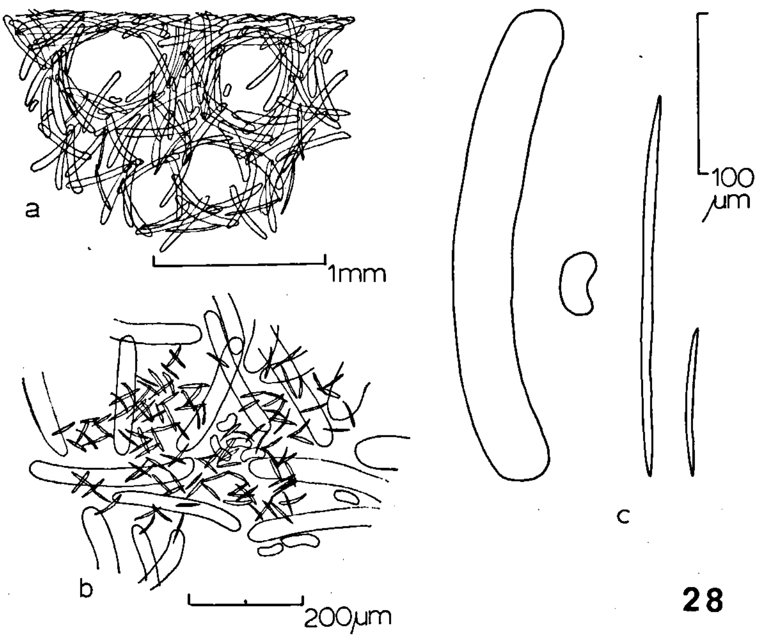
Description: (Fig. 28, Pl. XIII 1)

Shape, size and consistency: Semiglobular, with a flat base, 3 cm high, 3.5 cm in diameter. Surface smooth, but rough to the touch; no oscules visible. Consistency stony hard, very difficult to cut.

Colour: orange-brown (spirit).

Ectosome: a reticulation of tangentially arranged small oxea.

Choanosome: No large canals. The whole interior is a dense, halichondroid mass of thick strongyles, with only vaguely discernible, rounded meshes. Spicules: Two size classes of thick strongyles (of which the smaller are of the peculiar sausage shape), viz. 300–*340.0*–361 by 30–*34.1*–38 µm and 24–*48.8*–81 by 7–*20.2*–30 µm, and two size classes of thin oxea, 210–*252.0*–306 by 6–*6.5*–7 µm and 70–*91.0*–102 by 3–*3.8*–5 µm.



28

FIGURE 28. *Strongylophora hartmani* n.sp., a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicules.

TABLE 1

CHARACTERISTICS OF SPECIES KNOWN TO BELONG TO *Strongylophora* DENDY, 1905

					SPICULES				
SPECIES	SHAPE	SURFACE	CONSISTENCY	COLOUR	large strongyles	medium strongyles	small strongyles	large oxea	small oxea
S. durissima Dendy, 1905 (Indian Ocean)	massive, sprawling oscules present	uneven, irregular	stony hard, cavernous	grey-brown	260/20	–	26/6	–	28/2
S. strongylata (Thiele, 1900) (Pacific Ocean)	finger-shaped, oscules 2 mm	smooth?	?	dark brown	325/20	–	present but size not given	–	40/?
S. dendyi Hechtel, 1969 (Barbados)	encrusting, oscules 0,5–3 mm	smooth	soft	cream	205/7	110/5	35/3.5	–	22/1.5
S. hartmani n.sp. (Barbados)	semiglobular, no oscules	smooth	stony hard	orange-brown	340/34	–	49/20	252/6	91/4

Ecology: Living on muddy sand bottom at greater depths.

Distribution: Barbados.

Etymology: Named after Prof. WILLARD D. HARTMAN in recognition of his important contributions to spongology.

The new species seems to be closest to *S. durissima* Dendy, 1905 from the Indian Ocean. This species differs from the present one in the presence of large choanosomal canals and in spicule size (strongyles up to 260 by 20 µm, oxea as small as 28 by 2 µm). *S. dendyi* Hechtel, 1969 from Barbados differs widely from *S. hartmani* in shape, consistency and spicule size (cf. Table 1). LEWIS (1965) records a *Strongylophora* species (identification by W.D HARTMAN) from 50–100 m near Barbados; this is likely to be the same as the present species.

DISCUSSION OF THE GENUS *Strongylophora*

Four West Indian species have been recorded under *Strongylophora,* viz. *S. rampa* De Laubenfels (1934), *S. santa* De Laubenfels (1936b), *S. amphioxa* De Laubenfels (1950) and *S. dendyi* Hechtel (1968). Of these only the latter species seems to be a proper *Strongylophora* with the characteristic sausage-shaped microstrongyles. *S. amphioxa* is represented in the British Museum (N. H.) by a portion of the holotype (reg.no. 1948.8.6.23); it is a soft sponge with an easily detachable ectosome consisting of a unispicular, unilayered tangential reticulation with spongin at the nodes. It is here transferred to *Adocia* (cf. above); the only exceptional feature of it is the occurrence of two apparently distinct megasclere categories, viz. 210 by 6 µm and 105 by 5 µm, arranged into a loose reticulation of primary lines (1–4 spicules) and interconnecting single spicules. If the genus *Menanetia* Topsent (1896) is proven to be valid, then this species would fall to *Menanetia. S. rampa* is in all probability a *Xestospongia* close to, if not conspecific with *X. tierneyi* (De Laubenfels, 1953), as it has no distinct sausage-shaped spicules. *S. santa* is tentatively referred to the genus *Pachypellina* (cf. below).

TABLE 1 gives a comparison of all *Strongylophora* species and their characteristics.

DISCUSSION OF THE FAMILY PETROSIIDAE

A fourth genus should be included in the Petrosiidae to receive *Haliclona pellasarca* De Laubenfels (1934), from deep water off Puerto Rico. The skeleton of the single specimen (USNM 22336, kindly sent on loan by Dr. RUETZLER) is reminiscent of *Xestospongia subtriangularis* (Duch. & Mich.) with the added peculiarity of ectosomal brushes of microxea (30 by 1 µm) next to normal sized megascleres (220 by 9 µm) (cf. Plate XVIII 1).

Family **OCEANAPIIDAE** n. fam.

Definition: Haplosclerida with an ectosomal skeleton consisting of an often multilayered isotropic reticulation of single spicules; choanosomal skeleton an isotropic reticulation of single spicules (producing a "pulpy" effect) with an irregular system of predominantly tangential thick spicule tracts. Thin walled fistular outcrops are common.

This family includes characteristic fistulate genera such as *Oceanapia* and *Pellina* next to lipostomous genera as *Calyx* and *Pachypellina*.

Genus **Pellina** Schmidt, 1870

Definition: Oceanapiidae with a simple complement of small oxeote to strongylote megascleres; no microscleres. Fistule ectosome supported by longitudinal, sparsely anastomosing spicule tracts.

Pellina nodosa (George & Wilson, 1919)

Phloeodictyon nodosum GEORGE & WILSON, 1919: 152, pl. 62 figs. 29–30 and 32, 64 fig. 63.
Pellina coela DE LAUBENFELS, 1950: 62, pl. 2 fig. 5, text-fig. 27.
Rhizochalina oleracea; WELLS, et al., 1960: 212; LITTLE, 1963: 44, figs. 15, 17. [Non: *Rhizochalina oleracea* Schmidt, 1870].
Pellina coeliformis HECHTEL, 1965: 29, pl. 3 fig. 1, text-fig. 4.

CURAÇAO: ZMA POR.3789, 3852, 3983 (Piscadera Baai, N part SW, small bay, 2 m, muddy, 30.X.1963, coll. P. Wagenaar Hummelinck, *1480A*); 3801 (Piscadera Baai, NE, small bay, 3.5

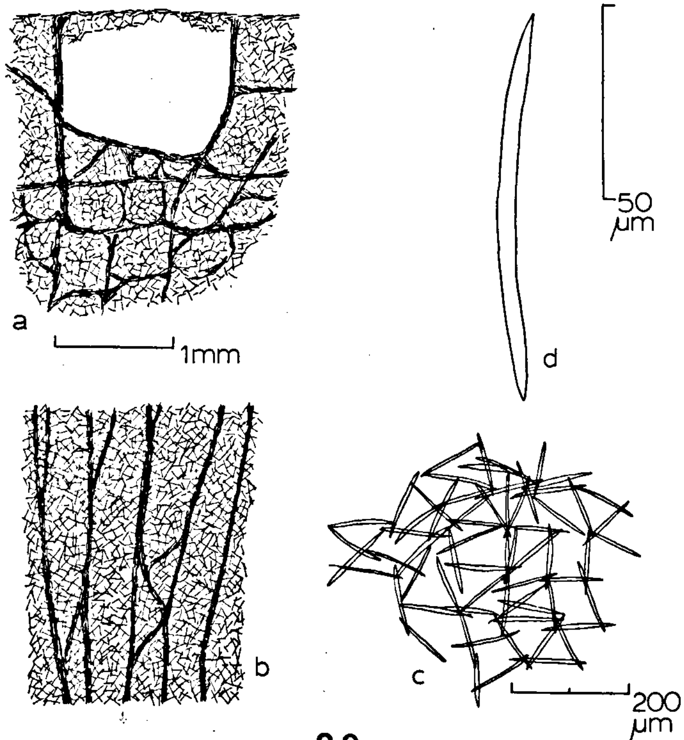
m, sandy mud, 30.X.1963, coll. Hummelinck, *1486*); 3933 (Piscadera Baai, N part SW, on *Rhizophora*, 11.X.1963, coll. Hummelinck, *1479*); 3919 (Piscadera Baai, NW, 1.5–3 m, muddy, 26.X,1963, coll. Hummelinck, *1500A*).

Margarita: ZMA POR. 3755 (Puenta de la Restinga, on *Geodia gibberosa*, on rocks near mangrove, 11.I.1966, coll. Hummelinck, *1449*).

Florida: ZMA POR. 3686 (Key Biscayne, NE point, on *Geodia gibberosa*, on beachrock, 7.IX.1963, coll. Hummelinck, *1411*).

General diagnosis: (Fig. 29, Pl. XIII 2)

Shape, size and consistency: Thinly (several mm in thickness) to thickly (up to 2 cm in thickness) encrusting base, with a large number of tall, fairly stiff fistules and oscular tubes rising from it. Laterally spreading masses of



29

Figure 29. *Pellina nodosa*, a: perpendicular section of massive part of the sponge, b: tangential view of fistule wall, c: tangential view of ectosomal skeleton, d: spicule.

up to 50 cm². Tubes and fistules with paper-thin, semitransparant (particularly near the apices) walls, up to 4 cm long and 5 mm in diameter.
Consistency: fragile, easily damaged.
Colour: white or dirty white alive, dirty white to dirty brown in spirit.
Ectosome: of the encrusting base: a unispicular tangential multilayered reticulum supported by multispicular columns traversing large subdermal spaces; of fistules: a unispicular tangential reticulum supported by longitudinal, sometimes anastomosing tracts, 20–60 µm in diameter, running lengthwise along the inside of the tubes and fistules, but petering out to thin sinous lines near the apex.
Choanosome: Absent in tubes and fistules. In the base stout skeletal columns of fasciculated tracts traverse a more or less continuous subdermal lacuna. Underneath, the stout fibres form a square meshed reticulum of multispicular spongin rich tracts, enclosing a ground mass of loose spicules. Meshes 200–600 µm, tracts 60–80 µm in diameter (10–20 spicules per cross-section). Oxea: 82–*129*–165 by 3–*4.8*–6.5 µm.

Ecology: The species is known from mangrove forests and intertidal rocks, often associated with the sponge *Geodia gibberosa*.

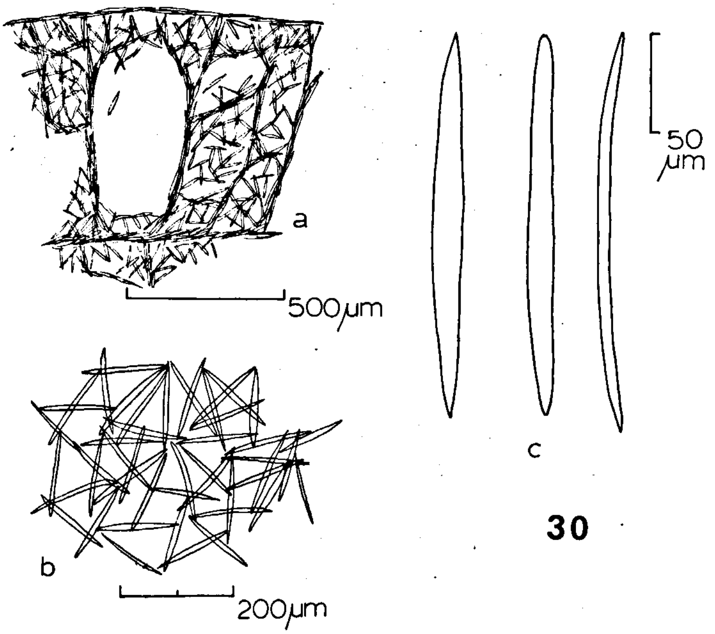
Distribution: Curaçao, Margarita, Florida; Jamaica (HECHTEL, 1965, as *P. coeliformis*), Bermuda (DE LAUBENFELS, 1950, as *P. coela*), North Carolina (GEORGE & WILSON, 1919, as *Phloeodictyon nodosum;* WELLS, et al., 1960, as *Rhizochalina oleracea*), Gulf Coast (LITTLE, 1963, as *Rhizochalina oleracea*).

Pellina coela De Laubenfels, 1950 and *P. coeliformis* Hechtel, 1965 are here considered synonymous, as the only significant difference seems to be the small size of the spicules given by DE LAUBENFELS (90 by 3 µm). These smaller spicules were not uncommon in the present material, and in view of the overall similarity of other characters there are no sufficient grounds for upholding both as separate species. When the description and figures of these sponges are compared with those of GEORGE & WILSON'S *Phloeodictyon nodosum,* it is clear, that we are dealing with the same species. WELLS, et al. (1960) and LITTLE (1963) apparently followed DE LAUBENFELS' (1947) misunderstanding of the identity of *Rhizochalina oleracea* Schmidt, 1870. HECHTEL (1965) noted the absence of subdermal lacunae in his material; all the present specimens contained ample subdermal spaces (size about 1.8 by 1.8 mm) in between supporting skeletal columns.

Pellina carbonaria (Lamarck, 1814)

Spongia carbonaria Lamarck, 1814: 375.
Thalysias carbonaria; Duchassaing & Michelotti, 1864: 83, pl. 17 fig. 4, 19 fig. 2.
Pachychalina carbonaria; Arndt, 1927: 152, pl. 1 fig. 1.
Phloeodictyon carbonaria; Topsent, 1930: 26.
Pellina carbonaria; De Laubenfels, 1936a: 68; 1954: 101, fig. 63; Bergquist, 1965: 157, fig. 19.
Adocia carbonaria; Hechtel, 1965: 26, pl. 3 figs 2–3; 1968: 9

Curaçao: ZMA POR. 1721, 1722, 1723, 1724, 1726 (Spaans Water, V.1920, coll. C.J. van der Horst, cf. Arndt, 1927: 152, pl. 1 fig. 1).
St. Martin: ZMA POR.4155 (Rolandus Canal at Welvaartsbridge near Great Bay, muddy, 28.IX.1963, coll. P. Wagenaar Hummelinck).
St. Thomas: ZMA POR.2371 (Duch. & Mich. specimen labeled *Thalysias carbonaria*).
Puerto Rico: ZMA POR.4040 (Bahía Fosforescente, SE, *Rhizophora,* 17.IX.1963, coll Hummelinck, *1421*).
Florida: ZMA POR. 4073 (Key Biscayne, sandy creek in mangrove swamp, 31.VIII.1963 coll. P. Hummelinck, *1412*).



30

Figure 30. *Pellina carbonaria,* a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicules.

General diagnosis: (Fig. 30, Pl. XIII 3)

Shape, size and consistency: Massive, lobate to ramose; fistules short, often broken off, thin walled. Surface smooth. Size up to 10 × 6 × 7 cm, oscular collars about 4 mm in diameter. Consistency brittle to pulpy, easily torn, easily broken into fragments.

Colour: black to blackish brown both alive and in spirit. Gives off a long persisting blackish exudate when put into spirit.

Ectosome: smooth, detachable, consisting of a multilayered coarse tangential reticulum, uni- to multispicular. Fistule wall architecture unknown.

Choanosome: The ectosomal crust overlies fairly large subdermal spaces. Skeleton partly or wholly confused, halichondroid, with very little spongin and alsmost no tracts. Spicules basically oxea, but a large variation is often found from sharply pointed oxea to strongyla, often stair-stepped. Size: 127–*188.0*–260 by 3–*8.1*–13 µm.

Ecology: Soft bottom substrates, mangroves, and seagrass fields.

Distribution: St.Thomas, Curaçao, St.Martin, Puerto Rico, Florida; Jamaica (HECHTEL, 1965 as *Adocia carbonaria*), Pacific Ocean (DE LAUBENFELS, 1954; BERGQUIST, 1965).

In contrast to HECHTEL'S (1965) opinion I regard DE LAUBENFELS' *Pellina carbonaria* as conspecific with LAMARCK'S *Spongia carbonaria*. DE LAUBENFELS' specimen (USNM 22480, kindly sent on loan by Dr. RUETZLER) has thinner, strongylote spicules (180 by 5 µm) and delicate fistules, but these features fall within the variation of the present material.

DISCUSSION OF THE GENUS *Pellina*

There is considerable difference between both West Indian *Pellina* species. *P. carbonaria* is in many aspects not a typical *Pellina* as the "fistules" are moderately thick-walled and their walls do not, as far as could be ascertained from the broken pieces, possess the characteristic subdermal longitudinal supporting tracts, as found in *P. nodosa* and also in the type species *P. semitubulosa* (Schmidt, 1862).

Pellina needs comparison with *Oceanapia*, with which it has been confused in the past. The differences between these genera are mostly of a quantitative kind: *Oceanapia* species are bigger and tougher (with a leathery spongin-enforced ectosome). In addition to this, the fistule walls are supported by an isotropic reticulation of thick spicule tracts and sigmatose microscleres are common.

Genus **Oceanapia** Norman, 1869

Rhizochalina Schmidt, 1870
Phloeodictyon Carter, 1882

Definition: Oceanapiidae with a spongin-enforced tangential ectosomal crust. Fistule walls supported by an irregular isotropically meshed reticulation of spicule tracts bound by spongin. Microscleres, if present, sigmata.

Oceanapia fistulosa (Bowerbank, 1873)

Desmacidon fistulosa BOWERBANK, 1873: 19, pl. 4 figs. 7–8.
Rhizochalina fistulosa; RIDLEY, 1884: 420; RIDLEY & DENDY, 1887: 32, pl. 8 figs. 2–2a, 9 fig. 4.
Oceanapia robusta; RIDLEY & DENDY, 1887: 36, pl. 9 fig. 3. (Non: *Oceanapia robusta* (Bowerbank, 1866))

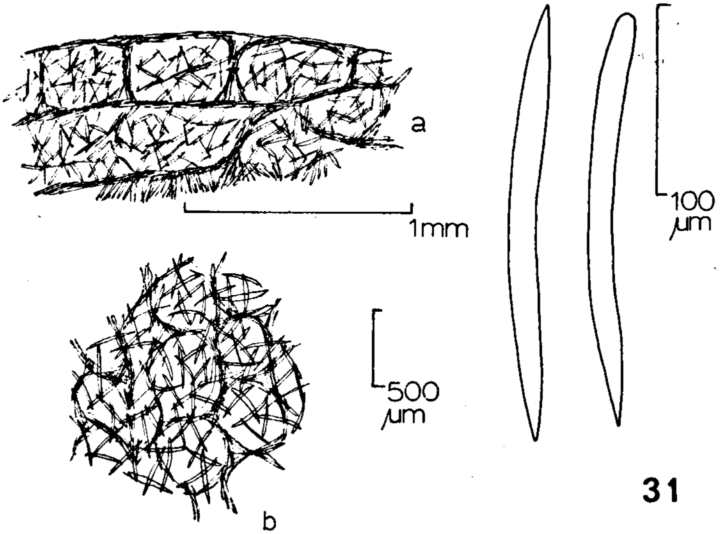
PUERTO RICO: ZMA POR.3684, 4076 (Mayagüez, 4 km off mouth Añásco River, 10 m, sandy mud, 14.IX.1963, dredged J. E. Randall, coll. P. Wagenaar Hummelinck, *1416*); 3727, 4260 (Mayagüez, 4 km off Punta Cadena, 90 m, muddy sand, 14.IX.1963, dredged Randall, coll. Hummelinck, *1415*).

General diagnosis: (Fig. 31, Pl. XIII 4)

Shape, size and consistency: Pear-shaped to globular, up to 6 cm in diameter and 5 cm high. Upper and lateral side provided with stiff, long fistules, up to 9 cm long. The largest specimen possesses 7 fistules, the smallest 3. Fistules not branched, or anastomosed. Surface of main body and fistules smooth, coated with sand and debris. Underside provided with a tuft of long fibres serving as a root system. Interior of the sponge lighter in colour; pulpy; clear distinction between crust and pulp. Consistency hard, fistules fragile.

Colour: yellow to yellow-brown in spirit.

Ectosome: multilayered tangential unispicular reticulum (spongin at the



31

FIGURE 31. *Oceanapia fistulosa*, a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicule.

nodes), supported by a reticulation of spicule tracts, 40 µm in diameter, with little spongin.
Choanosome: an isotropic to confused reticulation of single spicules dominates the skeleton. Distinct multispicular tracts parallel to the surface; radial fibres are rare and follow erratic courses. The fistular lumina communicate with the main body by way of peripheral canals, which are lined by dense masses of perpendicular spicules. Spicules oxea, with many stylote and strongylote modifications and quite variable in length: 78–*209.7*–301 by 4–*8.1*–11 µm.

Ecology: Living on muddy sand bottom at depths below 10 m.

Distribution: Puerto Rico; Azores (Ridley & Dendy, 1887), Indian Ocean (Ridley, 1884), Australia (Bowerbank, 1873), New Guinea (Ridley & Dendy, 1887).

The present material has been compared with Bowerbank's *Desmacidon fistulosa* from Freemantle, Australia, and with Ridley & Dendy's material of *Rhizochalina fistulosa* (BMNH reg.no. 1887.5.2.243, 245, 246, 264) and *Oceanapia robusta* (BMNH reg.no. 1887.5.2.244, 248). All specimens agree quite closely in habit, though internally there is much variation in the quantity and thickness of longitudinal tracts, one specimen being more stringy, whereas others are more pulpy. The species is quite close to *Oceanapia robusta* (Bowerbank, 1866) from Northern Atlantic waters, but differs from it primarily in habit.

Oceanapia bartschi (De Laubenfels, 1934)

Inflatella bartschi De Laubenfels, 1934: 21.
Rhizochalina hondurasensis; De Laubenfels, 1953: 524, fig. [Non: *Phloeodictyon hondurasense* Carter, 1882: 122; nec: *Rhizochalina hondurasensis;* De Laubenfels, 1950: 66, fig. 29.]

Puerto Rico: ZMA POR.3553 (18°15′ N, 67°13′ W, 40–50 fthm, muddy, 21.II.1963, coll. J. H. Stock).

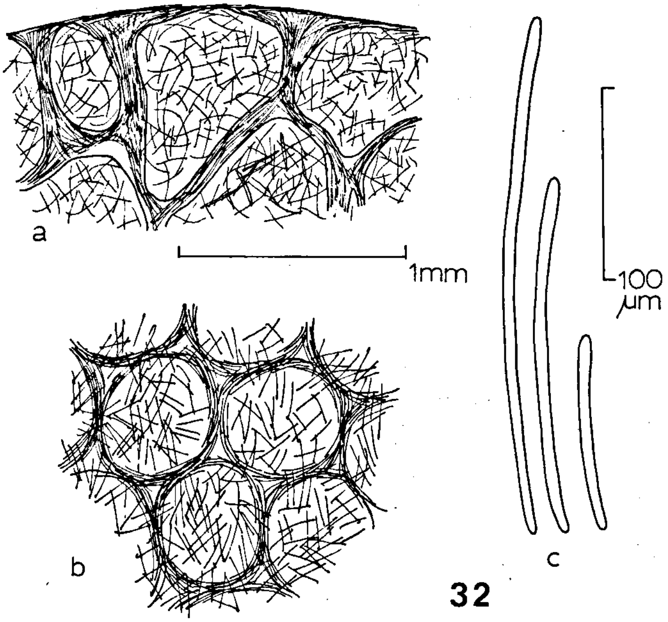


Figure 32. *Oceanapia bartschi,* a: perpendicular section of peripheral skeleton, b: tangential view of ectosomal skeleton, c: spicules.

Diagnosis: (Fig. 32, Pl. XIV 1)

Shape, size and consistency: Lobate mass, covered in mud and sand (probably was buried in the substrate), 14 × 6 × 2.5 cm. Upper side with numerous small fistules 2–6 mm in diameter, 1–3 cm high. Most of the fragile fistules were broken off, but a few are complete with a blind apex. Consistency of main body tough, leathery, somewhat compressible. Cortex leathery, but fairly fragile, easily torn, peeled off. Interior lighter in colour, fibrous, with a pulpy mass in between fibres.

Colour: blackish brown.

Ectosome: blackish brown, due to a heavy pigmentation of the cortex. A spongin enforced tangential skeleton of single spicules or vague bundles, confusedly arranged, is carried by a supporting subdermal reticulum of multispicular fibres.

Choanosome: an irregular reticulation of thick spicule tracts (80–200 µm in diameter), sheathed in spongin forming erratic, very wide meshes. In between lies a pulpy mass of organic material and loose spicules. Longitudinal spicule tracts rare. Spicules: predominantly strongyles, straight to slightly curved, with a few oxea, of widely varying length: 61–*240.4*–349 by 4–*6.2*–8 µm.

Ecology: Soft substrate at larger depths.

Distribution: Puerto Rico; Florida (De Laubenfels, 1953).

De Laubenfels (1934) put this species in the genus *Inflatella* of the Poecilosclerid family Coelosphaeridae. However, when the descriptions of Schmidt (1875) and later redescriptions of e.g. Lundbeck (1910) of this genus are compared to the morphology of the present species, it is clear that this assignment is incorrect. *Inflatella* has a peculiar fistule morphology and lacks a subdermal reticulation of spicule tracts; spongin is scarce in this genus.

De Laubenfels' (1953) material of *Rhizochalina hondurasensis* was found to be conspecific with the present species after examination of his specimen (USNM 23401, kindly sent on loan by Dr. Ruetzler). It differs from *Phloeodictyon hondurasense* Carter, 1882 (type: BMNH reg.no. 1877.5.21.1869) and from *Rhizochalina hondurasensis* sensu De Laubenfels (1950) (specimen BMNH reg.no. 1948.8.6.28) pronouncedly in habit (much larger fistules in *hondurasensis*), colour (orange-brown in *hondura-*

sensis), in consistency (much tougher in *hondurasensis*) and in megasclere size (smaller, 60–180 by 5–8 µm), in *hondurasensis*). The British Museum (N.H.) holds another specimen of *Oceanapia hondurasensis* from Turneffe Island, British Honduras (reg.no. 1934.1.26.15a). In all probability *Oceanapia oleracea* sensu Wilson (1902) is also referable to *O. hondurasensis*.

Oceanapia oleracea (Schmidt, 1870)

Rhizochalina oleracea SCHMIDT, 1870: 35, pl. 4 fig. 1; TOPSENT, 1920: 2. [Non: *Rhizochalina oleracea* sensu De Laubenfels, 1947; WELLS, et al., 1960; LITTLE, 1963 = all *Pellina nodosa* (George & Wilson, 1919). Nec: *Oceanapia oleracea;* WILSON, 1902 = *O. hondurasensis* (Carter, 1882).]
Rhizochalina carotta SCHMIDT, 1870: 36, pl. 4 fig. 2.

PUERTO RICO: ZMA POR.3338 (18°15′ N, 67°13.5′ W, 40–50 fthm, muddy sand, 21.II.1963, coll. J. H. Stock, PR.88).

Diagnosis: (Fig. 33, Pl. XIV 2)

Shape, size and consistency: Turnip-shaped with on the upper side numerous thin digitated fistules of irregular shape and outline; with on the under side long, extensive, partly hollow roots. Upper fistules often branched, up to 8 cm long. Roots stringy, tapering into single fibres, up to 12 cm long. Main body with smooth surface, up to 13 cm in diameter. One specimen consists apparently of two merged "turnips". Consistency of main body tough, with much sand adhering; fistules are fragile; roots are resilient.

Colour: brownish grey in spirit, with reddish brown fistules.

Ectosome: multilayered tangential unispicular reticulation, supported by a subdermal reticulation of spicule tracts.

Choanosome: an irregular system of stout tracts sheathed in spongin, often arranged parallel to the surface. In between tracts an isotropic reticulation of single spicules predominates, but there are also thin paucispicular fibres following erratic courses. Fistules only have the ectosomal crust and the subdermal supporting reticulation. The roots consist of an ectosomal skeleton and a central core of longitudinal unbranched fibres. The fistular lacunae communicate with an elaborate subdermal canal system. Spicules oxea, often hastate: 125–*134.7*–151 by 3.5–*4.9*–6.5 µm. Some rare sigmata were noted (35–40 µm).

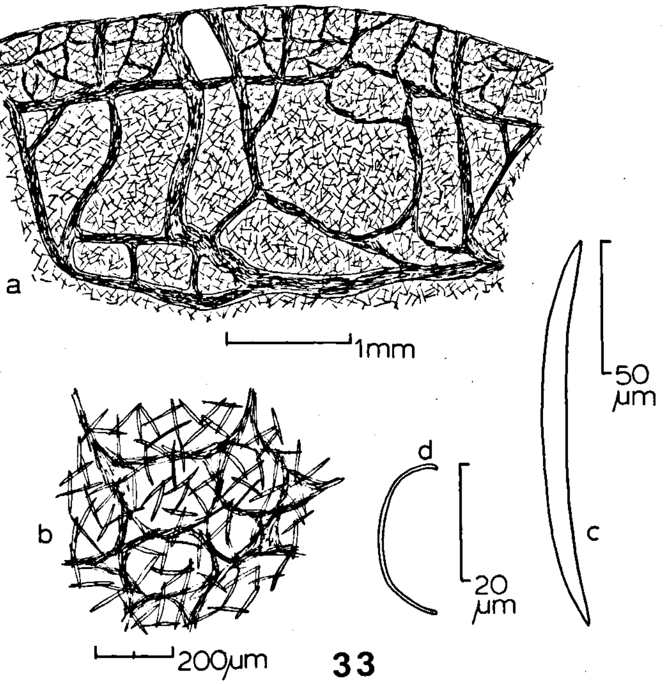


FIGURE 33. *Oceanapia oleracea*, a: perpendicular section, b: tangential view of ectosomal skeleton, c: oxea, d: sigma (rare).

Ecology: Known only from deeper waters on soft bottoms.

Distribution: Puerto Rico.

Rhizochalina carotta Schmidt, 1870 and the present material are so similar in habit, that it is unlikely to suppose they are different species. The skeleton of both is also similar (slide of SCHMIDT's type specimen of *R. carotta* is incorporated inBMNH reg.no. 70.5.3.169), except for abundant sigmata in *R. carotta*. I do not think this feature is of specific value.

DE LAUBENFELS' (1947) assumption that his littoral fistulose specimens were conspecific with the elaborate deep water species of SCHMIDT is obviously incorrect – WELLS, et al. (1960) and LITTLE (1963) based their records on DE LAUBENFELS' identification. The species concerned is *Pellina nodosa* (George & Wilson, 1919) (cf. above).

DISCUSSION OF THE GENUS OCEANAPIA

I propose here to include in *Oceanapia* both *Rhizochalina* and *Phloeodictyon,* as the type species of all three are very similar in their basic characters. The type of *Oceanapia* (viz. *Desmacidon robusta* Bowerbank, 1866) is quite similar to *Phloeodictyon hondurasense* Carter (1882). The presence or absence of sigmata is judged to be of little value.

The genus *Biminia* Wiedenmayer (1977) with type species *Oceanapia toxophila* Dendy (1922) is quite close to *Oceanapia.* The West Indian species *B. stalagmitica* Wiedenmayer (1977) is similar in habit to *O. hondurasensis,* but differs in the possession of microscleres (both sigmata and toxa).

Rhizochalina amphirhiza Schmidt (1888) and *R. fibulata* Schmidt (1888) are West Indian species belonging to the genus *Oceanapia,* but they are unrecognizable on the species level.

Genus **Pachypellina** Burton, 1934

Definition: Oceanapiidae with a thick ectosomal crust of tangential spicules and a densely spiculous choanosome, which is riddled with holes; no microscleres, no fistules.

Pachypellina podatypa (De Laubenfels, 1934) comb.nov.

Haliclona podatypa DE LAUBENFELS, 1934: 23
? *Haliclona podatypa* sensu WIEDENMAYER, 1977a: 90, pl. 13 fig. 6, text-fig. 15.

PUERTO RICO: ZMA POR.4352 (18°15′ N, 67°13.5′ W, 40–50 fthm, muddy sand, 21.II.1963, coll. J. H. Stock, PR.90).

Diagnosis: (Fig. 34, Pl. XIV 3)

Shape, size and consistency: Massive, fragile (broken into pieces), about 10 × 6 × 4.5 cm; riddled with rounded holes and canals of about 6 mm in diameter. Dermal crust mostly lost, but still adhering in places. Surface smooth; canals smoothly lined. Oscules small, indistinct. Consistency crumbly, fragile.

Colour: dermal crust orange-brown, choanosome white-yellow (spirit).

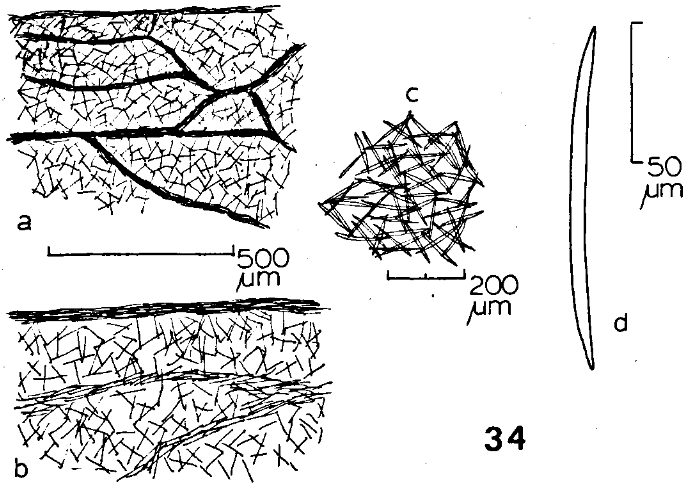


FIGURE 34. *Pachypellina podatypa*, a: perpendicular section of the type specimen (USNM 22305), b: perpendicular section of the ZMA specimen, c: tangential view of ectosomal crust, d: spicule.

Ectosome: a felted mass of tangential spicules, about 150 µm in thickness. Choanosome: predominantly an isotropic reticulation of single spicules with traces of spongin at the nodes. Vague, indistinct tracts, parallel to the surface, only found in places. Spicules oxea, 158–*170.2*–180 by 4.5–*5.1*–6.5 µm).

Ecology: Muddy bottom in deeper water.

Distribution: Puerto Rico, British Honduras (cf. below); ? Bimini (Wiedenmayer, 1977a).

I know of four West Indian samples belonging, presumably, to the present species, viz. the type material (USNM. 22305, kindly sent on loan by Dr. Ruetzler), Wiedenmayer's material, the above described specimen, and a specimen incorporated in the British Museum (N.H.), reg.no. 1934.11.26.14 (Turneffe, Shag Cay Coast, British Honduras, labeled "*Oceanapia carbonaria* (Lam.)"). It is with some hesitation that these samples are brought under one name. A short characterization of them will be given here, to enlighten future attempts assess the specific variation thought to exist in *P. podatypa* (a summary is given in Table 2).

TABLE 2

CHARACTERISTICS OF CENTRAL ATLANTIC SPECIMENS CONSIDERED TO BELONG IN THE GENUS *Pachypellina* BURTON, 1912

	"Haliclona" podatypa type	*"Haliclona" podatypa* sensu Wiedenmayer	*Pachypellina podatypa* present collection	*"Oceanapia carbonaria"* BMNH (unpublished)	*"Reniera" tufa* Ridley & Dendy, 1886
Colour ectosome	pale drab (spirit)	walnut-brown (alive)	orange-brown (spirit)	dark grey (spirit)	pale yellow (spirit)
Colour endosome	pale white	–	pale yellow	pale brown	pale yellow
Habit	massive	massive	massive	massive	massive
Choanosome	clathrous	clathrous	clathrous	clathrous	clathrous
Consistency	stiff	softly spongy to friable	cheese-like, friable	cheese-like, friable	cheese-like, friable
Oscules	Y-shaped	Y-shaped	round	round	round + Y-shaped
Spicule size	130/3½	107/3	170/5	126/4	150/8
Spicule tracts	many, clearly defined	present	vague	absent	absent
Depth of occurrence	33–40 fthm	shallow	40–50 fthm	–	100–128 fthm

The type specimen is a massive encrustation with easily detachable crust overlying a clathrous choanosome. Oscules are round or Y-shaped. The ectosomal crust is somewhat darker in colour. The choanosome is strongly fibrous with a *Pellina*-like or *Calyx*-like system of irregular (predominantly tangential spicule tracts sheathed in spongin). In between these there is a dense reticulation of single spicules.

The unpublished BM(NH)-specimen is a dark grey mass with a smooth surface riddled with numerous round holes which represent the terminations of choanosomal canals. The ectosome is a crust of tangential spicules grading into the choanosomal reticulation, thus not clearly separated from the choanosome. Spicule tracts are few and ill-developed. Consistency very cheese-like; dried pieces are friable.

WIEDENMAYER's material, judging from his description, is much like the above, with exception that his specimens have y-shaped oscules.

The present material has been described above. Spicule sizes of all specimens are given in TABLE 2.

DISCUSSION OF THE GENUS *Pachypellina*

The genus was hitherto known only from the Antarctic; it was erected to receive *Petrosia fistulata* Kirkpatrick, 1907. *Reniera tufa* Ridley & Dendy (1886) (Challenger Expedition, off the Cape Verde Islands, BMNH reg.no. 87.5.2.199) is probably also a species of *Pachypellina*, although a clear ectosomal crust is absent. The cheese-like consistency and the clathrous habit, however, point to congenericness.

Strongylophora santa De Laubenfels, 1936b, probably also belongs to *Pachypellina*. It is described as an amorphous, greenish black sponge of hard, friable consistency. There is a dermal crust and extensive subdermal cavities. The choanosome consists of crumb-of-bread arrangement of single spicules next to fibres with spongin.

DISCUSSION OF THE OCEANAPIIDAE

This new family includes next to the genera already treated above also *Calyx* Vosmaer (1883) and *Foliolina* Schmidt, 1870. The former is not represented in the West Indies, so far. *Foliolina* is represented by the type (and only) species *F. peltata* Schmidt (1870). This is a very characteristic species of pagoda-like habit. It is a hollow thin tube with leaf-like alternating outcrops, which are also hollow. The dermal crust consists of a multilayered unispicular reticulum, which is supported by longitudinal multispicular tracts. This structure is found both in the main shaft and in the leaf-like outcrops.

F. peltata is reported from Cuba by ALCOLADO, 1976.

CLASSIFICATION OF THE ORDER HAPLOSCLERIDA

HISTORICAL SURVEY

For a general introduction into the characters used in Haplosclerid classification and the problems they present one is referred to GRIESSINGER's (1971) treatment (first chapter), who also gave a brief summary of past ideas of the classification (second chapter). I will confine myself to a brief survey of the major recent classifications of the order Haplosclerida.

RIDLEY (1884) was the first to more or less group together those genera which are now considered to belong to the Haplosclerida. He distinguished in his suborder Monactinellida (which comprised, what is now understood as the subclass Ceractinomorpha + Axinellida and Hadromerida), 6 families the first three of which cover more or less the Haplosclerida of the present, although some Poecilosclerid genera are included. Those three families, viz. Chalinidae, Renieridae and Desmacididae, were distinguished on the basis of the presence of strong spongin fibres (Chalinidae), absence of them (Renieridae), and the presence of sigmatose microscleres (Desmacididae).

RIDLEY & DENDY (1887) used a modified system. They raised the Monactinellida to order status and renamed it Monaxonida; they subdivided this into two suborders, viz. Halichondrina (what is now considered to be the orders Haplosclerida, Poecilosclerida, Axinellida and Halichondrida) and Clavulina (Hadromerida). The suborder Halichondrina was subdivided into three families: Homorrhaphidae with an assorted generic complement of *Halichondria, Petrosia* and *Reniera* (subfamily Renierinae), *Pachychalina, Chalina* and *Siphonochalina* (subfamily Chalininae); Heterorrhaphidae with the genera *Rhizochalina* and *Oceanapia* (subfamily Phloeodictyinae), *Gellius, Gelliodes* and *Toxochalina* (subfamily Gelliinae), and several other genera now included in the Poecilosclerida; finally the family Desmacidonidae of which all genera are now considered to belong in the Poecilosclerida. The distinction of the two families that concern us, the Homo- and Heterorrhaphidae, was based on the absence in the former and the presence in the latter of microscleres.

TOPSENT (1928) introduced the concept of the Haplosclerida as we now understand it; he distinguished only a single family (Haplosclerinae), with three subfamilies, which bear the names of RIDLEY & DENDY and cover more or less their concept of them. The subfamily Ploeodictyinae was abandoned and merged into the Gelliinae. TOPSENT expressed many doubts about his classification, e.g. pointing out the artificiality of the subfamily Gelliinae. Moreover, his subfamilial diagnoses of the Renierinae and Chalininae are vague and general.

BURTON (1934b) took over TOPSENT's family Haplosceridae, but did not distinguish it on an ordinal level from other Demospongea. He did not subdivide the family, but pointed out that the microsclere component is variable in many genera and as such is not a character fit for grouping genera. In his disregard of microscleres, he probably exaggerated considerably, but his observations seem valid as far as distinction of higher categories is concerned. BURTON emphasized the importance of ectosomal specialisation.

DE LAUBENFELS (1936a) reintroduced the Desmacidinae (as Desmacidonidae) into the Haplosclerida, his main argument being the similarity between these sponges and freshwater sponges (family Spongillidae). The subfamily Gelliinae (renamed Adociidae) was put into the Poecilosclerida, including some genera without microscleres, such as *Adocia* and *Pellina.* The families remaining in the Haplosclerida were Haliclonidae (pro Chalininae), Desmacidonidae (pro Desmacidinae), and Callyspongiidae (including *Callyspongia, Patuloscula, Toxochalina, Euplacella, Dactylia* and *Tubulodigitus*). A new group was attributed to the Haplosclerida, viz. Oscarellidae; this designation has found no followers.

HECHTEL (1965) reintroduced the family Adociidae into the Haplosclerida, but otherwise followed DE LAUBENFELS' ideas closely (he kept the Desmacididae within the Haplosclerida).

GRIESSINGER (1971) dropped the families Callyspongiidae and Gelliidae (= Adociidae), distributing their genera over the family Haliclonidae and the re-erected family Renieridae. GRIESSINGER's allocation of genera to both families is given in TABLE 3.

LÉVI (1973) followed GRIESSINGER closely. His concept of both families is only slightly different (cf. TABLE 3).

WIEDENMAYER (1977a, 1977b) also recognized only two families, Haliclonidae and Nepheliospongiidae, which differ, however, in generic membership from those of LÈVI (cf. TABLE 3).

BERGQUIST (1978) distinguished three families: Haliclonidae (in restricted sense), Callyspongiidae and Adociidae (cf. TABLE 3), thus following DE LAUBENFELS-HECHTEL, although she left the Desmacididae within the Poecilosclerida.

DISCUSSION OF RECENT CLASSIFICATION SYSTEMS

Below I will discuss only the most recent classifications, i.e. those of GRIESSINGER-LÉVI, WIEDENMAYER and BERGQUIST, as past classifications have been seriously compromised or incorporated in the recent ones.

THE GRIESSINGER-LÉVI SYSTEM

The familial diagnoses can be summarized as follows:

Haliclonidae: Small oxea, regular both in size and form; skeleton arranged regularly, with reduced spicular density, in which spongin plays an important part. The primitive skeletal type is an isodictyal unispicular reticulum bound by spongin at the nodes. From this basic type a progressive increase in spongin is observed in this family. Ectosomal specialisation may be present.

Renieridae: Larger oxea, irregular in size and form; skeleton less regularly arranged, high spicular density and reduced spongin. Evolutionary development of the group has taken place in the opposite way to the one observed in the Haliclonidae. Ectosomal specialisation may be present.

The first criticism to be made is a general one: the definition of the families is given in relative terms, such as small or larger oxea (it is not stated which size is limiting), reduced or increased spongin (how much reduced or increased). These relative terms may express the hypothetical evolutionary development within the groups, but cannot serve as diagnostic criteria, because it is not possible to assign any given genus to either group on that basis.

The second criticism is more detailed: there is much more similarity between genera like *Haliclona* and *Reniera*, than there is between *Haliclona* and *Callyspongia*, or *Reniera* and *Calyx*. This means, that it is not very likely, if not impossible, that *Haliclona* and *Reniera* are in different families; there must be firm evidence for a familial difference if one is to uphold that view, and I do not see this major difference. Many *Haliclona* species are so similar to *Reniera* species, that they have been confused more often than not.

The third criticism is, that several genera, among them crucial ones, were omitted from the generic allocation, e.g. *Cribrochalina, Haliclonissa, Hemigellius, Xestospongia, Amphimedon* (= *Hemihaliclona*). Some of these genera are difficult to allocate in the Griessinger-Lévi system.

THE WIEDENMAYER SYSTEM

There is a slight discrepancy between both publications of WIEDENMAYER (1977a, 1977b), as he used the family Adociidae in the first, but expressed his doubts about its validity, and subsequently dropped it in the second paper. WIEDENMAYER's system contains the two families Haliclonidae and Nepheliospongiidae, defined in this way (summary of his lenghty diagnoses):

Haliclonidae: As a rule only diactinal oxeote megascleres; microscleres may be present, but are unstable. Peripheral skeleton may or may not be present. Siliceous skeleton tends to be weakly developed.

Nepheliospongiidae: Pronounced variability in shape and size of the oxeote megascleres. Microscleres (sigmata and toxa) may be present. Tendency towards formation of a peripheral crust (either by tangential or by perpendicular spicules). Siliceous skeleton strongly developed.

The same criticism as made above of the GRIESSINGER-LÉVI system can be made with regard to the diagnostic value of the given definitions. In most respects WIEDENMAYER's classification is very much like the LÉVI-GRIESSINGER system, with three major exceptions: *Reniera* (which is a subgenus of *Haliclona* in WIEDENMAYER's view), *Gellius* (which is a Haliclonid in WIEDENMAYER's system) and *Foliolina* (which has been allocated – no doubt incorrectly – to the Haliclonidae). The discrepancy of both systems on *Reniera* is fundamental, as it is the type genus of GRIESSINGER-LÉVI's family Renieridae.

I have grave doubts about the Nepheliospongiid = Petrosiid nature of *Cribrochalina*, which is very similar in skeletal architecture to *Niphates* and *Amphimedon*. *Pellina* very probably is not a typical Haliclonid.

TABLE 3

CLASSIFICATION OF RECENT MARINE HAPLOSCLERID GENERA INTO FAMILIES BY DIFFERENT AUTHORS

Griessinger, 1971	Lévi, 1973	Wiedenmayer, 1977	Bergquist, 1978
Haliclonidae	Haliclonidae	Haliconidae	Haliclonidae
Haliclona	*Haliclona*	*Haliclona*	*Haliclona*
Chalinula	*Adocia*	*Adocia*	
Adocia	*Callyspongia*	*Gellius*	
Callyspongia	*Siphonochalina*	*Foliolina*	Callyspongiidae
Siphonochalina	*Gelliodes*	*Callyspongia*	*Callyspongia*
	Toxochalina	*Niphates*	*Dactylia*
Renieridae		*Gelliodes*	
Reniera	Renieridae	*Sigmadocia*	Adociidae
Pellina	*Reniera*	*Pellina*	*Adocia*
Rhizoniera	*Pellina*		*Gellius*
Dendroxea	*Rhizoniera*		*Petrosia*
Calyx	*Dendroxea*	Nepheliospongiidae	
Petrosia	*Calyx*	*Calyx*	
Rhizochalina	*Petrosia*	*Petrosia*	
Pachychalina	*Rhizochalina*	*Rhizochalina*	
Cladocroce	*Pachychalina*	*Oceanapia*	
Haliclonissa	*Cladocroce*	*Biminia*	
	Oceanapia	*Vagocia*	
	Gellius	*Hemigellius*	
		Siphonodictyon	
		Cladocroce	
		Haliclonissa	
		Cribrochalina	
		Xestospongia	

THE BERGQUIST SYSTEM

Three families are distinguished on the following diagnoses (slightly rephrased to give only the essentials):

Haliclonidae: Spicules of uniformly small size, organized into an isodictyal skeleton which is always consolidated by spongin. Microscleres absent; tangential dermal skeleton absent.

Adociidae: Diactinal spicules arranged in isodictyal fashion, frequently in polyspicular tracts. Spicules quite variable in size, but no distinct categories. Microscleres, when present, sigmata and toxa. Tangential dermal spicule skeleton present.

Callyspongiidae: Spicules largely enclosed in spongin fibres, may be lost. Massive spongin skeleton. Tangential dermal spongin fibre skeleton with primary, secondary and sometimes tertiary meshes. Microscleres, when present, toxa.

BERGQUIST very obviously tried to give precise definitions, which enable one, at least in theory, to assign genera easily into her families. Unfortunately, she only allocated a few typical genera to her families. There are quite a lot of genera, not named, which cannot be assigned, because their characters conflict with the family diagnoses. For instance, *Amphimedon* has a paratangential, but distinct ectosomal reticulation of spicule tracts, not subdivided into primaries and secondaries, but uniformly meshed. Together with a number of other genera, it does not fit in either three families. A further problem is posed by the genus *Adocia* (and related genera as *Orina* and *Gellius*). The type species of *Adocia*, i.e. *Halichondria simulans* Johnston, 1845, is very similar to *Haliclona* and *Reniera*, and differs quite fundamentally from genera as *Petrosia* and *Strongylophora*. It is again unlikely to suppose, that two such similar types of sponges as *Haliclona-Reniera* and *Adocia* have developed separately in different families. If *Adocia, Orina* and *Gellius* are left out of the Adociidae, this family is again comparable to WIEDENMAYER's *Nepheliospongiidae* and GRIESSINGER-LÉVI's Renieridae without *Reniera*.

This group is large and diverse. In my opinion it is possible to subdivide it into two separate families, one characterized by an isotropic skeleton of thick spicule tracts, the other by a dense disorganized isotropic skeleton of single spicules with in addition an irregular non-reticulate system of predominantly tangential spicule tracts and a multilayered dermal crust of tangential spicules.

Also I propose to erect a family for the group of genera like *Amphimedon* and *Niphates*, characterized by a paratangential uniformly meshed dermal skeleton and a choanosomal reticulation of multispicular fibres or tracts.

This leads to the new classification presented below, in which the recent marine Haplosclerida are divided into five families.

PROPOSED NEW CLASSIFICATION OF THE HAPLOSCLERIDA

Families and genera considered to belong to the Haplosclerida are defined below; skeletal plans of the genera are given in Figures 35–42, and in Plates XV–XVIII.

Order HAPLOSCLERIDA Topsent, 1928

Ceractinomorpha with a reticulate skeleton of smooth oxeote spicules and a microsclere complement, if present, of sigmata, toxa and smooth microxeote forms.

Family HALICLONIDAE De Laubenfels, 1932

Haplosclerida with a choanosomal skeleton consisting of uni- or paucispicular primary (ascending)tracts or fibres interconnected by single spicules; ectosomal skeleton, if present, a tangential, unilayered, unispicular isotropic skeleton with nodal spongin.

Genus **Haliclona** Grant, 1835

Synonyms: *Chalina* Grant (1838), *Philotia* Gray (1867), *Chalinula* Schmidt (1870), *Acervochalina* Ridley & Dendy (1887), *Phylosiphonia* Lendenfeld (1887), *Veluspa* Miklucho-Maclay (1868), *Reniclona* De Laubenfels (1954), *Euchalinopsis* Lendenfeld, 1887.

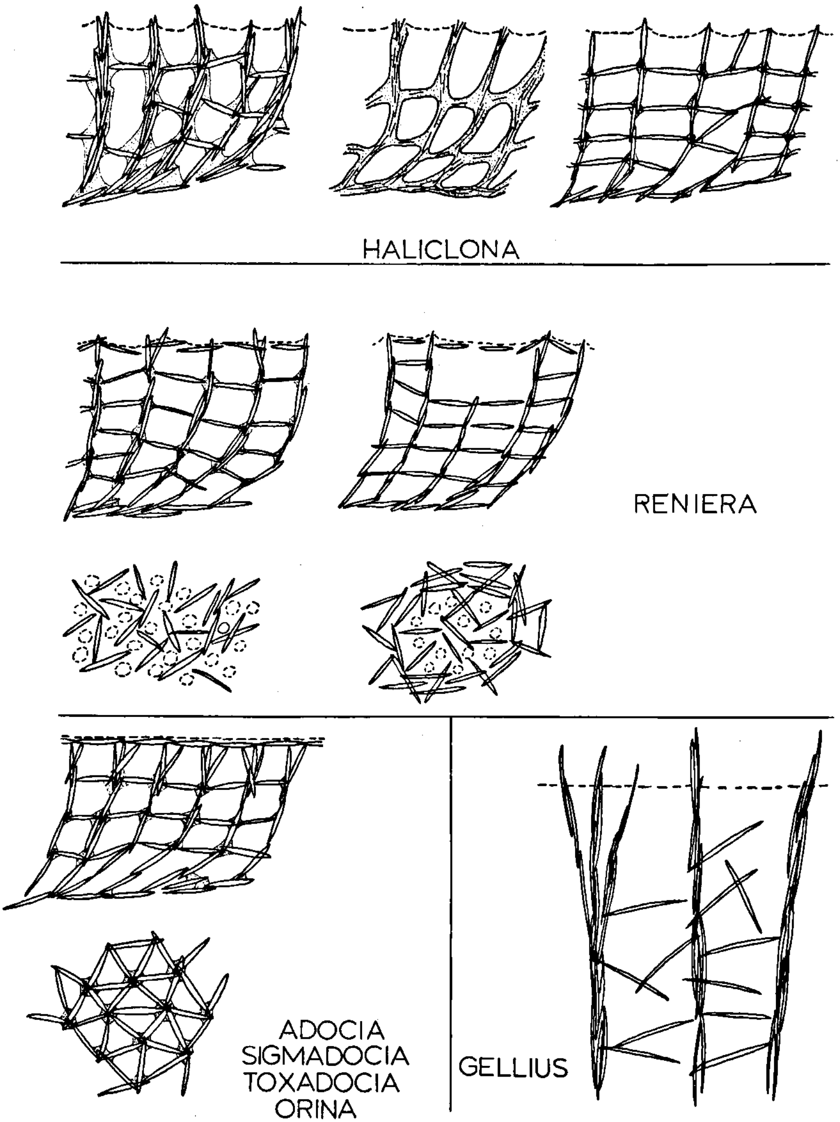
Haliclonidae without ectosomal skeleton and without microscleres.

Species examined: *H. hogarthi* Hechtel (1965), *H. limbata* (Montagu, 1818), *H. loosanoffi* Hartman (1958), *H. mediterranea* Griessinger (1971), *H. molitba* De Laubenfels (1949), *H. oculata* (Pallas, 1766 = type of the genus), *H. permollis* (Bowerbank, 1866).

Genus **Reniera** Nardo, 1833

Haliclonidae with an irregular ectosomal tangential spiculation supporting the exopinacoderm. No microscleres.

Species examined: *R. aquaeductus* Schmidt (1862 = type of the genus), *R. carmabi* n.sp., *R. cinerea* (Grant, 1835), *R. curaçaoensis* n.sp., *R. cratera* Schmidt (1862), *R. indistincta* (Bowerbank, 1866), *R. peachi* (Bowerbank, 1866), *R. tubifera* George & Wilson (1919), *R. viscosa* Topsent (1887).



35

FIGURE 35. Structural characters of genera of the family HALICLONIDAE. (*Gellius* drawn after BURTON, 1934)

Genus **Gellius** Gray, 1867

Synonym: *Asychis* Gray, 1867.

Haliclonidae without ectodermal skeleton, but with sigmata as microscleres. (This genus is probably artificial and should be subdivided among *Haliclona* and *Reniera*).

Species examined: *Gellius "flagellifer"* Ridley & Dendy (1886, West Indian material), *Gellius petrosioides* Dendy (1905).

Genus **Adocia** Gray, 1867

Synonyms: *Chalinopora* Lendenfeld (1887), *Menanetia* Topsent (1896), *Halichoclona* De Laubenfels (1932).

Haliclonidae with a distinct ectosomal unilayered tangential reticulation of single spicules with nodal spongin. Microscleres absent.

Species examined: *A. implexiformis* Hechtel (1965), *A. simulans* (Johnston, 1845 = type species of the genus).

Genus **Sigmadocia** De Laubenfels, 1936

Haliclonidae with an ectosomal tangential unilayered reticulum of single spicules bound at the nodes by spongin. Microscleres sigmata. (This genus should probably be united with *Reniera* or *Adocia*).

Species examined: *S. caerulea* Hechtel (1965), *S. piscaderaensis* n.sp.

Genus **Orina** Gray, 1867

Haliclonidae with an ectosomal tangential unilayered reticulum of single spicules bound at the nodes by spongin. Microscleres sigmata and toxa. (This genus also is probably artificial).

Species examined: *O. calcinea* (Burton, 1954), *O. tenerrima* (Burton, 1954), *O. sagittaria* (Sollas, 1902).

Genus **Toxadocia** De Laubenfels, 1936

Haliclonidae with an ectosomal tangential unilayered reticulum of single spicules bound at the nodes by spongin. Microscleres toxa. (This genus also is probably artificial).

Species examined: none.

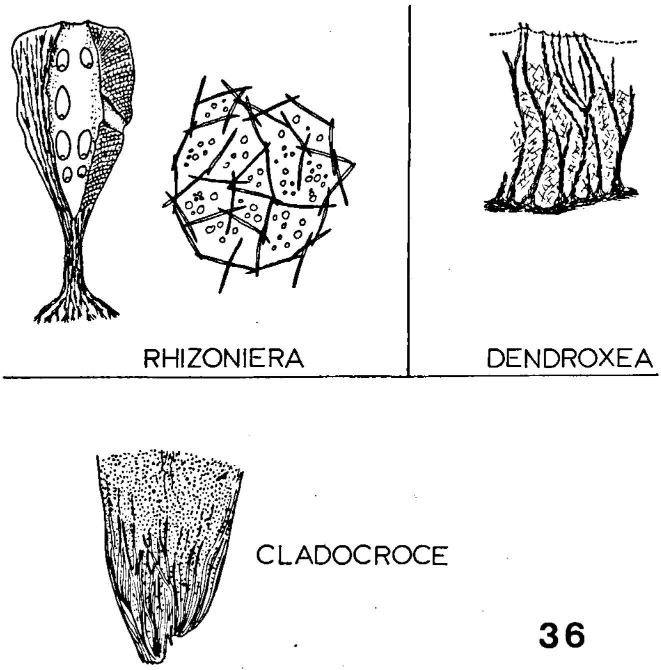


FIGURE 36. Structural characters of genera of the family HALICLONIDAE (continued). (*Rhizoniera* and *Dendroxea* after GRIESSINGER, 1971; *Cladocroce* after TOPSENT, 1928)

Genus **Rhizoniera** Griessinger, 1971

Haliclonidae in which the typical skeleton of primary tracts and interconnecting spicules is strengthened by longitudinal spicule tracts.

Species examined: none.

Genus **Dendroxea** Griessinger, 1971

Haliclonidae in which the typical skeleton of the family is strengthened by dendritic multispicular tracts rising from a dense spicular mass at the base of the sponge.

Species examined: none.

Genus **Cladocroce** Topsent, 1892

Haliclonidae in which the typical skeleton of the family is strengthened by dendritic multispicular tracts, broad at the base, tapering into thin endings.

Species examined: none.

Family NIPHATIDAE n.fam.

Haplosclerida with an ectosomal paratangential (i.e. three dimensional) multispicular reticulation of fibres or tracts, and with a choanosomal reticulation of multispicular fibres or tracts. Microscleres, if present, sigmata or microxea.

Genus **Amphimedon** Duchassaing & Michelotti, 1864

Synonyms: *Pachychalina* Schmidt (1868), *Hemihaliclona* Burton (1937).

Niphatidae in which the ectosomal reticulation is of uniform mesh size, and in which the choanosomal primaries barely protrude the surface, resulting in an optically smooth surface. Spongin dominant. Microscleres absent.

Species examined: *A. compressa* Duch. & Mich. (1864 = type of the genus), *A. complanata* (Duchassaing, 1850), *A. viridis* Duch. & Mich. (1864).

Genus **Niphates** Duchassaing & Michelotti, 1864

Synonym: *Dasychalina* Ridley & Dendy, 1886

Niphatidae in which the ectosomal tangential reticulation is obscured by protruding tufts of the choanosomal primaries, producing a rough, conulose surface. Spongin dominant. Microscleres: rare sigmata.

Species examined: *N. alba* n.sp., *N. digitalis* (Lamarck, 1814 = type of the genus), *N. erecta* Duch. & Mich. (1864), *N. amorpha* Wiedenmayer (1977).

Genus **Gelliodes** Ridley, 1884

Niphatidae in which the tangential ectosomal reticulation is obscured by protruding tufts of the choanosomal primaries, producing a rough conulo-

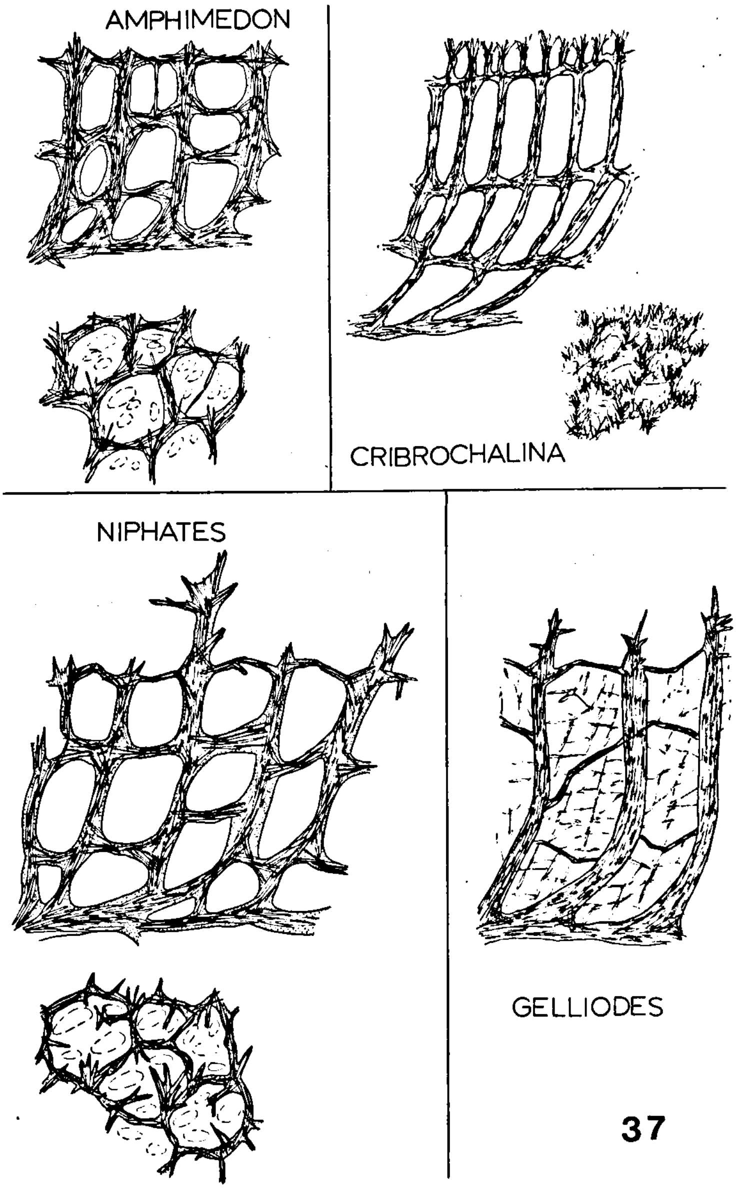


FIGURE 37. Structural characters of genera of the family NIPHATIDAE.

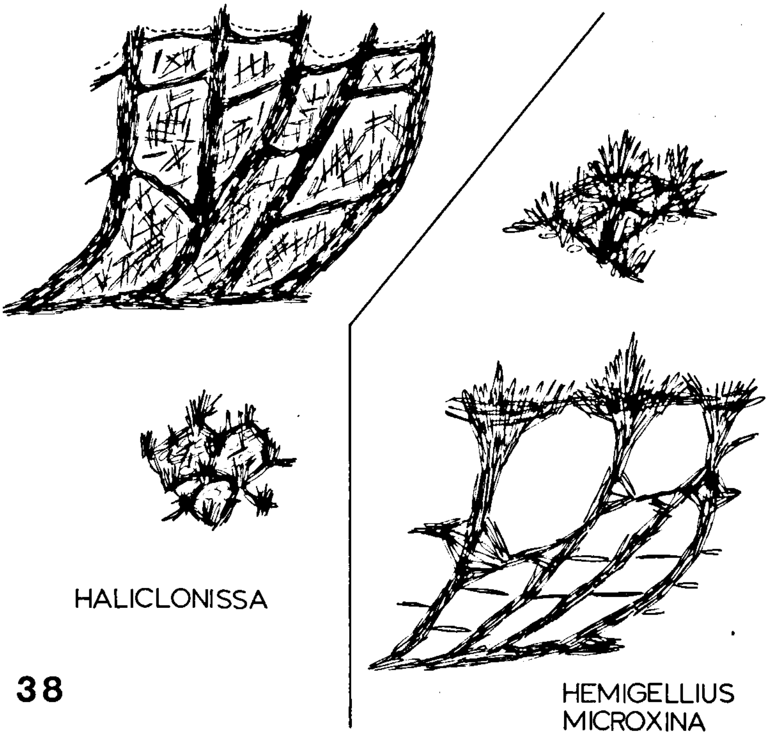
se surface. Spongin present. Secondary fibres largely reduced. Microscleres abundant sigmata. (The genus is barely distinguishable from *Niphates*).

Species examined: *G. fibulatus* (Carter, 1881 = type of the genus), *G. leucosolenia* De Laubenfels (1934).

Genus **Cribrochalina** Schmidt, 1870

Niphatidae in which the tangential ectosomal reticulation is obscured by perpendicular spicule brushes, producing an optically smooth but microscopically hispid surface. Spongin dominant. Choanosomal meshes long and narrow, condensed peripherally. Microscleres absent.

Species examined: *C. vasculum* (Lamarck, 1814 = type of the genus), *C. spiculosa* (Dendy, 1887).



38

FIGURE 38. Structural characters of genera of the family NIPHATIDAE (continued).

Genus **Siphonodictyon** Bergquist, 1965

Niphatidae in which the tangential ectosomal skeleton is uniformly meshed producing a smooth surface. Choanosomal reticulation grading into a pulpy mucous central part. Spongin scarce. Microscleres absent. (Burrowing habit).

Species examined: none.

Genus **Hemigellius** Burton, 1932

Niphatidae in which the tangential ectosomal reticulation is obscured by protruding tufts of the choanosomal skeleton producing a conulose surface. Spongin absent. Microscleres sigmata.

Species examined: *H. rudis* (Topsent, 1901 = type of the genus).

Genus **Microxina** Topsent, 1916

Niphatidae in which the ectosomal tangential reticulation is obscured by protruding tufts of the choanosomal primaries, producing a conulose surface. Spongin absent. Microscleres microxea.

Species examined: *M. benedeni* (Topsent, 1901 = type of the genus).

Genus **Haliclonissa** Burton, 1932

Niphatidae in which the tangential ectosomal reticulation is obscured by protruding tufts of the choanosomal primaries (producing a conulose surface) and by perpendicular spicule brushes. Interconnecting choanosomal tracts reduced. Spongin absent. No microscleres.

Species examined: *H. verrucosa* Burton (1932 = type of the genus).

Family CALLYSPONGIIDAE De Laubenfels, 1936

Haplosclerida with a two-dimensional tangential ectosomal reticulation of sparsely cored spongin fibres, and a choanosomal reticulation of primary spongin fibres cored by two or more spicules and interconnecting spongin fibres cored by a single spicule or uncored. Microscleres, if present, toxa.

Genus **Callyspongia** Duchassaing & Michelotti, 1864

Synonyms: *Cladochalina* Schmidt (1868), *Tubulodigitus* Carter (1881), *Patuloscula* Carter (1882), *Spinosella* Vosmaer (1883).

Callyspongiidae with a beautifully regular ectosomal tangential reticulation of primary and secondary (sometimes tertiary) spongin fibres. (Two subgenera are distinguished, viz. *Callyspongia* (all primaries, single, reticulation of main skeleton beautifully regular with rectangular meshes) and *Spinosella* (primaries fasciculate)).

Species examined: *C. arcesiosa* De Laubenfels (1936), *C. eschrichti* (Duch. & Mich. 1864), *C. fallax* Duch. & Mich. (1864 = type of the genus). *C. pallida* Hechtel (1965), *C. plicifera* (Lamarck, 1814), *C. strongylophora* Hartman (1955), *C. tenerrima* Duch. & Mich. (1864), *C. vaginalis* (Lamarck, 1814).

Genus **Dactylia** Carter, 1885

Callyspongiidae with a beautiful hexagonal ectosomal tangential skeleton of uncored primary and secondary spongin fibres. Choanosomal spongin fibres also uncored. Both megascleres and microscleres absent. (This genus is probably synonymous with *Callyspongia*).

Species examined: *D. ceratosa* (Dendy, 1887).

Genus **Toxochalina** Ridley, 1884

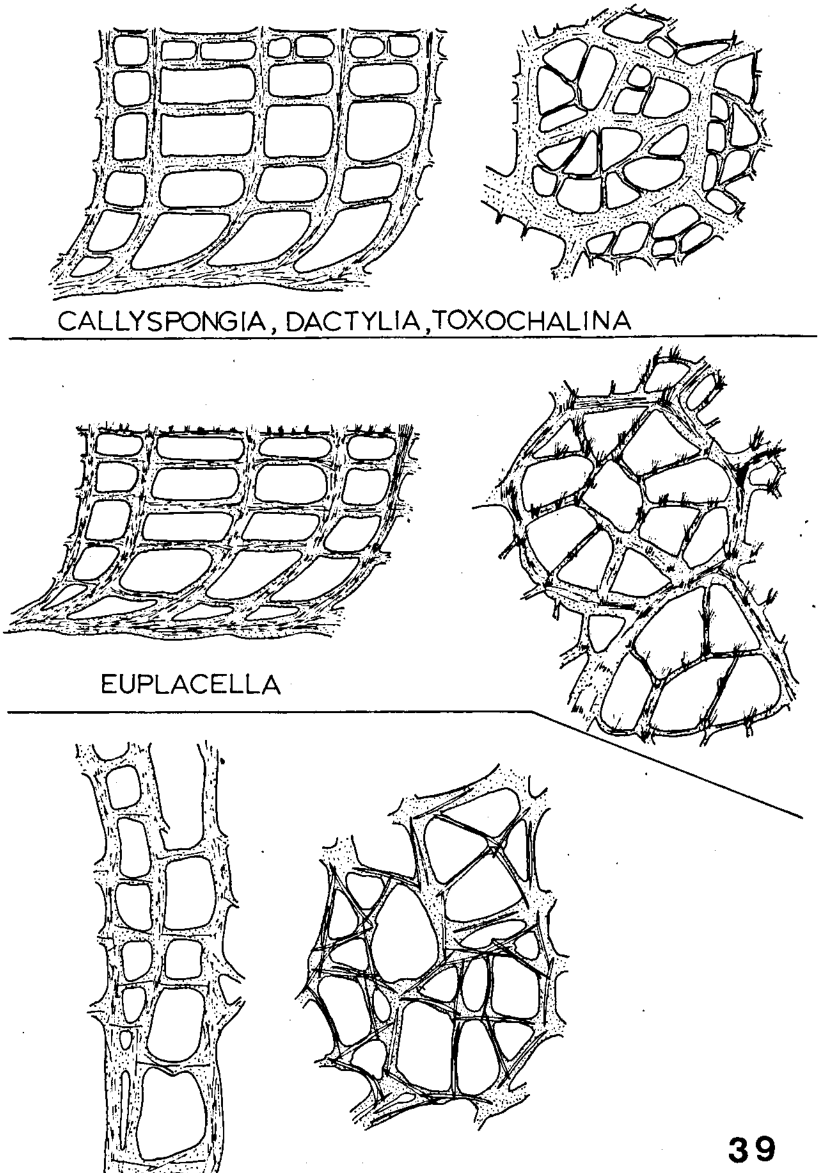
Callyspongiidae with a beautifully regular ectosomal tangential reticulation of primary and secondary spongin fibres cored sparingly. Choanosomal reticulation beautifully regular with rectangular meshes; fibres cored sparsely. Microscleres toxa. (This genus should be merged into *Callyspongia*).

Species examined: *T. robusta* (Ridley, 1884).

Genus **Euplacella** Lendenfeld, 1887.

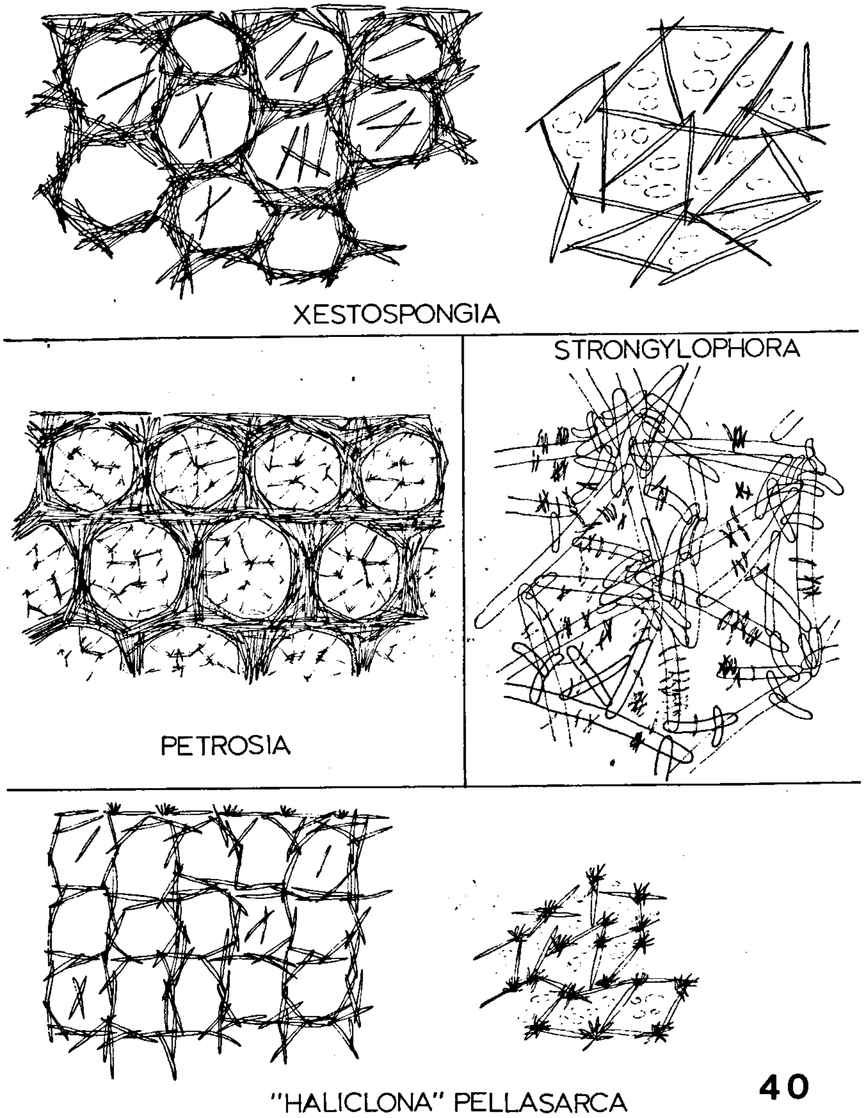
Synonym: *Placochalina* Lendenfeld, 1887.

Callyspongiidae with a beautifully regular ectosomal tangential reticulation of primary and secondary spongin fibres cored sparsely, in addition to



39

FIGURE 39. Structural characters of genera of the family CALLYSPONGIIDAE. (*Siphonochalina* drawn after GRIESSINGER, 1971)



40

FIGURE 40. Structural characters of genera of the family NEPHELIOSPONGIIDAE. (*Strongylophora* drawn after DENDY, 1905)

which there are erect spicule brushes on the primary and secondary fibres. Choanosomal spongin fibres cored sparsely. Microscleres absent.

Species examined: *E. elongata* (Ridley & Dendy, 1886).

Genus **Siphonochalina** Schmidt, 1868

Callyspongiidae with an irregular ectosomal tangential reticulation in which the sparsely cored primary and secondary spongin fibres are indistinct. Choanosomal reticulation irregular, fibres cored sparsely. Microscleres absent.

Species examined: *S. coriacea* Schmidt (1868 = type of the genus).

Family PETROSIIDAE n. fam.

Haplosclerida with a tangential ectosomal skeleton consisting of an isotropic reticulation of single spicules or spicule tracts, and a choanosomal skeleton verging towards an isotropic reticulation of spicule tracts, in which primary and secondary tracts are indistinct or absent. Microscleres if present microxeote forms. Consistency stony.

Genus **Xestospongia** De Laubenfels, 1930

Synonyms: *Schmidtia* Balsamo-Crivelli (1860, preoccupied), *Neopetrosia* De Laubenfels (1949).

Petrosiidae in which the choanosomal skeleton is confused-isotropic and lacks spongin. Spicules in one size category.

Species examined: *X. diprosopata* (De Laubenfels, 1930 = type species of the genus), *X. muta* (Schmidt, 1870), *X. portoricensis* n.sp., *X. subtriangularis* (Duch. & Mich., 1864), *X. testudinaria* (Lamarck, 1814), *X. wiedenmayeri* n.sp.

Genus **Petrosia** Vosmaer, 1883

Petrosiidae with a basically lamellate-isotropic choanosomal reticulation of spicule tracts bound by spongin. Spicules in at least two size categories.

Species examined: *P. dura* (Schmidt, 1862), *P. ficiformis* (Poiret, 1789 = type of the genus), *P. nigricans* (Lindgren, 1897), *P. weinbergi* n.sp.

Genus **Strongylophora** Dendy, 1905

Petrosiidae with a lamellate-isotropic choanosomal reticulation of spicule tracts bound by spongin. Spicules in at least two size categories. Microscleres peculiar kidney-shaped microstrongyles.

Species examined: *S. durissima* Dendy, 1905 (type of the genus), *S. hartmani* n.sp., *S. strongylata* (Thiele, 1903).

Genus unnamed

Petrosiidae with a simple choanosomal skeleton of paucispicular tracts forming isotropic meshes. Ectosomal brushes of microxea.

Species examined: *"Haliclona" pellasarca* De Laubenfels, 1934.

Family OCEANAPIIDAE n. fam.

Haplosclerida with an often multilayered ectosomal tangential reticulation of single spicules. Choanosome an isotropic reticulation of single spicules (producing a pulpy effect) with an irregular non-isodictyal supporting system of predominantly tangential spicule tracts.

Genus **Pellina** Schmidt, 1870

Oceanapiidae with a simple complement of small (100–250 µm) oxeote megascleres; microscleres absent. Fistule walls thin, consisting only of an ectosomal crust and longitudinal supporting spicule tracts.

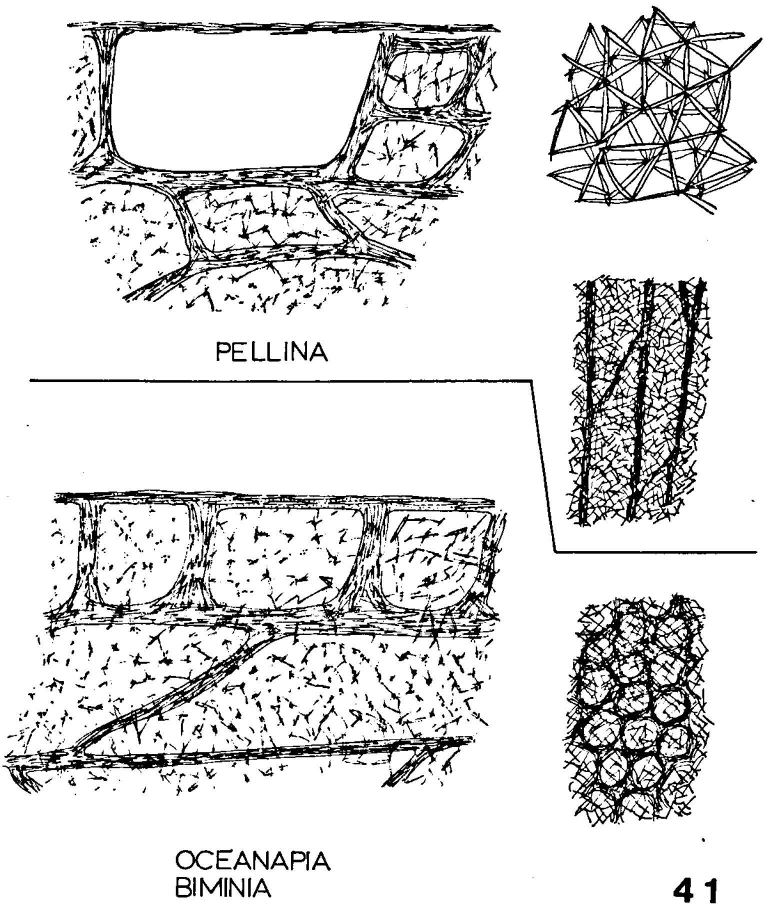
Species examined: *P. carbonaria* (Lamarck, 1814), *P. nodosa* (George & Wilson, 1919), *P. semitubulosa* (Schmidt, 1862 = type of the genus).

Genus **Oceanapia** Norman, 1869

Synonyms: *Rhizochalina* Schmidt (1870), *Phloeodictyon* Carter (1882)

Oceanapiidae with a spongin-enforced tangential ectosomal crust. Fistule walls supported by an irregular isotropically meshed reticulation of spicule tracts bound by spongin. Microscleres if present sigmata.

Species examined: *O. fistulosa* Bowerbank (1873), *O. hondurasensis* (Carter, 1882),*O. jeffreysi* (Bowerbank, 1866 = type of the genus = *O. robusta* (Bowerbank, 1866)), *O. oleracea* (Schmidt, 1870), *O. bartschi* (De Laubenfels, 1934).



41

Figure 41. Structural characters of genera of the family Oceanapiidae.

Genus **Biminia** Wiedenmayer, 1977

Oceanapiidae with an ectosomal crust supported by an irregular reticulation of spicule tracts. Habit with volcano-shaped osculiferous tubes. Microscleres sigmata and toxa. (This genus is probably synonymous with *Oceanapia*)

Species examined: none

Genus **Calyx** Vosmaer, 1885

Synonym: *Lieberkühnia* Balsamo-Crivelli, 1860 = preoccupied.

Oceanapiidae in which longitudinal spicule tracts dominate the choanosome, producing a stringy texture. Fistules absent. No microscleres.

Species examined: *C. nicaensis* (Risso, 1826 = type of the genus).

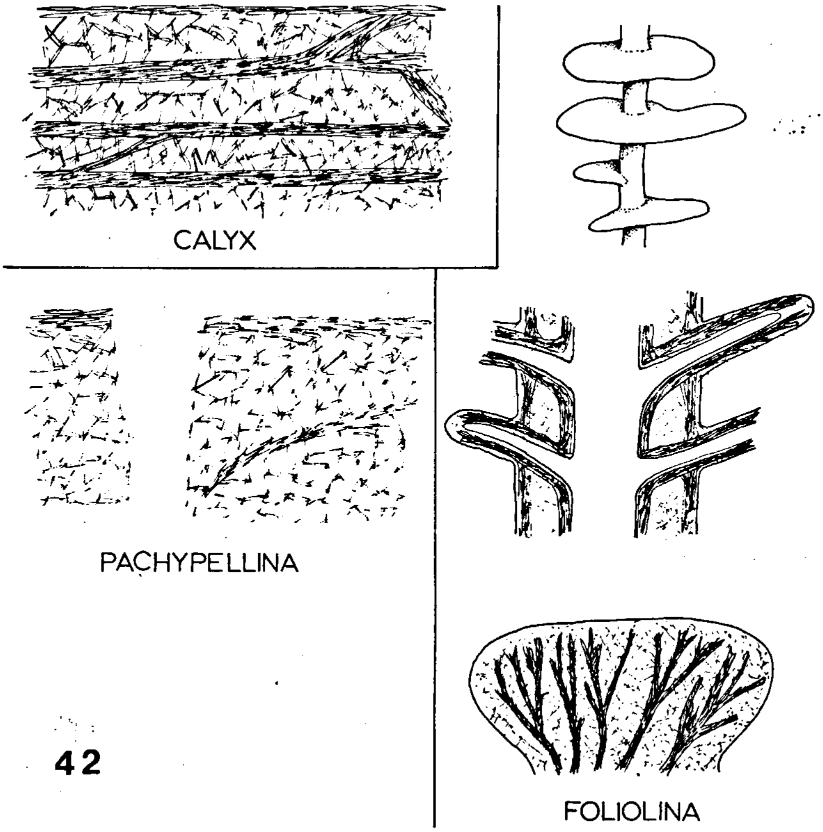


FIGURE 42. Structural characters of genera of the family OCEANAPIIDAE (continued).

Genus **Foliolina** Schmidt, 1870

Oceanapiidae with hollow pagoda-like habit.

Species examined: *F. peltata* Schmidt, 1870 = type of the genus.

Genus **Pachypellina** Burton, 1934

Oceanapiidae with a thick ectosomal crust of tangential spicules and a densely spiculous choanosome which is riddled with holes. No microscleres, no fistules.

Species examined: *P. podatypa* (De Laubenfels, 1934).

DISCUSSION

It would be false to suggest, that the above given classification solves all problems. I realize there are probably several amendments to make before the system would fit all Haplosclerid genera and species. For instance, I have misgivings about the familial allocation of *Rhizoniera, Cladocroce* (which seem closely related) and *Dendroxea*, placed in the Haliclonidae, on the basis of the absence of an ectosomal specialisation. Other skeletal features of these genera do not correspond to the general trend in this family. Part of my uncertainty may stem from the fact, that I am not familiar with these genera.

Microxina is only hesitatingly allocated, as the skeletal architecture is very confused with large, stout oxea. It is for the time being considered a Niphatid on the basis of its outward similarity to *Hemigellius* and *Niphates*.

The allocation of *"Haliclona" pellasarca* also poses problems, as this species bears a considerable resemblance to certain *Reniera* species, but differs from them by the hard consistency and the ectosomal microxea.

A fair lot of genera seem to be artificial in the sense that they are almost identical to others, but differ in a minor character, such as microsclere complement or ectosomal spicule brushes. These clusters of genera are: *Adocia – Orina – Sigmadocia – Toxadocia; Haliclona – Gellius – Reniera; Callyspongia – Euplacella – Dactylia – Toxochalina; Niphates – Gelliodes – Hemigellius; Petrosia – Strongylophora; Oceanapia – Biminia.* It is tempt-

TABLE 4

HAPLOSCLERID GENERIC NAMES OF UNCERTAIN IDENTITY

Arcesios Duch. & Mich., 1864 (type *A. prominula* Duch. & Mich., 1864)
Cacochalina Schmidt, 1870 (type *C. subtilis* Schmidt, 1870)
Cavochalina Carter, 1882 (type *C. digitata* var. *arenosa* Carter, 1882)
Ceraochalina Lendenfeld, 1887 (type *C. papillata* Lendenfeld, 1887)
Chalinella Lendenfeld, 1887 (type *C. macropora* Lendenfeld, 1887)
Chalinodendron Lendenfeld, 1887 (type *C. exiguum* Lendenfeld, 1887)
Chalinoraphis Lendenfeld, 1887 (type *C. armata* Lendenfeld, 1887)
Dactylochalina Lendenfeld, 1885 (type *Chalina cervicornis* Bowerbank, 1866)
Diplodemia Bowerbank, 1862 (type *D. vesicula* Bowerbank, 1862)
Euchalina Lendenfeld, 1887 (type *E. rigida* Lendenfeld, 1887)
Hoplochalina Lendenfeld, 1887 (type *H. incrustans* Lendenfeld, 1887)
Kallypilidion De Laubenfels, 1954 (type *K. poseidon* De Laubenfels, 1954)
Lessepsia Keller, 1882 (type *L. violacea* Keller, 1882)
Nara De Laubenfels, 1954 (type *N. nematifera* De Laubenfels, 1954)
Neoadocia De Laubenfels, 1950 (type *N. mokuoloea* De Laubenfels, 1950)
Protoschmidtia Czerniavsky, 1880 (type *P. simplex* Czerniavsky, 1880)
Pseudochalina Schmidt, 1870 (no species named)
Querciclona De Laubenfels, 1936 (type *Antherochalina quercifolia* Keller, 1882)
Sclerochalina Schmidt, 1868 (type *S. asterigena* Schmidt, 1868)
Siphonella Lendenfeld, 1887 (type *S. communis* Lendenfeld, 1887)
Toxiclona De Laubenfels, 1954 (type *Siphonochalina gaussiana* Hentschel, 1914)
Vagocia De Laubenfels, 1936 (type *Gellius arcuarius* Topsent, 1923)
Ysiphonia De Laubenfels, 1936 (no species named)

ing to unite these groups of genera, but a comparative study of their type species is needed to decide on a sound basis.

There is quite a number of generic names associated with the Haplosclerida, which are not mentioned in the above given classification, because of uncertainty over their identity. They are listed in TABLE 4 together with their type species.

PHYLOGENETIC REMARKS

Current ideas on the phyletic lines within the Haplosclerida have been formulated by GRIESSINGER (1971: 124) and LÉVI (1973: 616), who think that the paucispicular skeleton with little spongin, such as found in *Haliclona* and *Reniera* represent the primitive ancestral type of choanosomal skeleton, from which evolved the more elaborate skeletons of Haplosclerida in two diverging lines, viz. the reduction of the spicular component in favour of strongly developed spongin fibres (in their family Haliclonidae), and the reduction of the spongin component in favour of multispicular tracts (in their family Renieridae).

If we apply the commonly used principle of outgroup comparison in determining the characters of the ancestral forms, it is very difficult to assume the *Haliclona—Reniera* type to be ancestral, as similar skeletal types are rare in the related Ceractinomorph orders, with the exception of the Halichondrida, which are, however, difficult to relate due to the rarity of useful characters.

WIEDENMAYER (1977b) has quite different ideas on the ancestral forms of Haplosclerida, although his classification is rather similar to that of GRIESSINGER-LÉVI. WIEDENMAYER studied the skeletal characters of fossil Nepheliospongiidae and found significant similarities between *Petrosia-Xestospongia*-like recent and fossil sponges. In his opinion ancestral characters are multispicular tracts with little spongin. Again, according to the principle of the outgroup, there is little evidence for this, as this type of skeleton is also rare in other Ceractinomorph groups.

My view is that the ancestral form had an isodictyal skeleton of multispicular primary and secondary fibres sheathed in spongin, a dermal skeleton of single spicules, and a spicule complement of oxeotes, sigmata and toxa. Such a type of sponge is still to be found among Niphatids, Callyspongiids and Petrosiids. This ancestral type shared with the related Keratosa its spongin fibre skeleton, with the Poecilosclerida its spongin enforced multispicular fibres, dermal specialisation and microsclere complement, with the Halichondrida its dermal specialisation, and even with the Tetractinomorph order Axinellida its spongin enforced radiating skeleton. Genera like *Haliclona* and *Reniera*, or Oceanapiid genera are considered highly evolved, dissimilar to the ancestral type.

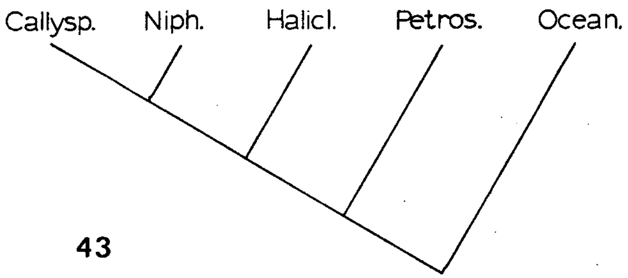


FIGURE 43. Proposed phylogenetic relationships of families of the order HAPLOSCLERIDA. (Callysp. = Callyspongiidae, Niph. = Niphatidae, Halicl. = Haliclonidae, Petros. = Petrosiidae, Ocean. = Oceanapiidae)

Although we are still far from a detailed character analysis in the Haplosclerida, the above given hypothesis leads to the hypothetical evolutionary tree, given in Fig. 43.

The Oceanapiidae are considered as a separate group through its full loss of the radiate architecture. The Petrosiidae have a distinct tendency towards an isotropic skeleton, but the basic radiate type is still recognized in some forms. The three remaining families are closely related, differing only in minor points. The Haliclonidae show skeletal similarities (Renierid reticulation) with the Oceanapiids and the Petrosiids. Callyspongiids and Niphatids are difficult to separate (although there may be additional cytological differences, cf. POMPONI, 1976), and thus are considered to be related more closely to each other than any other Haplosclerid group.

ZOOGEOGRAPHY

With the aid of literature data (RIDLEY, 1881, 1884; RIDLEY & DENDY, 1887; DE LAUBENFELS, 1954, 1956; BURTON, 1937, 1956; HECHTEL, 1976) the world distribution of all West Indian Haplosclerida has been determined (cf. TABLE 5). The subdivision used in the comparable table on West Indian Keratosa distribution (cf. VAN SOEST, 1978), is extended with a category of Amphi-American sponges, which seem to exist genuinely, be it rarely, in this order.

From TABLE 5 it appears that 72% of alle recognized species (i.e. well established species) is endemic to the West Indian region (compared to 60% in the case of Keratosa), 80% is endemic to the tropical Western Atlantic (equal to endemism found in the Keratosa). The 20% remaining species contain 5 circumtropical ones; these should, in my opinion, be subjected to detailed comparative studies. The two tropical Atlantic species seem to be genuine, as do the four Amphi-American ones.

A special case is *Haliclona hogarthi* Hechtel (1965), which is almost indistinguishable from Mediterranean *H. mediterranea* Griessinger (1971) and Northern Atlantic *H. permollis* (Bowerbank, 1866). The morphological distinctness of these forms remains to be determined.

HECHTEL (1976) names 7 Brazilian Haplosclerid species, which do not occur in the West Indies, viz. *Callyspongia pergamentacea* (Ridley, 1881), *C. coppingeri* (Ridley, 1881), *C. robusta* (Ridley, 1884) (= *Toxochalina robusta* Ridley, 1884), *C. fibrosa* Ridley & Dendy (1886), *C.* spec., *Adocia* spec., and *Oceanapia atlantica* Ridley (1881). Apart from *Callyspongia* spec. and *Adocia* spec. on which we have no information, they seem to be good species, different from any West Indian species in my experience.

Endemism on the generic level seems to be quite low, if existing at all. Only the genera *Niphates* and *Amphimedon* have not been reported from outside the West Indies in original publications. However, *Niphates* species are quite likely to be found among *Gelliodes* species reported from waters outside the West Indies. WIEDENMAYER (1977a) transferred *Cribrochalina olemda* De Laubenfels (1954) (Pacific) to *Niphates*. *Amphimedon* is considered synonymous with *Pachychalina* Schmidt (1868), and many species described under that name will probably belong to *Amphimedon*.

TABLE 5
WORLD DISTRIBUTION OF SPECIES OF HAPLOSCLERIDA OCCURRING IN THE WEST INDIES

	Bermuda	North Carolina	Florida	Gulf of Mexico	Br. Honduras Yucatán	Panamá	Leeward Group	Windward Group	Virgin Islands	Greater Antilles	Bahama Islands	Brasil	Pacific Coast America	Mediterranean	W. Africa	Tropical Pacific	Tropical Indian Ocean
A. **Cosmopolitan species:**																	
Gellius flagellifer	–	–	–	–	×	–	–	–	–	–	–	–	–	–	×	×	×
Amphimedon viridis	×	×	×	×	–	–	×	×	×	×	×	×	–	–	–	×	–
Callyspongia vaginalis armigera	×	–	×	–	–	–	–	–	×	×	–	–	–	–	–	–	×
Pellina carbonaria	–	–	×	–	–	–	×	×	×	×	–	×	–	–	–	×	–
Oceanapia fistulosa	–	–	–	–	–	–	–	–	–	×	–	×	–	–	–	×	×
B. **Tropical Atlantic species:**																	
Siphonochalina coriacea	–	–	–	–	×	–	–	–	–	–	–	–	–	×	–	–	–
Foliolina peltata	–	–	×	–	–	–	–	–	–	×	–	–	–	–	×	–	–
C. **Amphi-American species:**																	
Haliclona hogarthi	–	×	×	×	–	–	×	×	–	×	×	–	×	–	–	–	–
Adocia implexiformis	–	–	×	–	–	–	×	–	–	×	–	–	×	–	–	–	–
Sigmadocia coerulea	–	–	–	–	–	×	×	–	–	×	–	–	×	–	–	–	–
Pellina nodosa	×	×	×	×	–	–	×	–	–	×	–	–	×	–	–	–	–
D. **Tropical Western Atlantic species:**																	
Haliclona molitba	–	–	–	–	–	–	×	–	–	–	×	×	–	–	–	–	–
Niphates erecta	×	×	×	–	×	–	×	×	×	×	×	×	–	–	–	–	–
Callyspongia vaginalis	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–
Xestospongia muta	–	–	×	–	–	–	×	–	–	×	×	×	–	–	–	–	–
Oceanapia oleracea	–	–	–	–	–	–	–	–	–	×	–	×	–	–	–	–	–
E. **West Indian Endemics:**																	
Reniera tubifera	×	×	–	–	×	–	–	–	–	×	–	–	–	–	–	–	–
Amphimedon complanata	–	–	×	–	×	–	–	×	×	×	×	–	–	–	–	–	–
Amphimedon compressa	–	–	–	–	–	–	–	×	×	–	×	–	–	–	–	–	–
Niphates digitalis	–	–	×	–	–	–	–	×	–	×	×	–	–	–	–	–	–

	Bermuda	North Carolina	Florida	Gulf of Mexico	Br. Honduras Yucatán	Panamá	Leeward Group	Windward Group	Virgin Islands	Greater Antilles	Bahama Islands	Brasil	Pacific Coast America	Mediterranean	W. Africa	Tropical Pacific	Tropical Indian Ocean
Niphates amorpha	—	—	—	—	—	—	—	x	—	x	x	—	—	—	—	—	—
Cribrochalina dura	—	—	—	—	—	—	—	—	—	x	x	—	—	—	—	—	—
Cribrochalina spiculosa	—	—	—	—	—	—	—	—	—	x	x	—	—	—	—	—	—
Cribrochalina vasculum	—	—	—	—	x	—	—	—	—	x	x	—	—	—	—	—	—
Callyspongia arcesiosa	—	—	x	—	—	—	—	x	—	—	—	—	—	—	—	—	—
Callyspongia eschrichti	x	—	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—
Callyspongia fallax	—	—	x	—	x	—	x	x	x	x	x	—	—	—	—	—	—
Callyspongia longissima	—	—	—	—	—	—	—	—	x	—	x	—	—	—	—	—	—
Callyspongia pallida	—	—	—	—	—	—	x	—	—	x	x	—	—	—	—	—	—
Callyspongia plicifera	—	—	x	—	—	—	x	x	x	x	x	—	—	—	—	—	—
Callyspongia strongylophora	—	—	—	—	x	—	—	—	—	x	—	—	—	—	—	—	—
Callyspongia tenerrima	—	—	x	—	—	—	—	—	x	—	x	—	—	—	—	—	—
Siphonodictyon siphonum	—	—	—	—	—	—	—	x	—	—	x	—	—	—	—	—	—
Xestospongia subtriangularis	—	—	x	—	x	x	x	x	x	x	x	—	—	—	—	—	—
Xestospongia wiedenmayeri	—	—	x	—	—	—	x	—	—	—	x	—	—	—	—	—	—
Petrosia weinbergi	—	—	—	—	—	—	x	—	—	x	—	—	—	—	—	—	—
Oceanapia hondurasensis	x	—	—	—	x	—	—	—	—	x	—	—	—	—	—	—	—
Oceanapia bartschi	—	—	x	—	—	—	—	—	—	x	—	—	—	—	—	—	—
Pachypellina podatypa	—	—	—	—	x	—	—	—	—	x	x	—	—	—	—	—	—
EI. Known from a single locality:																	
Haliclona "crassiloba"	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Reniera curaçaoensis	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—
Reniera carmabi	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—
Adocia albifragilis	—	—	—	—	—	—	—	—	—	x	—	—	—	—	—	—	—
Adocia amphioxa	x	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sigmadocia piscaderaensis	—	—	—	—	—	—	x	—	—	—	—	—	—	—	—	—	—
Sigmadocia recondita	—	—	—	—	—	—	—	—	—	—	x	—	—	—	—	—	—

	Bermuda	North Carolina	Florida	Gulf of Mexico	Br. Honduras Yucatán	Panamá	Leeward Group	Windward Group	Virgin Islands	Greater Antilles	Bahama Islands	Brasil	Pacific Coast America	Mediterranean	W. Africa	Tropical Pacific	Tropical Indian Ocean
Orina tenerrima	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—
Orina calcinea	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Gelliodes leucosolenia	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Niphates alba	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Cribrochalina cretacea	—	—	×	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dactylia ceratosa	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
Siphonodictyon coralliphagum	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Siphonodictyon brevitubulatum	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Siphonodictyon cachacrouense	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Xestospongia portoricensis	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Xestospongia rampa	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Strongylophora dendyi	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
"Haliclona" pellasarca	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—
Biminia stalagmitica	—	—	—	—	—	—	—	—	—	—	×	—	—	—	—	—	—
Strongylophora hartmani	—	—	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—
Pachypellina santa	—	—	—	—	—	×	—	—	—	—	—	—	—	—	—	—	—

ECOLOGICAL REMARKS

Data provided by the various collectors allow an assessment of the ecological preferences of the species treated in this study; these are presented below, distributed over 6 habitat types:

Intertidal rocks:
Adocia implexiformis, Amphimedon viridis, Callyspongia pallida, Pellina nodosa.

Mangrove forests:
Haliclona hogarthi, Reniera tubifera, Adocia implexiformis, Sigmadocia coerulea, Sigmadocia piscaderaensis, Amphimedon viridis, Callyspongia pallida, Xestospongia wiedenmayeri, Pellina carbonaria.

Thalassia-fields in lagoons:
Haliclona molitba, Haliclona hogarthi, Sigmadocia piscaderaensis, Amphimedon viridis, Amphimedon complanata, Xestospongia subtriangularis, Pellina carbonaria.

Rocky and other hard substrates in lagoons:
Haliclona molitba, Reniera curaçaoensis, Reniera carmabi, Adocia implexiformis, Sigmadocia piscaderaensis, Amphimedon viridis, Niphates digitalis, Niphates amorpha, Callyspongia pallida, Callyspongia tenerrima, Pellina nodosa.

Reefs:
Adocia implexiformis, Amphimedon compressa, Amphimedon viridis, Niphates erecta, Niphates digitalis, Niphates alba, Cribrochalina spiculosa, Callyspongia fallax, Callyspongia vaginalis, Callyspongia vaginalis armigera, Callyspongia plicifera, Callyspongia tenerrima, Xestospongia subtriangularis, Xestospongia muta, Xestospongia wiedenmayeri, Petrosia weinbergi.

Muddy sand flats in deeper water:
Niphates amorpha, Callyspongia strongylophora, Xestospongia subtriangu-

laris, Xestospongia muta, Xestospongia portoricensis, Oceanapia fistulosa, Oceanapia bartschi, Oceanapia oleracea, Pachypellina podatypa, Strongylophora hartmani.

No data were available in the case of *Callyspongia eschrichti,* but if this species is synonymous with *Siphonochalina stolonifera* Whitfield (1901), it can be concluded, that it is at least native to intertidal rocks.

Definite euryoecious species are *Adocia implexiformis, Amphimedon viridis* and *Xestospongia subtriangularis.*

44

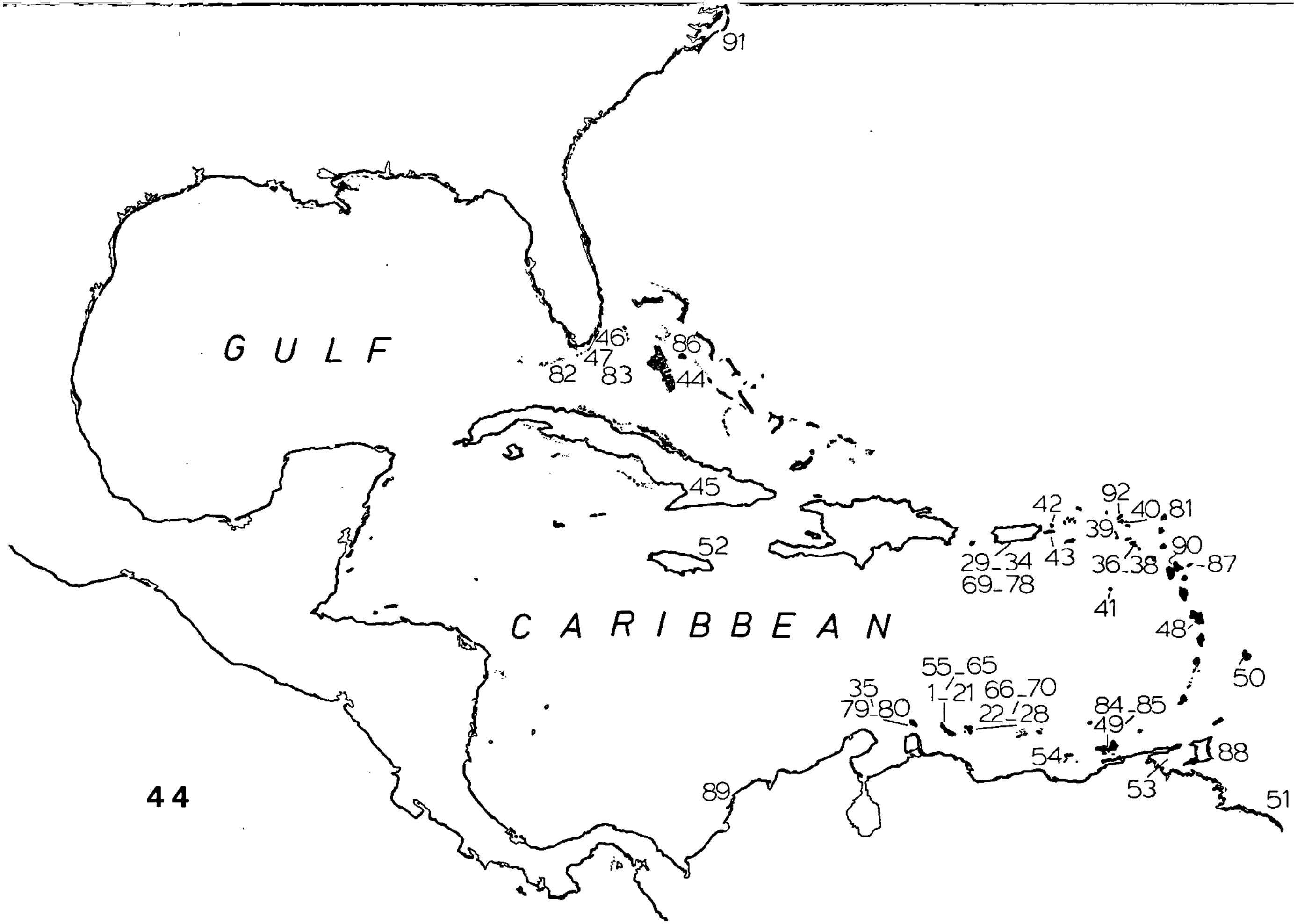


FIGURE 44. Sketch map of the Caribbean area. The numbers refer to the localities as mentioned in the Introduction.

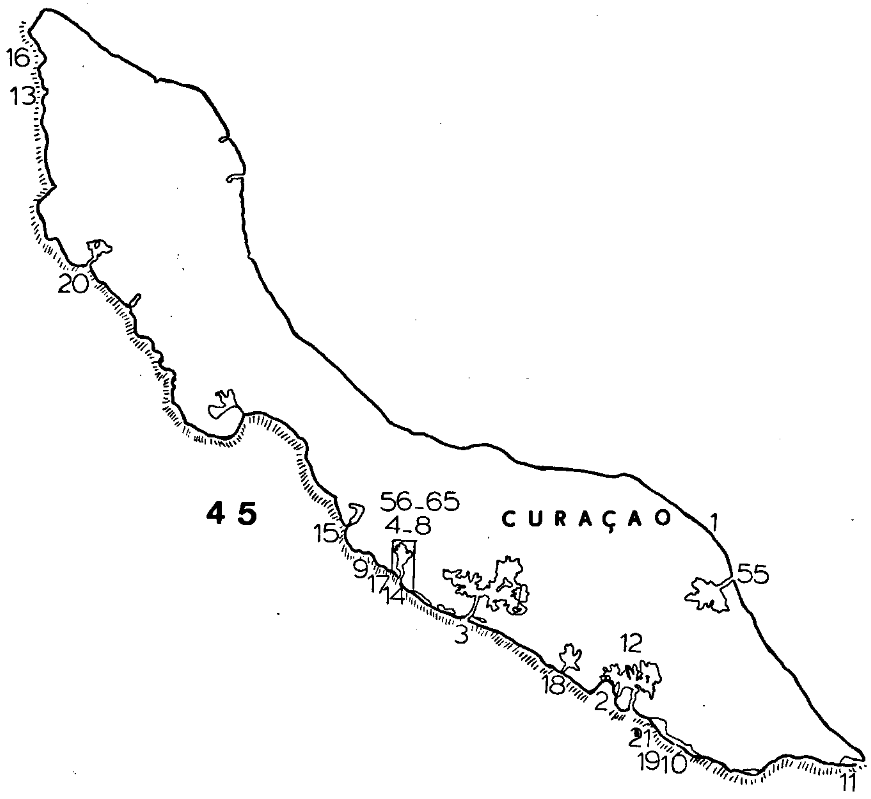
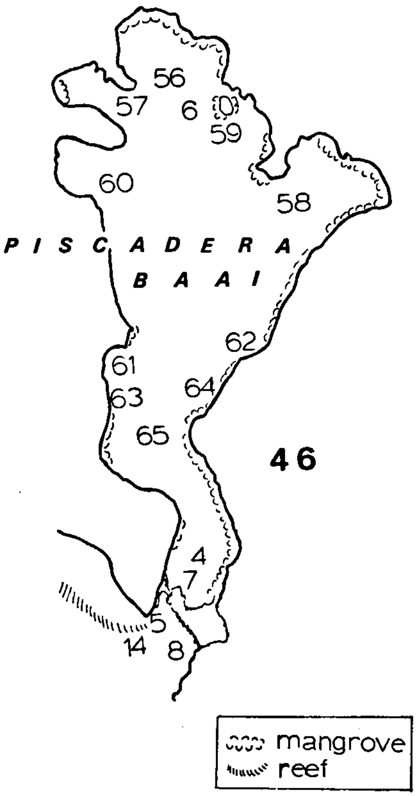
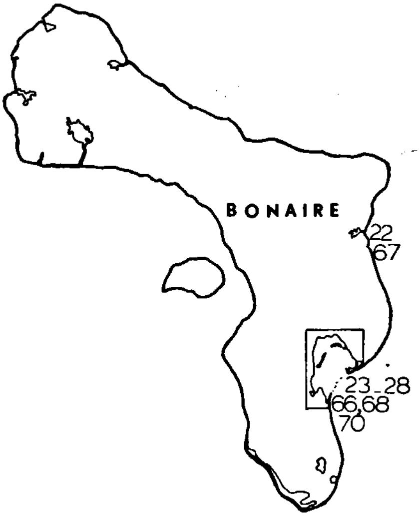
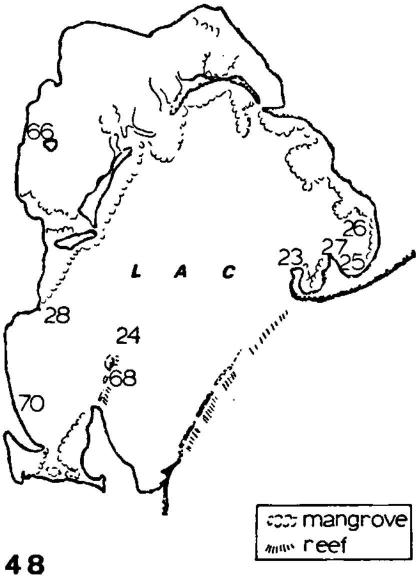


FIGURE 45–46. Sketch map of Curaçao with details of Piscadera Bay. Numbers refer to the localities given in the Introduction.

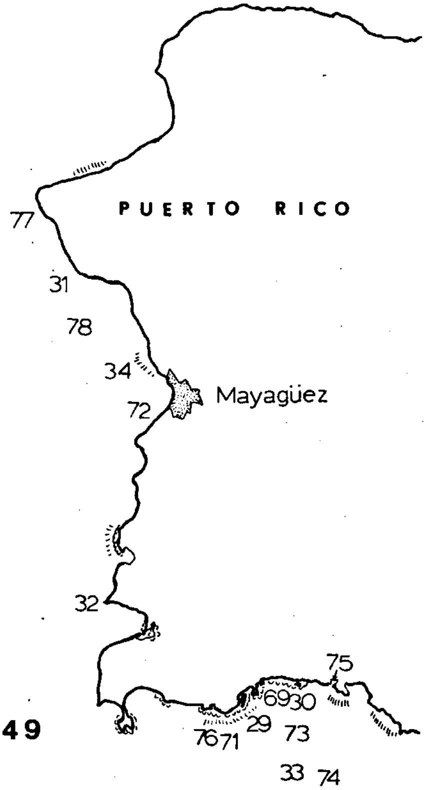

56
57
6
59
60
58
PISCADERA
BAAI
62
61
64
63
65
46
4
7
5
14
8
mangrove
reef


BONAIRE
22
67
23_28
66,68
70

47


66
L A C
26
27
23
25
28
24
68
70
mangrove
reef

48



49

FIGURE 47–49 Sketch maps of Bonaire with details of Lac, and the most western part of Puerto Rico. Numbers referring to the localities as given in the Introduction.

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NOTE ADDED IN THE PRESS

Shortly before the MS went to the printers' three sponge papers were published with bearing on the West Indian Haplosclerida.

ALCOLADO provided a list of additions to the sponge fauna of Cuba (*Poeyana 197*). Of the Haplosclerida are recorded: *Callyspongia fallax* Duch. & Mich. (as *C. bullata* and *C. repens*), *C. arcesiosa* De Laubenfels, *Adocia* implexiformis Hechtel, *Oceanapia oleracea* (Schmidt) (as *Rhizochalina carotta* and *R. oleracea*), and *O. bartschi* De Laubenfels (as *Inflatella*).

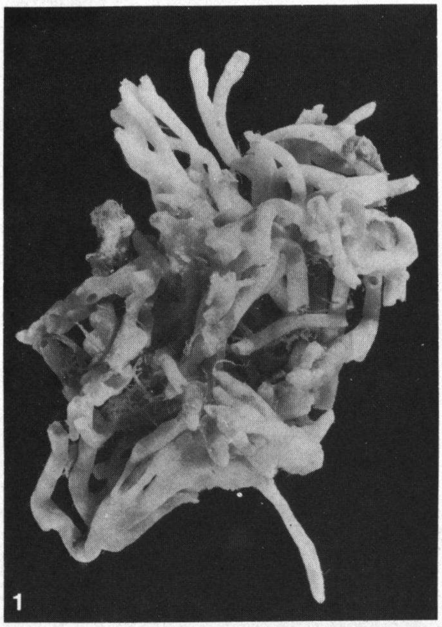
A second paper by ALCOLADO concerned the description of a new *Strongylophora* (*Poeyana 196*), *S. davilai*, which is not unlike *S. hartmani* in habit. However, colour (dark grey) and spiculation (strongyles only 3–9 µ thick, large oxea only 1–2 µ thick, small oxea only up to 30 µ long) are considerably different, so it is quite clear *S. davilai* and *S. hartmani* represent different species.

Finally, some comment is needed on BERGQUIST's surprising paper on the "Ordinal and subclass classification of Demospongida" (*New Zeal. J. Zool. 7*). Apart from the fact that the name of her new order (Nepheliospongia) is ill-chosen, because *Nepheliospongia* is very probably not a member of it (cf. this paper), its diagnosis rests solely on two (unrelated) observations, viz. the occurrence in some species of certain biochemical compounds (*Calyx nicaensis*, *Strongylophora* spec., *Petrosia* spec., *Xestospongia muta* and *Foliolina peltata*), and the occurrence of oviparity in *Xestospongia muta*. Bergquist thinks the latter character is primitive (shared with quite a lot of unrelated sponge groups). In my opinion the retention of a primitive character cannot be the basis for the establishment of a new order. The distribution of biochemical compounds among related species and genera is largely unknown, so the value of the observed differences remains doubtful. The question whether Petrosiids and Oceanapiids are more closely related to each other than to other Haplosclerids (or other Ceractinomorpha), will have to be decided on a thorough study of critical genera like *Xestospongia*, *Pellina*, *Cribrochalina*, *Hemigellius* and *Cladocroce*.

PLATES

PLATE I

1. *Haliclona hogarthi* Hechtel, 1965, from CURAÇAO, ZMA POR. 4005 (× 0.7)
2. *Haliclona hogarthi* Hechtel, 1965, from CURAÇAO, ZMA POR. 3765 (× 1)
3. *Haliclona molitba* De Laubenfels, 1949, from CURAÇAO, ZMA POR. 4259 (× 0.7)
4. *Reniera curaçaoensis* n.sp., holotype, from CURAÇAO ZMA POR. 3662 (× 0.7)



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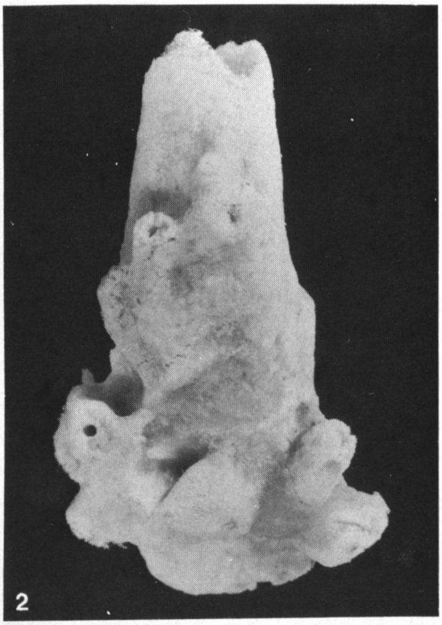

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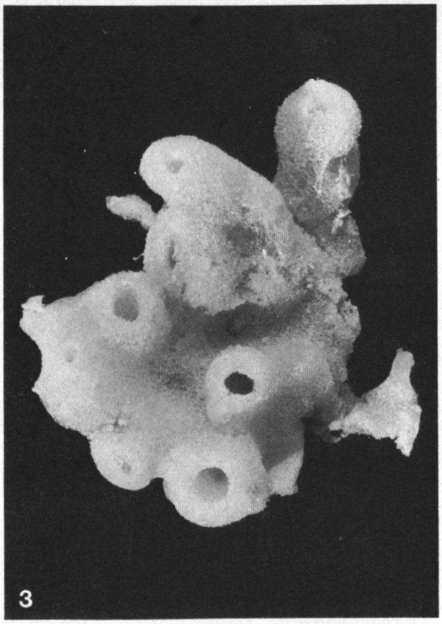

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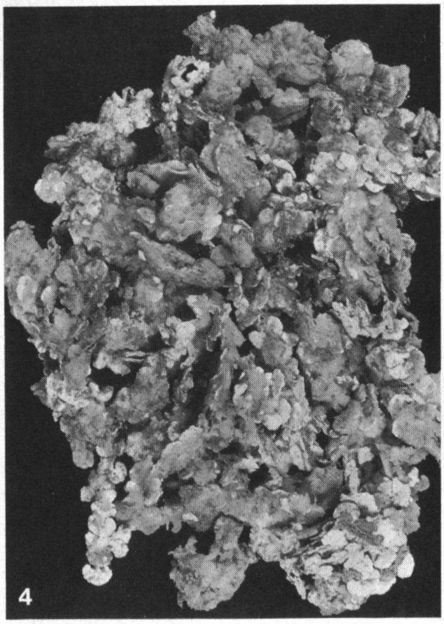

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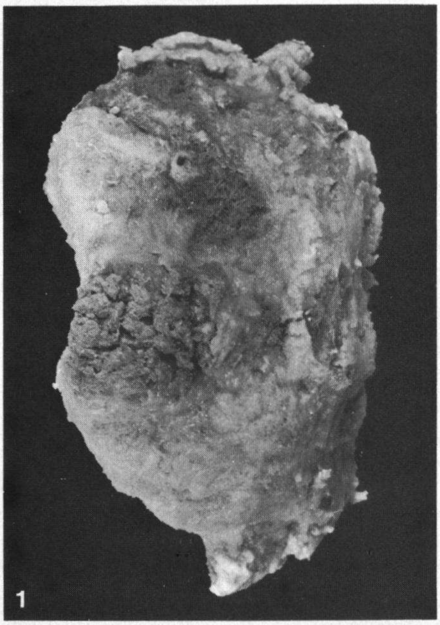
PLATE II

1. *Reniera carmabi* n.sp., holotype from CURAÇAO, ZMA POR. 4341 (× 0.7)
2. *Reniera tubifera* George & Wilson, 1919, from NORTH CAROLINA, ZMA POR. 40 (× 1.3)
3. *Adocia implexiformis* Hechtel, 1965, from CURAÇAO, ZMA POR. 3502 (× 0.3)
4. *Sigmadocia coerulea* Hechtel, 1965, from PUERTO RICO, ZMA POR. 3348 (× 0.7)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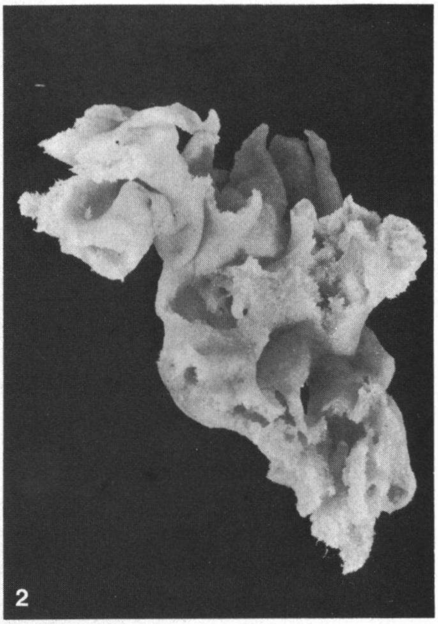
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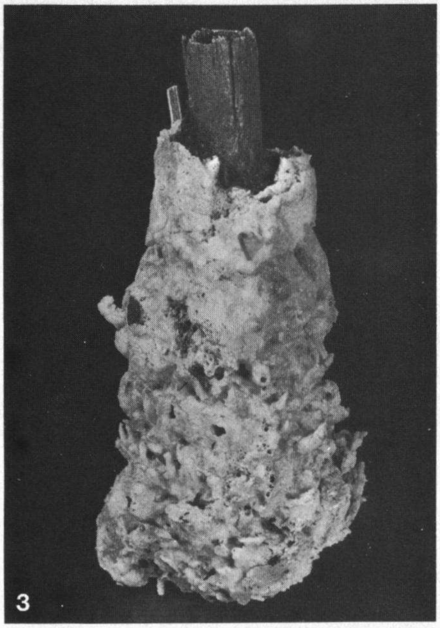
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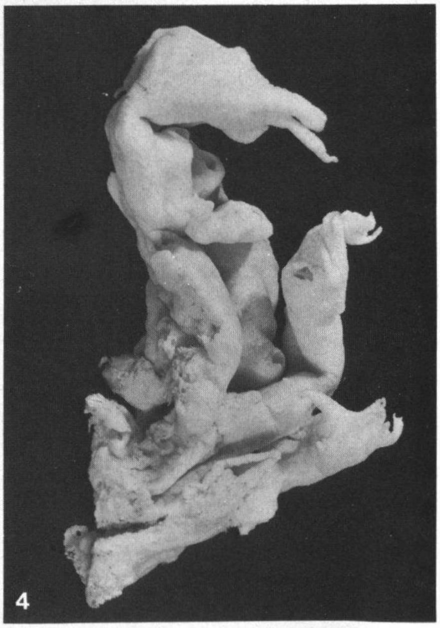
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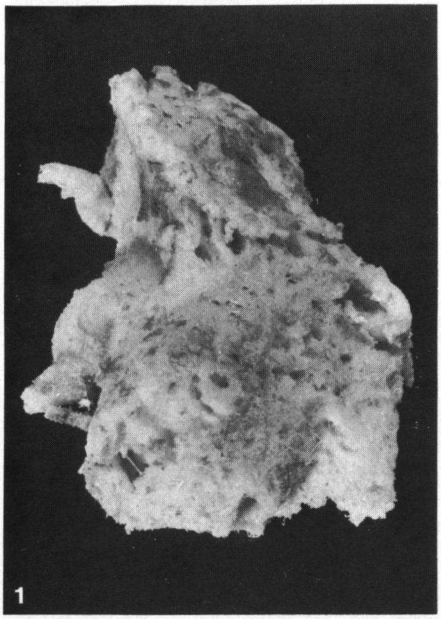
PLATE III

1. *Sigmadocia piscaderaensis* n.sp., holotype from CURAÇAO, ZMA POR. 3666 (× 1.4)
2. *Amphimedon compressa* Duch. & Mich., 1864, lectotype from ST. THOMAS, ZMA POR. 863 (× 0.3)
3. *Amphimedon arborescens* Duch. & Mich., 1864, lectotype, from ST. THOMAS, ZMA POR. 878 (= *A. compressa)* (× 0.3)
4. *Spongia rubens* Duch. & Mich., specimen from ST. THOMAS, ZMA POR. 2254 (=*A. compressa*) (× 0.3)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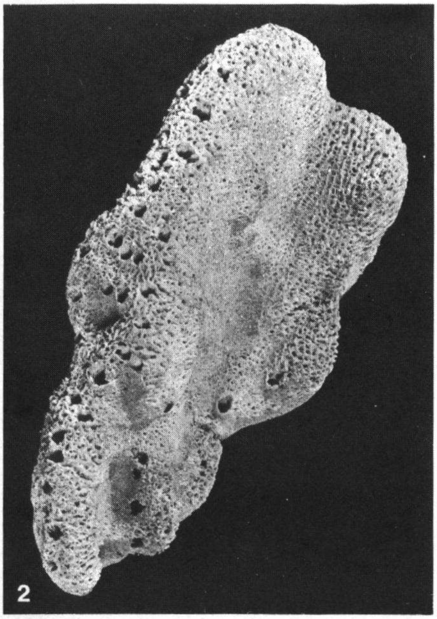
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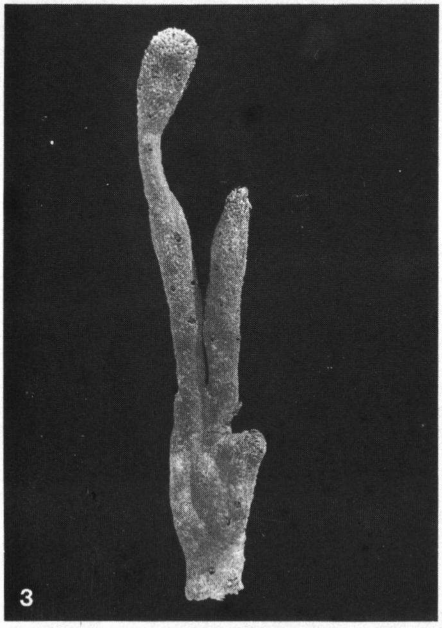
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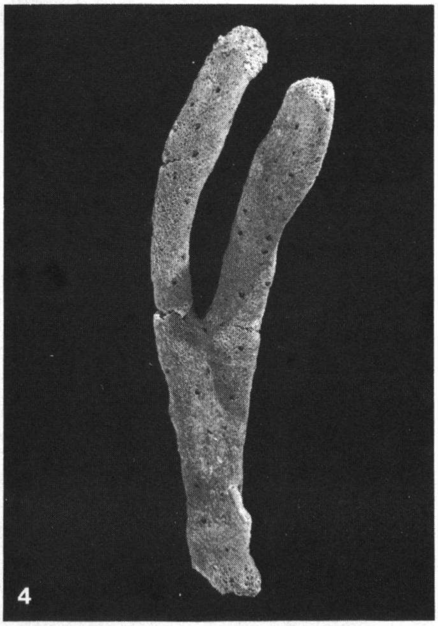
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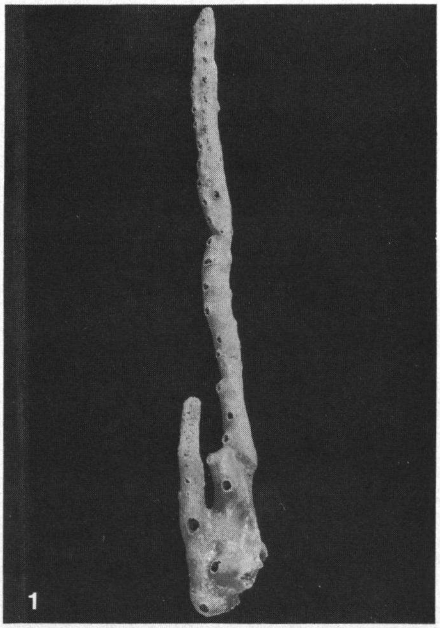
PLATE IV

1. *Amphimedon compressa* Duch. & Mich., 1864, from Curaçao, ZMA POR. 3321 (× 0.2)
2. *Amphimedon compressa* Duch. & Mich., 1864, detail of surface (× 2)
3. *Amphimedon viridis* Duch. & Mich., 1864, from Curaçao, ZMA POR. 3597 (× 0.7)
4. *Spongia fusca* Duch. & Mich., 1864, lectotype from St. Thomas, ZMA POR. 2086 (= *Amphimedon complanata* (Duch., 1850)) (× 0.5)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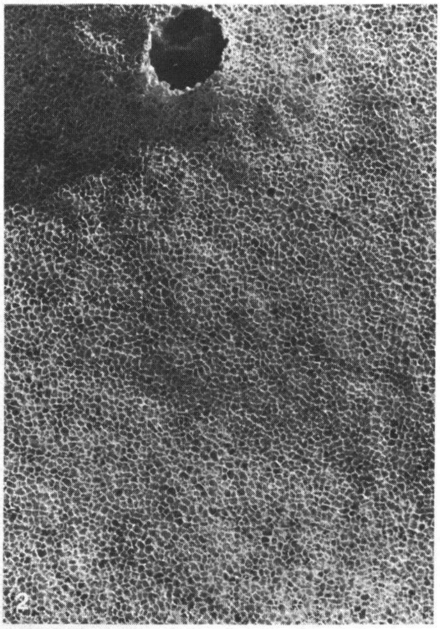
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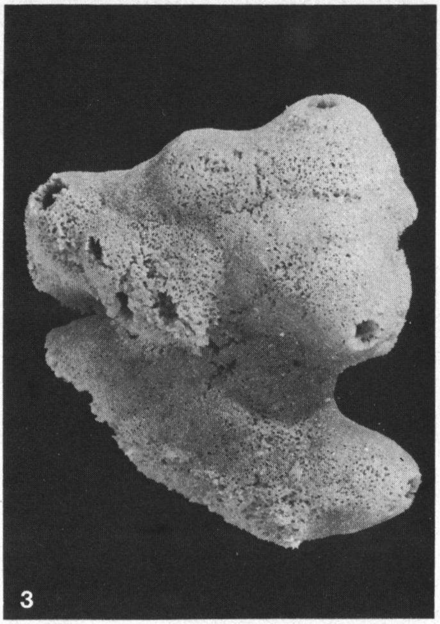
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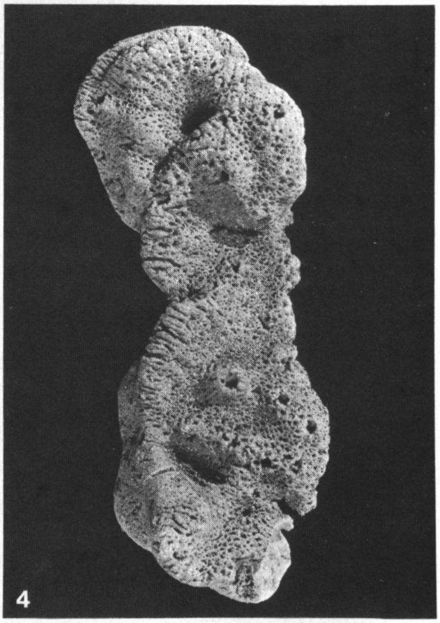
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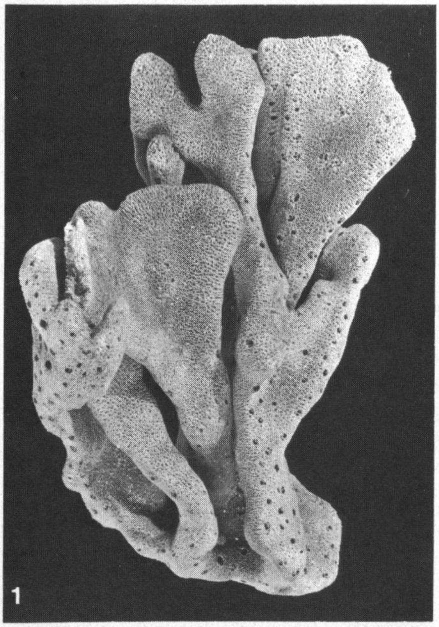
PLATE V

1. *Spongia manus* Duch. & Mich., 1864, paralectotype from St. Martin, ZMA POR. 2095 (= *Amphimedon complanata* (Duch., 1850)) (× 0.3)
2. *Niphates erecta* Duch. & Mich., 1864, lectotype from St. Thomas, ZMA POR. 1633 (× 0.5)
3. *Niphates erecta* Duch. & Mich., 1864, from Curaçao, ZMA POR. 3315 (× 0.7)
4. *Niphates erecta* Duch. & Mich., 1864, detail of surface (× 2), with *Parazoanthus* spec.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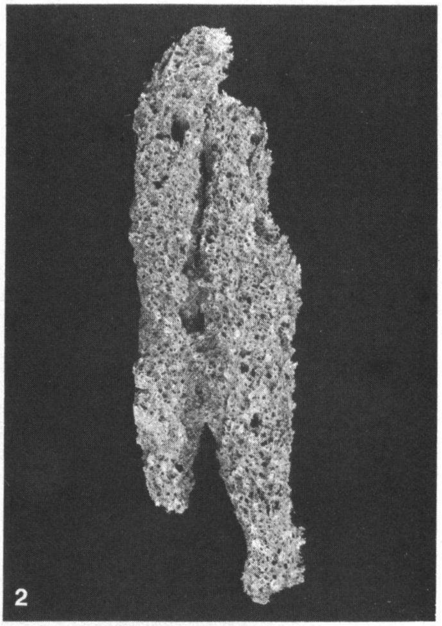
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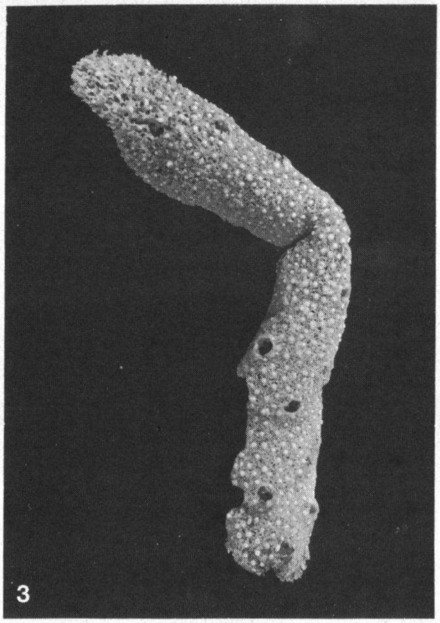
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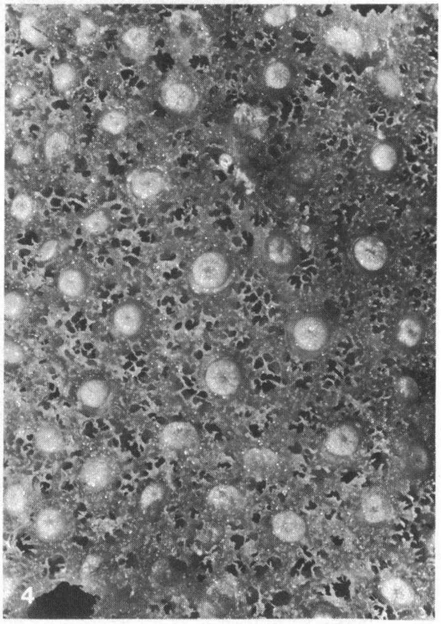
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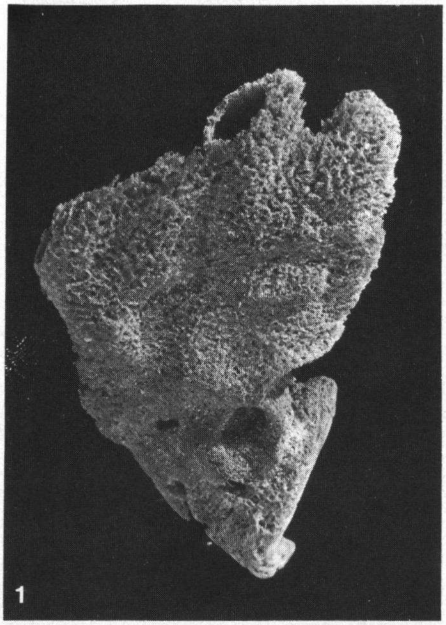
PLATE VI

1. *Tuba pavonina* Duch. & Mich., 1864, lectotype from ST. THOMAS, ZMA POR. 2413 (= *Niphates digitalis*) (× 0.5)
2. *Niphates digitalis,* Duch. & Mich. specimen from ST. THOMAS, ZMA POR. 2408 (× 0.7)
3. *Niphates amorpha* from PUERTO RICO, ZMA POR. 3969 (× 1.3)
4. *Niphates alba* n.sp., holotype from PUERTO RICO, ZMA POR. 3942 (× 0.25)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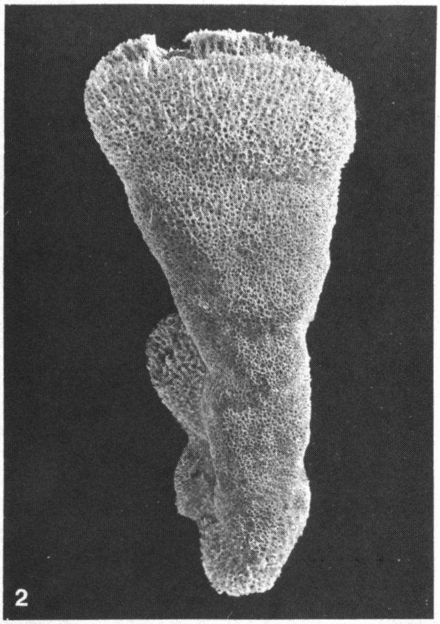
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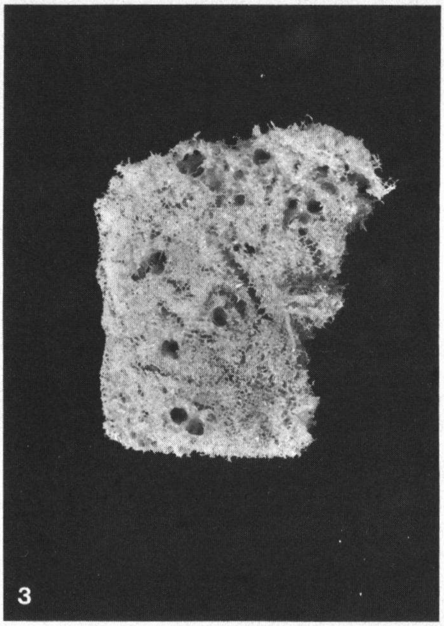
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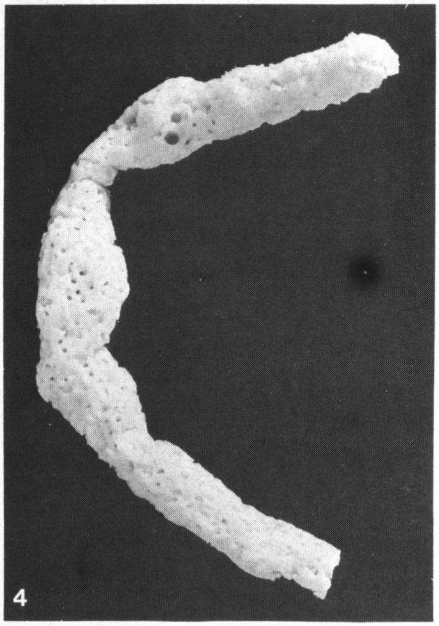
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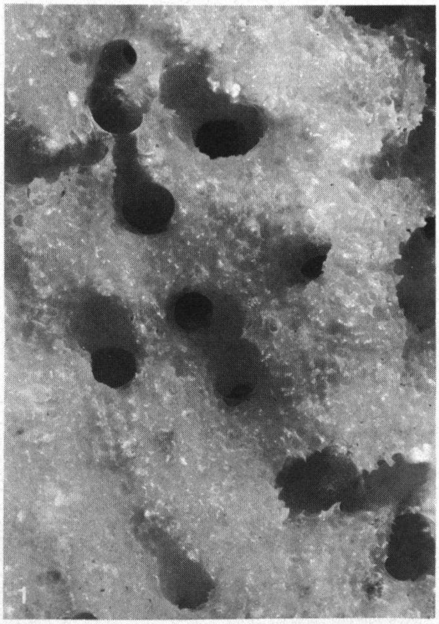
PLATE VII

1. *Niphates alba* n.sp., holotype, detail of surface (× 1)
2. *Cribrochalina spiculosa* (Dendy, 1890), from PUERTO RICO, ZMA POR. 3984 (× 0.7)
3. *Cribrochalina spiculosa* (Dendy, 1890), atypical specimen from PUERTO RICO, ZMA POR. 4439 (× 0.7)
4. *Callyspongia fallax* Duch. & Mich., 1864, lectotype from ST. THOMAS, Mus. Turin Por. no. 84 (× 0.5)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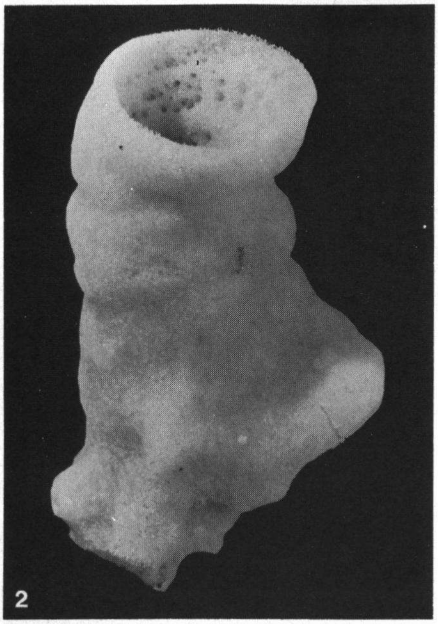
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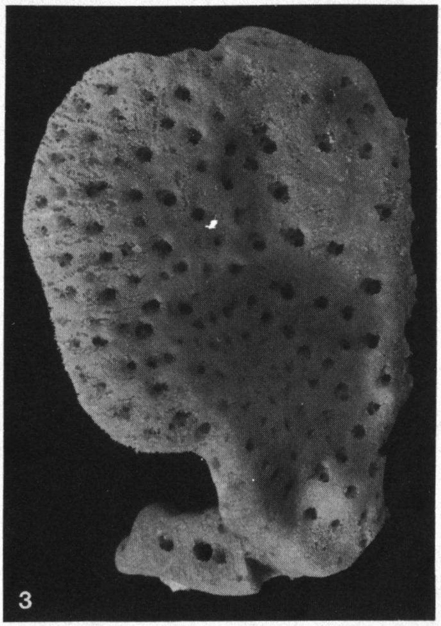
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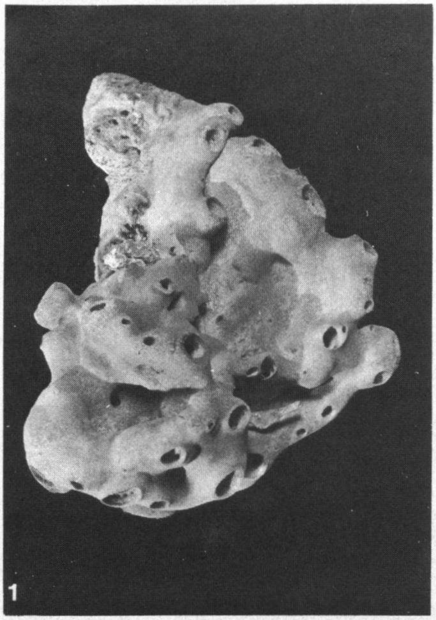
PLATE VIII

1. *Callyspongia bullata;* Duch. & Mich. specimen from VIEQUES (= *C.* (*Callyspongia) fallax* Duch. & Mich., 1864) ZMA POR. 626 (× 0.7)
2. *Callyspongia eschrichti* Duch. & Mich., 1864, lectotype from ST. THOMAS, ZMA POR. 620 (× 0.7)
3. *Callyspongia eschrichti* Duch. & Mich., 1864, paralectotype from ST. THOMAS, ZMA POR. 623 (× 0.7)
4. *Callyspongia (Callyspongia) pallida* Hechtel, 1965, from CURAÇAO, ZMA POR. 3791 (× 1)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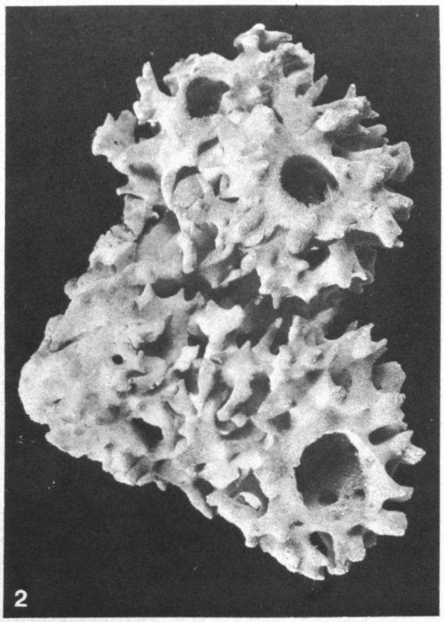
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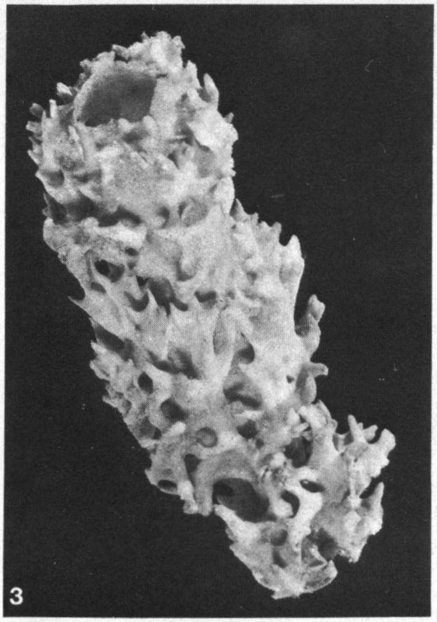
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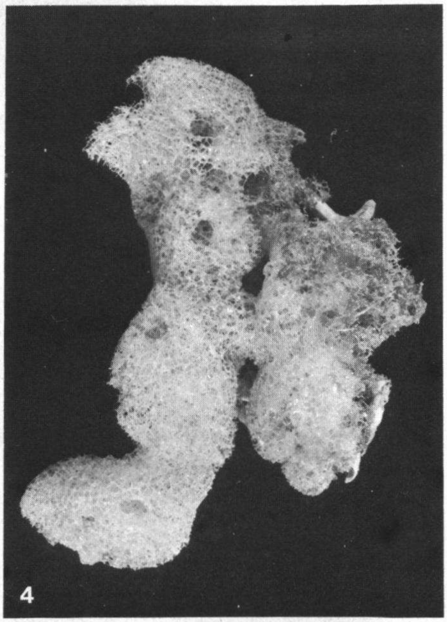
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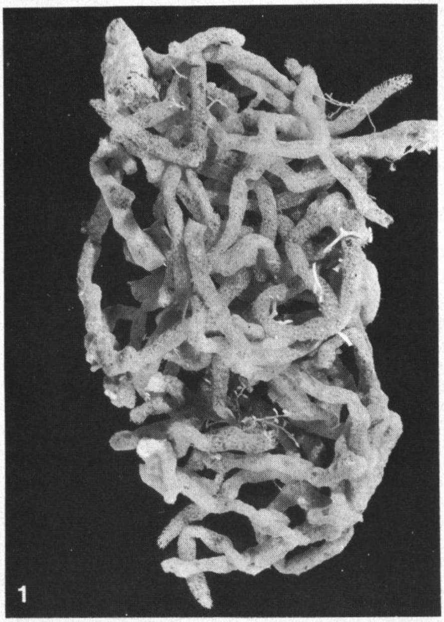
PLATE IX

1. *Callyspongia (Callyspongia) strongylophora* Hartman, 1955, from PUERTO RICO, ZMA POR. 3485 (× 0.3)
2. *Tuba megastoma* Duch. & Mich., 1864, lectotype from ST. THOMAS, ZMA POR. 2412 (= *Callyspongia (Spinosella) vaginalis* (Lamarck, 1814)) (× 0.3)
3. *Tuba irregularis* Duch. & Mich., 1864, lectotype from VIEQUES, ZMA POR. 2410 (= *Callyspongia (Spinosella) vaginalis* (Lamarck, 1814)) (× 0.3)
4. *Tuba sororia* Duch. & Mich., 1864, paralectotype from ST. THOMAS, ZMA POR. 2415 (= *Callyspongia (Spinosella) vaginalis* (Lamarck, 1814)) (× 0.3)



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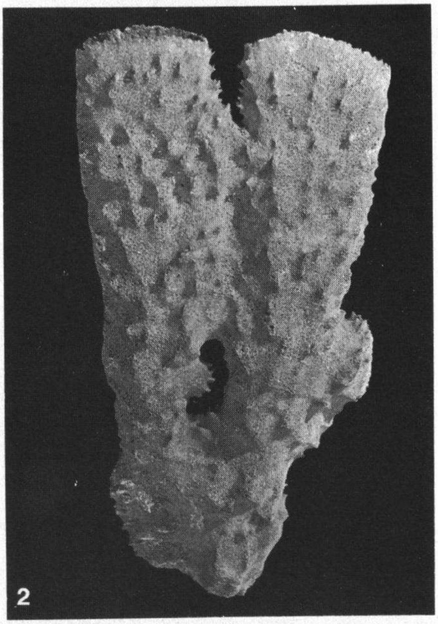

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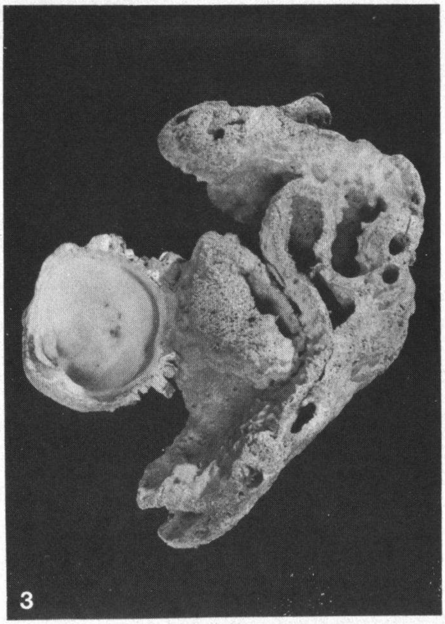

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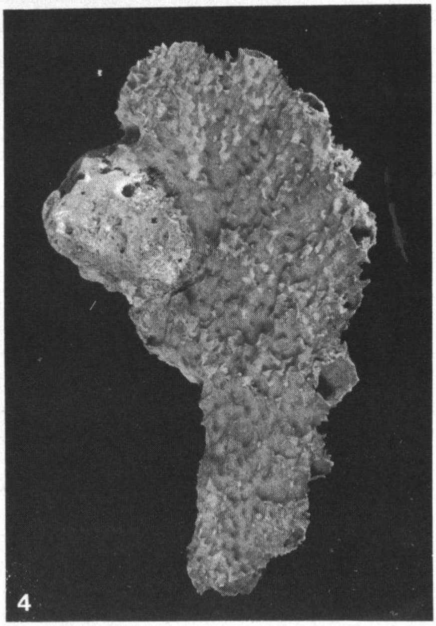

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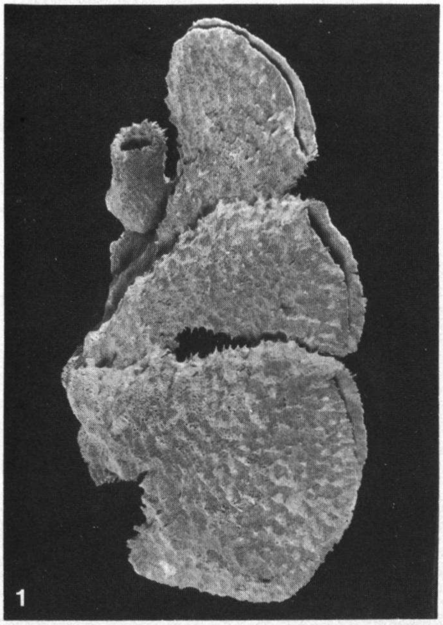
PLATE X

1. *Tuba bursaria;* Duch. & Mich. specimen (= *Callyspongia (Spinosella) vaginalis* (Lamarck, 1814)), ZMA POR. 2411 (× 0.25)
2. *Tuba armigera* Duch. & Mich., 1864, paralectotype from ST. THOMAS, ZMA POR. 2407 (= *Callyspongia (Spinosella) vaginalis* fo. *armigera)* (× 0.7)
3. *Callyspongia (Spinosella) plicifera* (Lamarck, 1814), from CURAÇAO, ZMA POR. 3871 (× 0.15)
4. *Callyspongia (Spinosella) tenerrima* (Duch. & Mich., 1864), ZMA POR. 2631 (× 0.3)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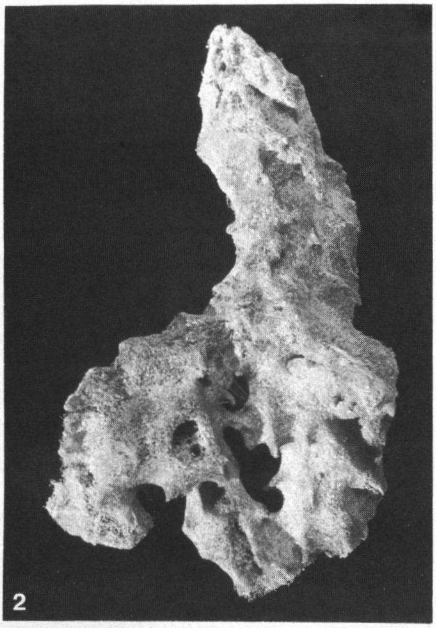
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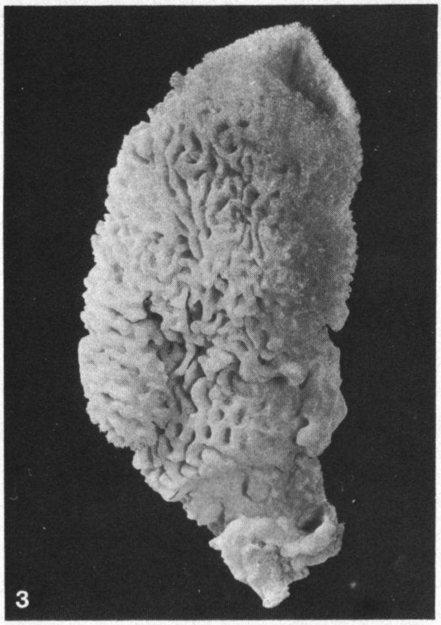
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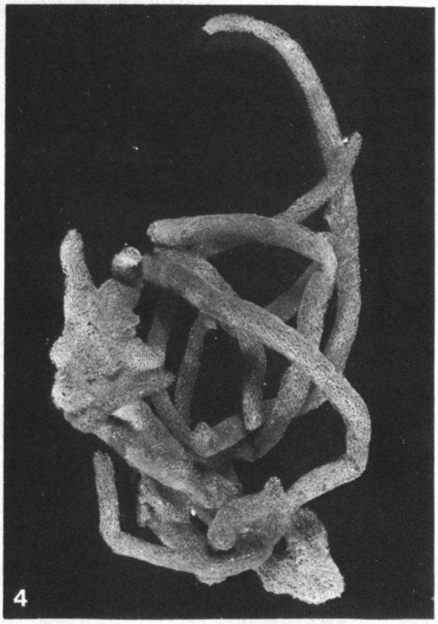
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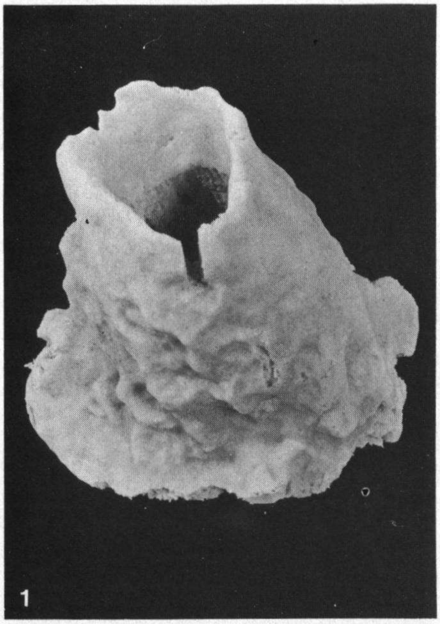
PLATE XI

1. *Xestospongia muta* (Schmidt, 1870), from PUERTO RICO, ZMA POR. 3337 (× 0.3)
2. *Xestospongia wiedenmayeri* n.sp., fragment of the holotype, CURAÇAO, ZMA POR. 3610 (× 0.7)
3. *Xestospongia portoricensis* n.sp., holotype from PUERTO RICO, ZMA POR. 4349 (× 0.3)
4. *Thalysias subtriangularis* var. *lyriformis* Duch. & Mich., 1864, lectotype, ZMA POR. 2375 (= *Xestospongia subtriangularis* (Duch., 1850)) (× 0.3)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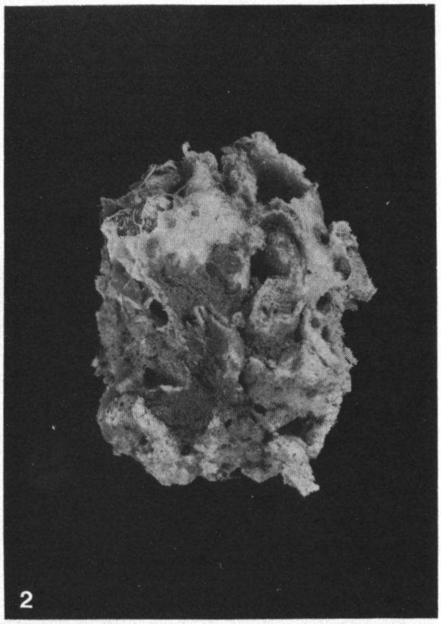
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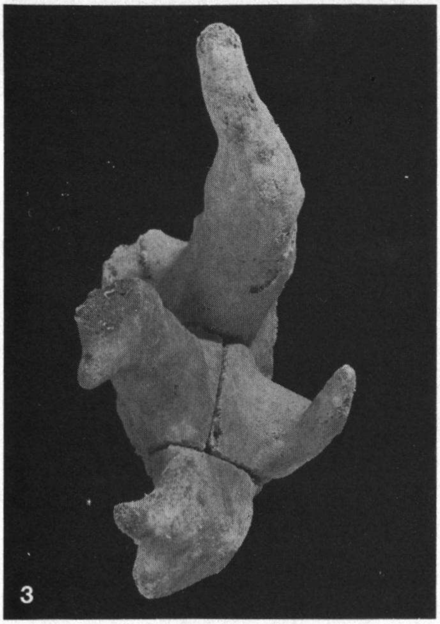
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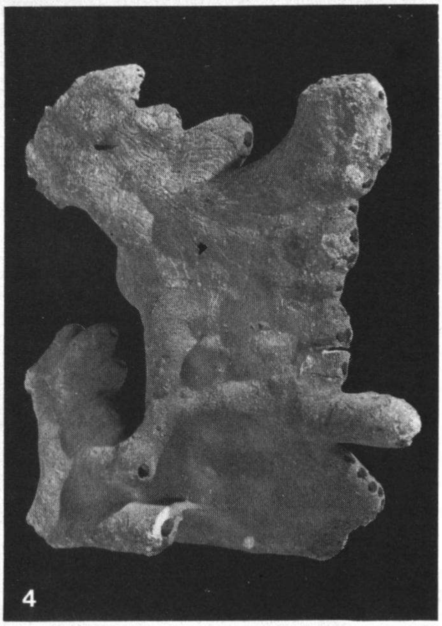
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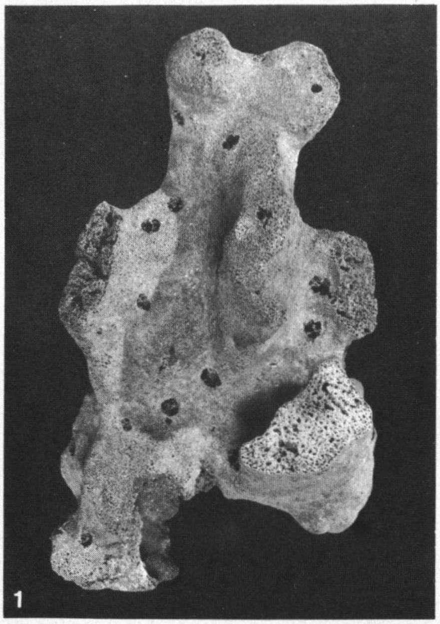
PLATE XII

1. *Thalysias rugosa* Duch. & Mich., 1864, lectotype from St. Thomas, ZMA POR. 2372 (= *Xestospongia subtriangularis* (Duch., 1859)) (× 0.7)
2. *Xestospongia subtriangularis* (Duch., 1850), from Puerto Rico, ZMA POR. 3507 (× 0.25)
3. *Petrosia weinbergi* n.sp., holotype from Curaçao, ZMA POR. 3670 (× 0.7)
4. *Petrosia weinbergi* n.sp., paratype from Puerto Rico, ZMA POR. 4351 (× 0.25)



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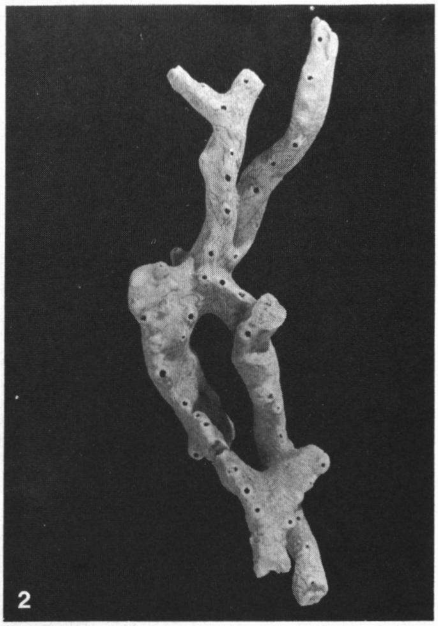

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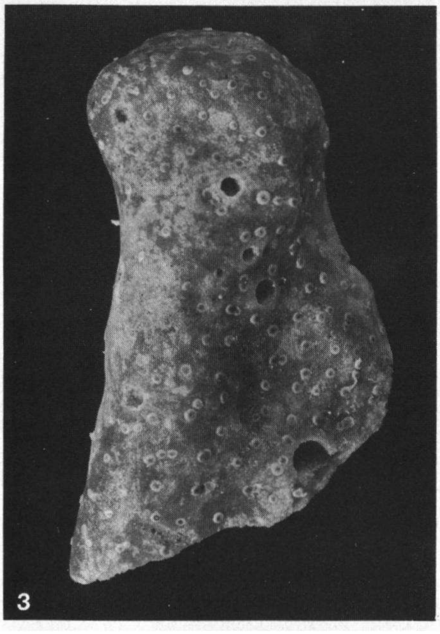

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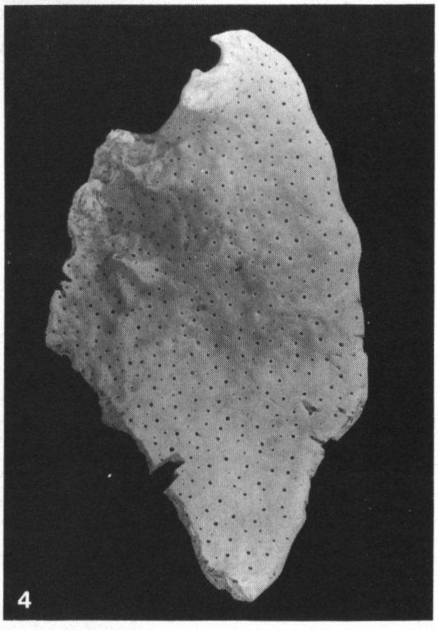

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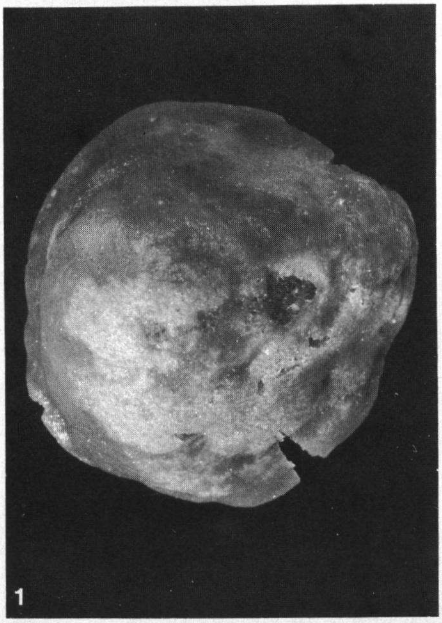
PLATE XIII

1. *Strongylophora hartmani* n.sp., holotype from BARBADOS, ZMA POR. 4442 (× 1.7)
2. *Pellina nodosa* (George & Wilson, 1919), from CURAÇAO, ZMA POR. 3789 (× 0.7)
3. *Thalysias carbonaria;* Duch. & Mich. specimen from ST. THOMAS (= *Pellina carbonaria* (Lamarck, 1814)), ZMA POR. 2371 (× 0.7)
4. *Oceanapia fistulosa* (Bowerbank, 1873), from PUERTO RICO, ZMA POR. 3727 (× 0.7)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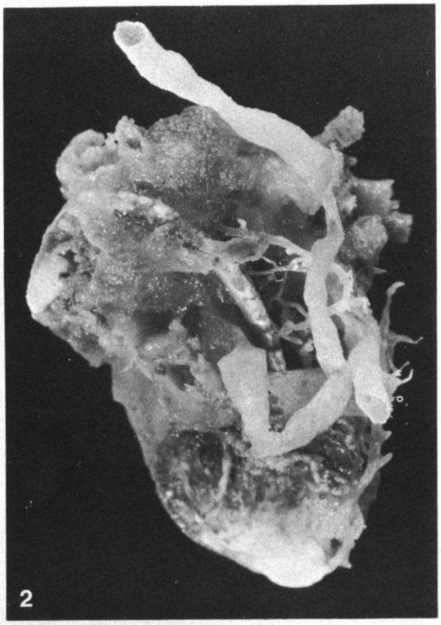
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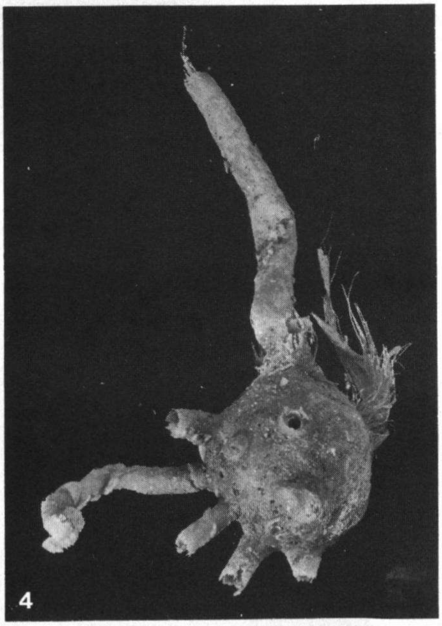
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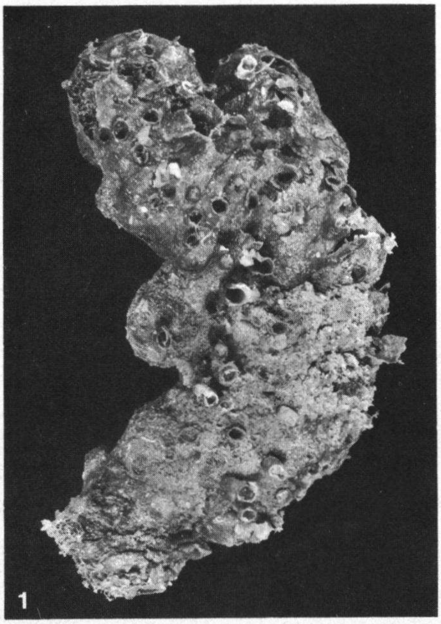
PLATE XIV

1. *Oceanapia bartschi* (De Laubenfels, 1934), from PUERTO RICO, ZMA POR. 3553 (× 0.7)
2. *Oceanapia oleracea* (Schmidt, 1870), from PUERTO RICO, ZMA POR. 3338 (× 0.15)
3. *Pachypellina podatypa* (De Laubenfels, 1934), from PUERTO RICO, ZMA POR. 4352 (× 1)



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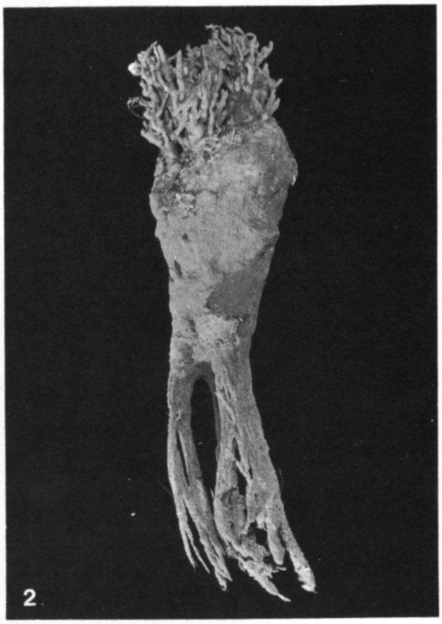

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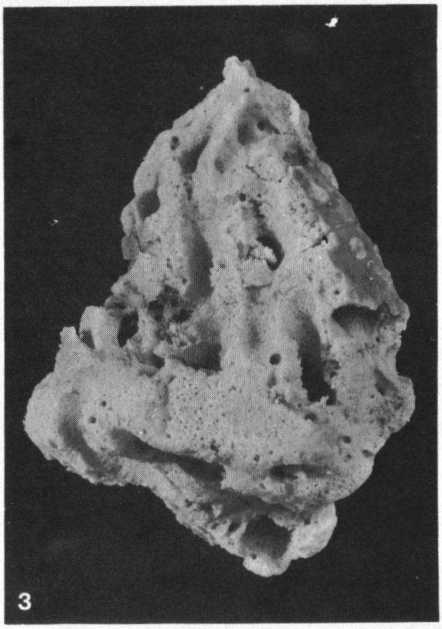

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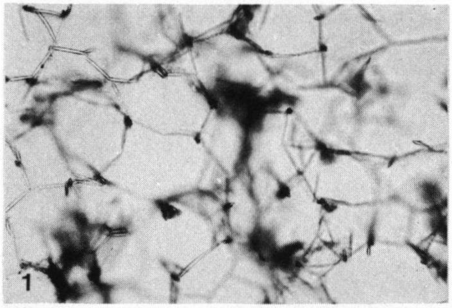
PLATE XV

Microphotographs of Haplosclerid skeletal plans.

1. Ectosome of *Haliclona oculata* (Pallas, 1766), type species of *Haliclona* (× 50)
2. Cross section of choanosome of *Haliclona molitba* De Laubenfels, 1949 (× 10)
3. Ectosome of *Sigmadocia coerulea* Hechtel, 1965 (× 30)
4. Ectosome of *Adocia simulans* (Johnston, 1845), type species of *Adocia* (× 75)
5. Cross section of choanosome of *Amphimedon compressa* Duch. & Mich., 1864, type species of choanosome of *Amphimedon compressa* Duch. & Mich., 1864, type species of *Amphimedon* (× 10)
6. Ectosome of *Amphimedon compressa* (× 10)
7. Cross section of choanosome of *Niphates erecta* Duch. & Mich., 1864, type species of *Niphates* (× 10)
8. Ectosome of *Niphates erecta* (× 15)



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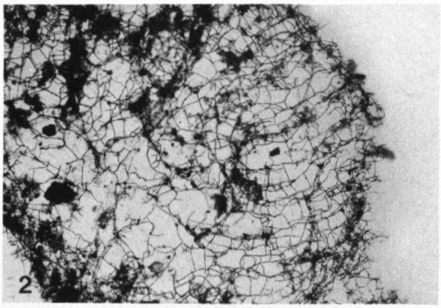

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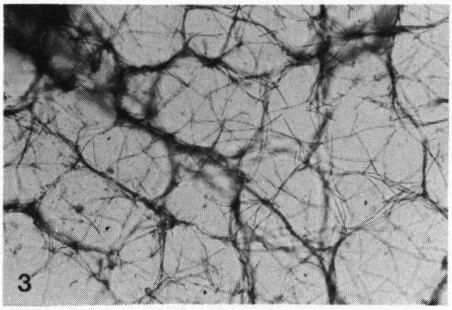

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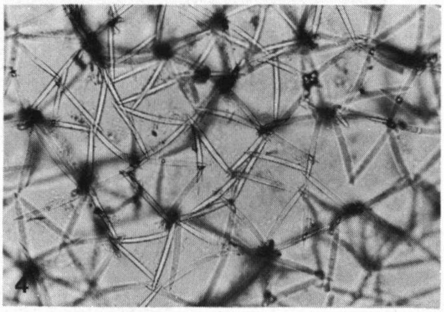

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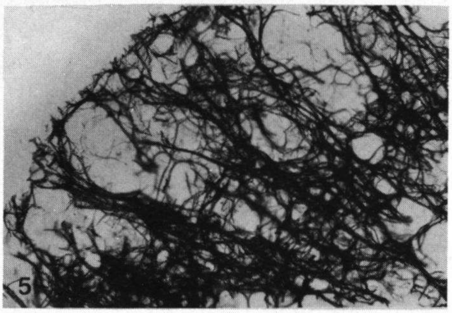

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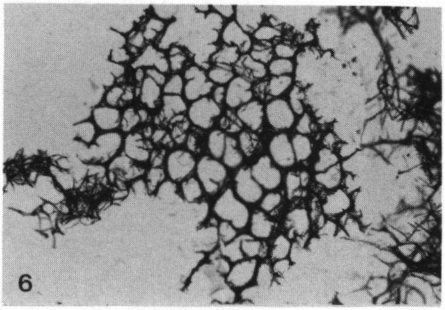

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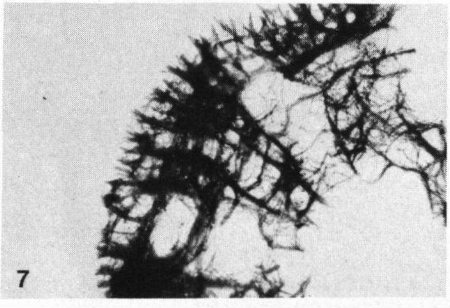

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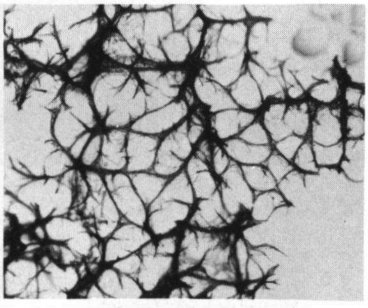

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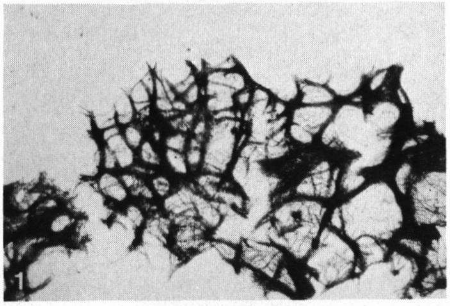
PLATE XVI

Microphotographs of Haplosclerid skeletal plans.

1. Cross section of choanosome of *Niphates alba* n.sp. (× 10)
2. Cross section of choanosome of *Niphates amorpha* Wiedenmayer, 1977 (× 10)
3. Cross section of choanosome of *Cribrochalina infundibulum* Schmidt, 1870, type species of *Cribrochalina* (× 10)
4. Cross section of choanosome of *Cribrochalina spiculosa* (Dendy, 1887) (× 10)
5. Ectosome of *Cribrochalina spiculosa* (× 10)
6. Cross section of choanosome of *Gelliodes fibulatus* (Carter, 1881), type species of *Gelliodes* (× 10)
7. Ectosome of *Callyspongia (Spinosella) vaginalis* (Lamarck, 1814) (× 15)
8. Ectosome of *Callyspongia (Callyspongia) pallida* Hechtel, 1965 (× 15)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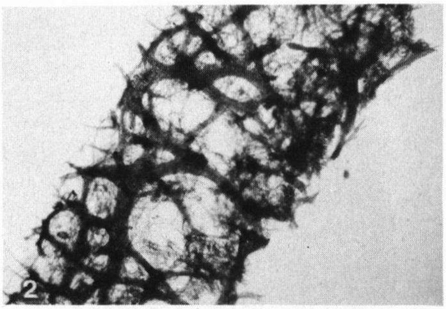
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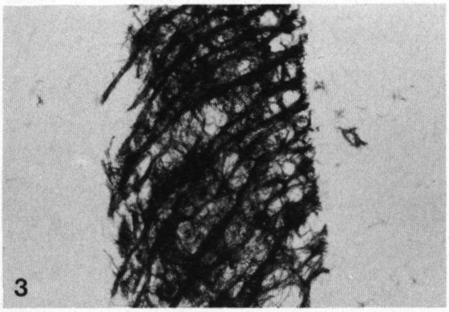
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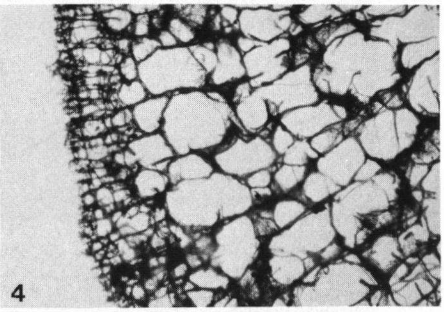
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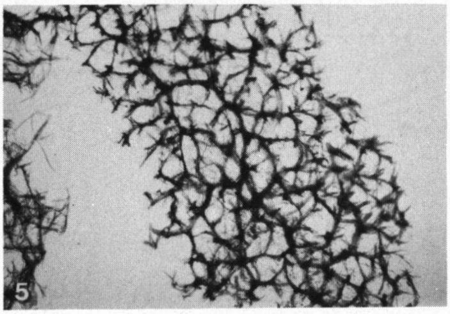
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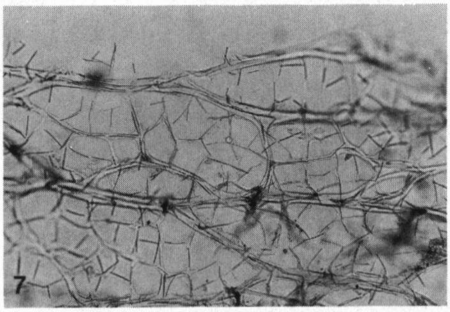
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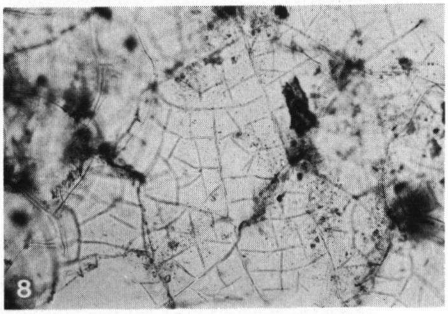
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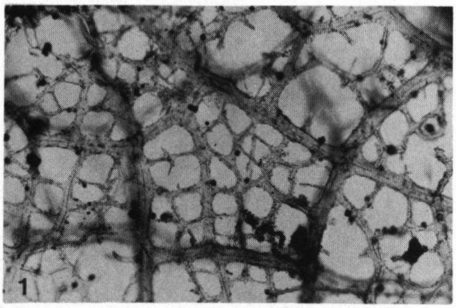
PLATE XVII

Microphotographs of Haplosclerid skeletal plans.

1. Ectosome of *Callyspongia (Callyspongia) eschrichti* (Duch. & Mich., 1864) (× 15)
2. Ectosome of *Dactylia ceratosa* (Dendy, 1887) (× 25)
3. Cross section of choanosome of *Xestospongia diprosopata* De Laubenfels, 1930, type species of *Xestospongia* (× 10)
4. Cross section of *Xestospongia wiedenmayeri* n.sp. (× 5)
5. Cross section of choanosome of *Xestospongia muta* (Schmidt, 1870) (× 10)
6. Cross section of choanosome of *Xestospongia subtriangularis* (Duchassaing, 1850) (× 10)
7. Cross section of choanosome of *Petrosia weinbergi* n.sp. (× 10)
8. Ectosome of *Strongylophora hartmani* n. sp. (× 5)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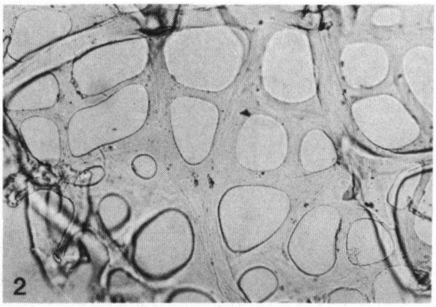
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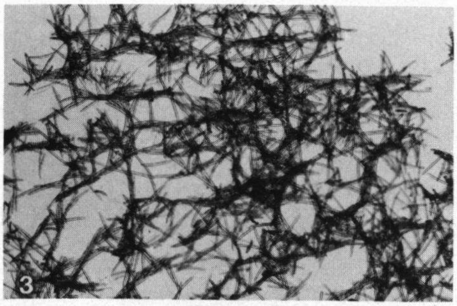
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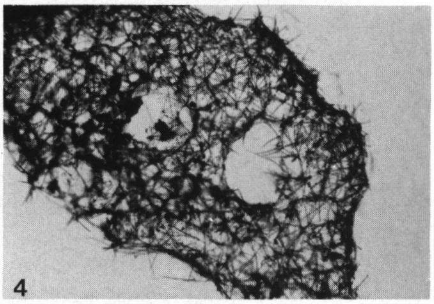
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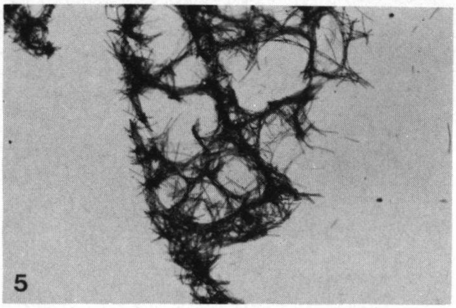
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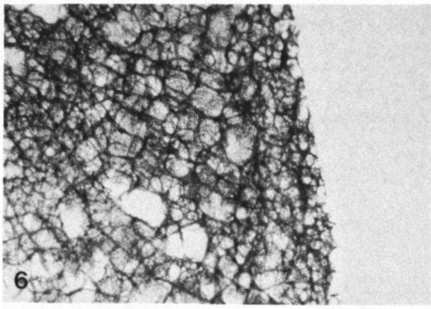
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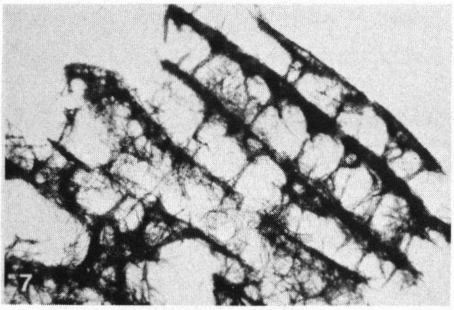
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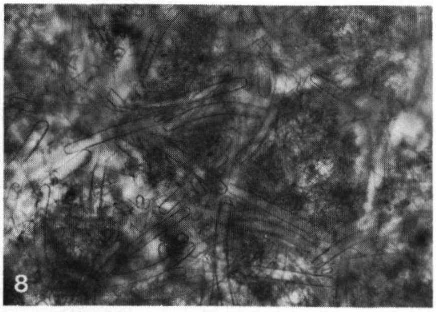
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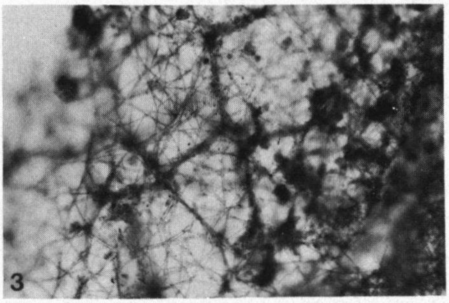
PLATE XVIII

Microphotographs of Haplosclerid skeletal plans.

1. Ectosome of *"Haliclona" pellasarca* De Laubenfels, 1934 (× 150)
2. Cross section of choanosome and fistule base of *Pellina nodosa* (George & Wilson, 1919) (× 10)
3. Ectosome of *Pellina nodosa* – basal part (× 15)
4. Ectosome of *Oceanapia bartschi* (De Laubenfels, 1934) (× 15)
5. Cross section of choanosome of *Oceanapia oleracea* (Schmidt, 1870) (× 10)
6. Ectosome of *Calyx nicaensis* (Risso, 1826), type species of *Calyx* (× 5)

1

2



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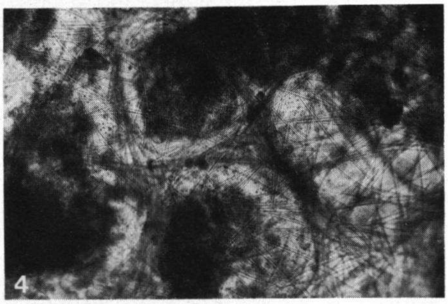

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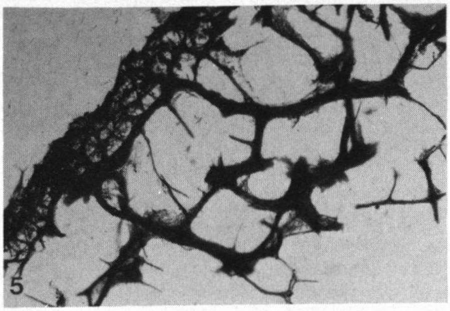

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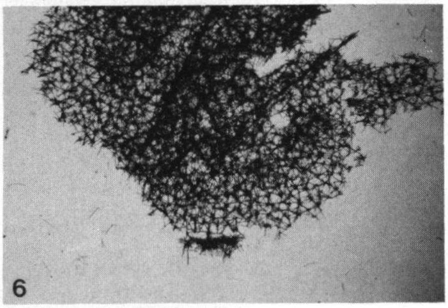

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