

BEAUFORTIA

BULLETIN ZOOLOGICAL MUSEUM

UNIVERSITY OF AMSTERDAM

Vol. 50, no. 1

October 18, 2000

A MONOGRAPH OF THE SHALLOW-WATER CHALINIDAE (PORIFERA, HAPLOSCLERIDA) OF THE CARIBBEAN

WALLIE H. DE WEERDT

*Institute for Biodiversity and Ecosystem Dynamics (Zoological Museum), University of Amsterdam,
P.O. Box 94766, 1090 GT Amsterdam, The Netherlands*

Key words: Porifera, Demospongiae, Haplosclerida, Chalinidae, Caribbean, monograph

ABSTRACT

All known species of the sponge family Chalinidae (Demospongiae, Haplosclerida) occurring in the shallower part of the Caribbean are described and taxonomically revised. The study is the result of collecting activities of the author and others throughout the Caribbean, and examination of type and other material in museums and institutes. In a previous revision of north-eastern Atlantic Chalinidae (De Weerd, 1986, 1989), the family was subdivided into eight monophyletic species groups, with various states of the skeletal architecture as main synapomorphous (shared derived) characters. After examination of all available type species of the nominal genera of the family, the species groups are now given proper names, replacing the tentative names in the earlier publications. These are the genus *Haliclona* Grant, 1835, with the nominotypical subgenus *Haliclona* for the 'oculata' group, subgenus *Reniera* Schmidt, 1862 for the 'aqueductus' group, subgenus *Soestella* n. subg. for the 'arenata' group, subgenus *Halichoelona* De Laubenfels, 1932 for the 'fistulosa' group, subgenus *Rhizoniera* Griessinger, 1971 for the 'rosea' group, subgenus *Gellius* Gray, 1867 for the 'angulata' group, the genus *Chalinula* Schmidt, 1868 for the 'Acervochalina' group, and genus *Dendroxea* Griessinger, 1971 for the 'Dendroxea' group. Twenty-three valid shallow-water species are recognized, seven of which are here described as new: *Haliclona* (*Reniera*) *ruetzleri* n.sp., *Haliclona* (*Soestella*) *lehmerti* n.sp., *Haliclona* (*Soestella*) *luciensis* n.sp., *Haliclona* (*Soestella*) *smithae* n.sp., *Haliclona* (*Soestella*) *vermeuleni* n.sp., *Haliclona* (*Halichoelona*) *stoneae* n.sp., and *Chalinula* *zeae* n.sp.

CONTENTS

Abstract	1	Genus <i>Haliclona</i>	6
Introduction	2	Subgenus <i>Haliclona</i>	6
Materials and methods	3	Subgenus <i>Reniera</i>	7
The genera and subgenera of the Chalinidae..	6	Subgenus <i>Soestella</i> n. subg.	7
		Subgenus <i>Halichoelona</i>	8
		Subgenus <i>Gellius</i>	9

Subgenus <i>Rhizoniera</i>	10
Genus <i>Chalinula</i>	10
Genus <i>Dendroxea</i>	13
Genus <i>Cladocroce</i>	13
Key to the genera of the Chalinidae	13
Key to the subgenera of the Chalinidae	13
Species of the subgenus <i>Haliclona</i>	15
Species of the subgenus <i>Reniera</i>	17
Key to the species of the subgenus <i>Reniera</i>	28
Species of the subgenus <i>Soestella</i> n.subg.	29
Key to the species of the subgenus <i>Soestella</i>	44
Species of the subgenus <i>Halichoelona</i>	45
Key to the species of the subgenus <i>Halichoelona</i> ..	51
Species of the subgenus <i>Gellius</i>	52
Species of the subgenus <i>Rhizoniera</i>	55
Species of the genus <i>Chalinula</i>	55
Key to the species of the genus <i>Chalinula</i>	62
Additional records of Caribbean Chalinidae ...	63
Acknowledgements	64
References	64

INTRODUCTION

The marine sponge family Chalinidae Gray, 1867 (order Haplosclerida) has a world-wide distribution with possibly more than 150 extant species living in all parts of the seas. It belongs to one of the most difficult sponge groups for systematic studies because of the scarcity, simplicity and sometimes high variability of taxonomic characters. Many species have been described in the past which turned out to be variations of one and the same species (see De Weerd, 1986, for an example of north-eastern Atlantic chalinids), whilst at the same time new species are continuously being discovered (e.g., Boury-Esnault & Lopes, 1985; De Weerd et al., 1991; Mothes & Lerner, 1994; Fromont, 1995; Lehnert & Van Soest, 1996; Muricy & Ribeiro, 1999; De Weerd et al., 1991, 1999; Zea & De Weerd, 1999). Because the family has such a wide distribution, it is a good subject for phylogenetic and biogeographic studies, despite the simplicity of the characters of its species (De Weerd, 1989, 1991; see also Humphries & Parenti, 1999). A sound systematic basis at the species level is, however, a first requirement for such studies, which is further urged by the occurrence in some species of chemical substances with promising biomedical prop-

erties (e.g., Devijver et al., 2000).

Recent taxonomic studies of chalinid species are all based on restricted geographic areas: Griessinger (1971, Mediterranean), Bergquist & Warner (1980, New Zealand), Van Soest (1980, Caribbean), De Weerd (1986, north-eastern Atlantic) and Fromont (1993, Great Barrier Reef). The present paper is a taxonomic revision of all the shallow-water species presently known from the Caribbean, and thus again restricted to one particular area. This is justified because revision of the family on a world-wide basis is still beyond present possibilities and the majority of chalinid species show a distribution pattern following the generally recognized marine faunal areas of endemism (Ekman, 1953; Briggs, 1974; Van Soest, 1994). The name Caribbean is here used in a wide sense for the area in the Central West Atlantic reaching from Cape Hatteras (North Carolina) in the north to Trinidad in the south, including Bermuda.

The study has resulted in the recognition of 23 valid species, a number considerably in excess to the number of species described by Van Soest (1980). Seven species are here described as new, other species have been described in foregoing publications (De Weerd et al., 1991; 1999; Zea & De Weerd, 1999). Despite extensive collecting activities by the present author and many others (including two expeditions to the Lesser Antilles by the Harbor Branch Oceanographic Institute, Florida) some species were found only in one locality, whilst others were recollected far from the place of the original description. Because the Caribbean comprise such a vast area with so many islands with different habitats, and a complex geographic history (e.g., Rosen, 1976), I refrain in some cases from making statements about the distribution patterns of these rare species. Keys to the species are provided, based on morphological characters and, where possible, on characters of the living sponges.

The history of the Chalinidae is reviewed in De Weerd (1986), who considered the Renicidae Schmidt, 1870, Haliclonidae De Laubenfels, 1932, Gelliidae Gray, 1872 and Adocidae De Laubenfels, 1936a as junior synonyms of the Chalinidae. Within these families over 25 nominal genera have been described in the past, but most of these are either based on varieties of the

same species, like *Diplodemia* Bowerbank, 1864, and *Veluspa* Miklucho-Maclay, 1870, created for species which are not different from *Haliclona oculata* (Pallas, 1766), or on so-called primitive characters which do not give information about the phylogenetic relations of the genera. Examples of these are the genera *Gellius* Gray, 1867, for the presence of sigmas, *Rhaphisia* Topsent, 1892b, for the presence of raphides, *Toxadocia* De Laubenfels, 1936a, for the presence of an ectosomal skeleton and toxas, and *Toxiclona* De Laubenfels, 1954, for the absence of an ectosomal skeleton and presence of toxas. As has already been discussed by Van Soest (1990) these characters do not necessarily have phylogenetic value at every taxonomic level: a tangential ectosomal skeleton and the above mentioned microscleres occur throughout the Haplosclerida, and are thus not inherited from the most recent common ancestor of species within the Chalinidae. Although they can be used to key out species, these characters are uninformative of phylogenetic relationships.

As a result of a phylogenetic analysis of north-eastern Atlantic chalinid species (De Weerd, 1989, 1991), based on morphological characters with emphasis on the choanosomal skeletal architecture, only eight species groups were recognized, and hypothesized to represent monophyletic units. Pending study of all available type species of the described genera and material from elsewhere these groups were given tentative names, like the 'oculata' group for species with a very regular, ladder-like choanosomal skeleton. In the present paper the eight species groups are given generic and subgeneric names, most of which are names already in use. The genera and subgenera are given amended definitions and a key is provided. Except for *Dendroxea*, which is so far only known from the Mediterranean and Azores, all the genera and subgenera are represented in the Caribbean, though in different numbers. Of each genus/subgenus the north-eastern Atlantic members are listed.

MATERIALS AND METHODS

Sponges were collected by the author by snorkeling, wading and SCUBA-diving during the following expeditions and field trips: in 1988 during

a field trip to Belize; in 1989 during two expeditions to the Lesser Antilles by the Harbor Branch Oceanographic Institution (HBOI), Division of Biomedical Research, Florida, with R/V Seward Johnson; in 1989 during two field trips to the Florida Keys and Los Roques Islands (Venezuela), and in 1990 during two field trips to Puerto Rico and San Salvador (Bahamas). In addition, material was obtained from the collecting activities of the HBOI (several localities), S. Zea (Colombia), H. Lehnert (Jamaica), K. Rützler and K. Smith (Belize), R.W.M. van Soest (Curaçao, Belize, Colombia), and J. Vermeulen (e.g., St. Croix, Trinidad, Grenada).

Type and other material has been studied in the National Museum of Natural History (NMNH), Washington D.C.; the Zoological Museum Amsterdam (ZMA), University of Amsterdam; the Peabody Museum of Natural History, Yale University (YPM), New Haven; the Harbor Branch Oceanographic Institution, Division of Biomedical Research (HBOI/BMR), Florida; the Natural History Museum, London (specimens catalogued under numbers of the British Museum of Natural History (BMNH)); the Muséum National d'Histoire Naturelle (MNHN), Paris; and the Fundación Científica Los Roques (FCLR), Venezuela. Fragments of types or other material were further obtained from the Museum of Natural History of Genova (MSNG), Italy; Station Marine d'Endoume, Marseille (SME), France; Universidade Federal do Rio de Janeiro (UFRJ), Brazil; and the Museu de Ciências Naturais (MCN), Porto Alegre, Brazil.

The material is preserved in 70% ethylalcohol and housed in the sponge collection of the NMNH, catalogued under numbers of the United States National Museum (USNM), and in the collection of the Zoological Museum Amsterdam (catalogued under numbers of ZMA Por.).

The species descriptions are based on the following morphological characters: shape and size of the sponges, colour, consistency, surface, skeletal architecture, and shape and size of the spicula. The techniques applied for study of the skeletal architecture and spicula is the same as described in De Weerd et al. (1999). Spicula sizes are based on measurements of 25 fully developed

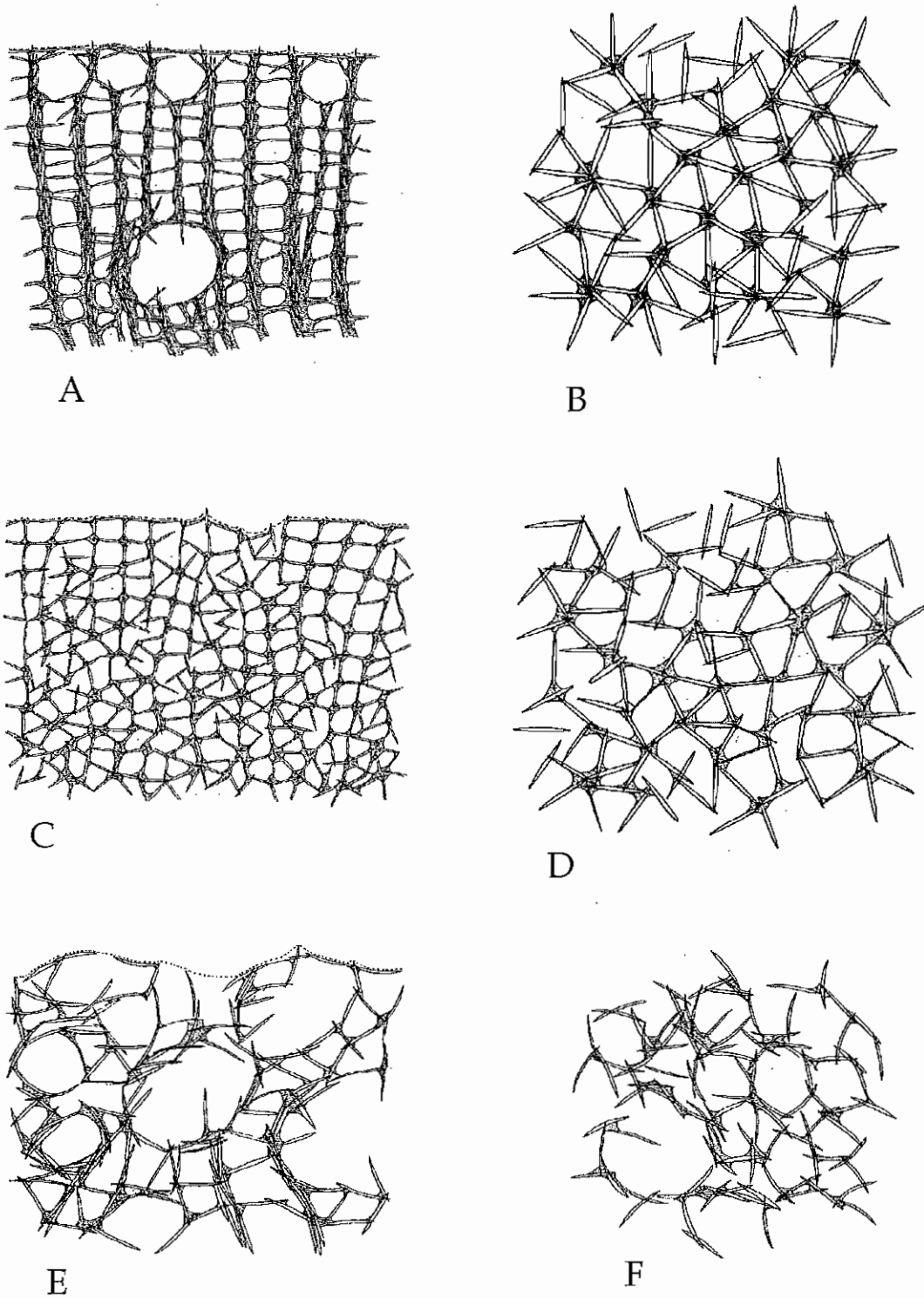
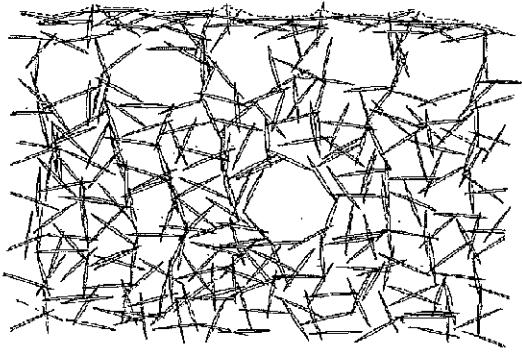
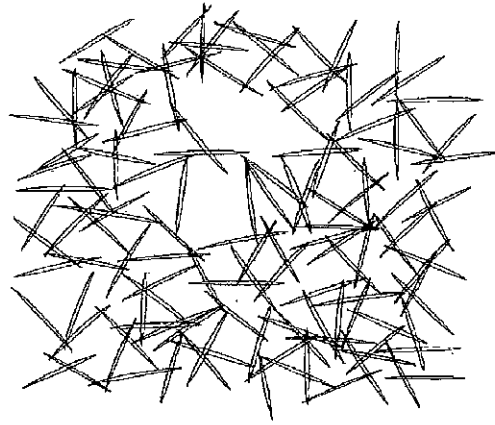


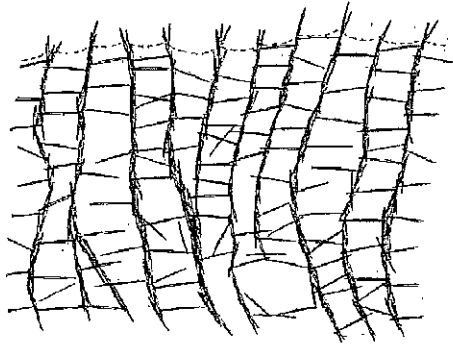
Fig. 1. Skeletal architectures of the genera/subgenera within the Chalinidae. A, subgenus *Haliclona*, choanosomal skeleton. B, tangential view of ectosome. C, subgenus *Reniera*, choanosomal skeleton. D, tangential view of ectosome. E, subgenus *Soestella*, choanosomal skeleton. F, tangential view of ectosome. G, subgenus *Halichoelona*, choanosomal skeleton. H, tangential view of ectosome. I, subgenus *Rhizoniera*, choanosomal skeleton. J, subgenus *Gellius*, choanosomal skeleton. K, genus *Chalinula*, choanosomal skeleton. L, genus *Dendroxea*, choanosomal skeleton.



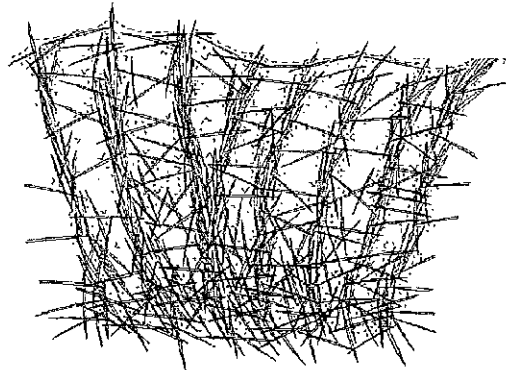
G



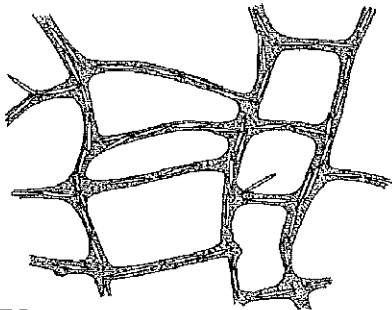
H



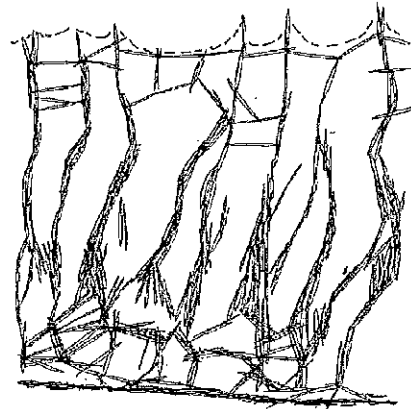
I



J



K



L

Fig. 1. Continued.

spicula in each specimen. Measurements are given in range (mean \pm s.d. in parentheses).

THE GENERA AND SUBGENERA OF THE CHALINIDAE

Phylum Porifera Grant
Class Demospongiae Sollas
Order Haplosclerida Topsent
FAMILY CHALINIDAE GRAY, 1867

DEFINITION. - Haplosclerida with a delicate reticulated choanosomal skeleton of uni-, pauci- or multispicular primary lines, which are regularly connected by uni- or paucispicular secondary lines. Ectosomal skeleton, if present, a unispicular, tangential reticulation.

GENUS *HALICLONA* GRANT, 1835

DEFINITION. - Chalinidac with unispicular secondary lines.

SUBGENUS *HALICLONA* GRANT, 1835

SUMMARIZED SYNONYMY. - *Chalina* Grant, 1861; *Adocia* Gray, 1867; *Diplodemia* Bowerbank, 1864; *Veluspa* Miklucho-Maclay, 1870; *Euchalinopsis* Lendenfeld, 1887; *Toxiclona* De Laubenfels, 1954; 'oculata' group (De Weerd, 1986).

DEFINITION (Figs. 1A, B). - Choanosomal skeleton consisting of a very regular, ladder-like reticulation of uni- paucispicular primary lines, regularly connected by unispicular secondary lines. Ectosomal skeleton, if present, a unispicular, tangential, isotropic reticulation. Oxeas short, rather robust, fusiform or with acerated points. Spongin moderate to abundant. Microscleres, may be present and are, if present, toxas.

TYPE SPECIES. - *Spongia oculata* Pallas, 1766, by original designation. Material examined: several specimens in the BMNH labeled "*Chalina oculata*", among which BMNH 1841.1.13.46, with the label (probably by Ridley): "*Chalina oculata* (Pallas), Type? (History to be investigated)". The drawing of the skeleton in Bowerbank, 1864, Pl. XIII fig. 262, and the figured specimen and oxeas of Bowerbank, 1874, Pl. LXVI figs. 1-3 conform

to *Haliclona* (*H.*) *oculata*. For further material and synonymy see De Weerd, 1986: 83.

SYNONYMS

Chalina Grant, 1861. Nomen nudum.

Adocia Gray, 1867. Type species: *Isodictya simulans*; Bowerbank, 1866, by original designation. Material examined: BMNH 1932.1.5.2a, *Isodictya simulans*, Hastings, figured specimen of Bowerbank, 1874, Pl. LI fig. 5.

Diplodemia Bowerbank, 1864. Type species: *Diplodemia vesicula* Bowerbank, 1864, by monotypy. Material examined: BMNH 1877.5.21.2082, *Diplodemia vesicula*, Shetlands, figured specimen of Bowerbank, 1874, Pl. LXX fig. 12 (= *Haliclona* (*Haliclona*) *oculata*, cf. De Weerd, 1986).

Veluspa Miklucho-Maclay, 1870. Type species: *Veluspa polymorpha* var. *gracilis* Miklucho-Maclay, 1870: 5, figs. 1-2, by original designation. No material examined. The description and figures conform entirely to *H.* (*H.*) *oculata*.

Euchalinopsis Von Lendenfeld, 1887. Type species: *Chalina oculata* (Bowerbank, 1864), by subsequent designation of Burton 1934a (objective synonym). Material examined: see above.

Toxiclona De Laubenfels, 1954. Type species: *Siphonochalina gaussiana* Hentschel, 1914, by original designation. No material examined, but the NMNH holds several specimens of this species in the United States Antarctic Research Program (USARP), presently on loan to ZMA. 'oculata' group of De Weerd (1986, 1989).

Other North Atlantic species assigned to the subgenus *Haliclona*: *Haliclona laevis* (Griessinger, 1971, as *Adocia*), Mediterranean, holotype, MNHN DJMG 12 examined; *Haliclona reptans* (Griessinger, 1971, as *Adocia*), Mediterranean, holotype, MNHN DJMG 7 examined; *Haliclona simulans* (Johnston, 1842, as *Halichondria*), Mediterranean-Atlantic, see De Weerd, 1986; *Haliclona urceolus* (Rathke & Vahl [in] Müller, 1806, as *Spongia*), Arctic, East Boreal, see De Weerd, 1986; *Haliclona varia* (Sarà, 1958, as *Adocia*), Mediterranean, see Griessinger, 1971; *Haliclona venata* (Sarà, 1960, as *Adocia*), Mediterranean, see Griessinger, 1971).

Species of the Caribbean: *Haliclona* (*Haliclona*) *epi-*

phytica Zea & De Weerd, 1999.

SUBGENUS *RENIERA* SCHMIDT, 1862

SUMMARIZED SYNONYMY. - *Philotia* Gray, 1867; *Toxadocia* De Laubenfels, 1936; *Reniclona* De Laubenfels, 1954; *Kallypilidion* De Laubenfels, 1954; 'aquaeductus' group (De Weerd, 1986).

TYPE SPECIES. - *Reniera aquaeductus* Schmidt, 1862: 73, Pl. VII, figs. 6, 6a, 6b (by subsequent designation of De Laubenfels, 1932: 61). Holotype: unknown. Material examined: BMNH 1867.7.26.47a (dry), one of Schmidt's specimens from the type locality, Sebenico, Adriatic.

DEFINITION (Figs. 1C-D). - Chalinidae with a choanosomal skeleton consisting of a delicate, regular, unispicular, isotropic reticulation. Ectosomal skeleton, if present, also a tangential, unispicular, isotropic, very regular and continuous reticulation. Spongin always present at the nodes of the spicula, but never abundant. Oxes frequently blunt-pointed or strongylote. Microscleres, if present, toxas and sigmas. Sponges commonly soft and fragile.

SYNONYMS

Philotia Gray, 1867. Type species: *Isodictya varians* Bowerbank, 1866, by original designation. Material examined: BMNH 1847.9.7.42, figured specimen of Bowerbank, 1874, Pl. XLVI-II, figs. 14-16 [= *Haliclona (Reniera) cinerea* (Grant, 1826)]. [Non: BMNH 1877.5.21.2083, nor the figured specimen of Bowerbank, 1874, Pl. LXXXVIII figs. 1-6 = *Haliclona (Haliclona) oculata* Pallas, 1766].

Toxadocia De Laubenfels, 1936a. Type species: *Gellius abbreviatus* Topsent, 1918: 538, by original designation. Material examined: MNHN D.T.2057, two microscopic slides, labeled: "Type, Praia das Conchas, 3.8.1906, Det. E.T., Descr. E.T., Arch. Zool. 1918, 57, p. 538-540".

Reniclona De Laubenfels, 1954. Type species: *Isodictya permollis* Bowerbank, 1866, by original designation. Junior synonym of *Haliclona (Reniera) cinerea* (Grant, 1826, as *Spongia*, cf. De Weerd, 1986, and De Weerd & Stone [in] De Weerd, 1987). Material examined: BMNH 1932.1.5.11, BC, Scarborough, Great Britain,

figured specimen of Bowerbank, 1874, pl. XLVIII figs. 9, 10; BMNH 1910.1.1.321, *Isodictya permollis*, NC, Strangford Lough, Great Britain, cf. Bowerbank, 1874: 123; BMNH 1877.5.21.2049, *Isodictya permollis*, Pentland Firth, Great Britain; BMNH 1877.5.21.2050, *Isodictya permollis*, BC, Peterhead, Great Britain; BMNH 1877.5.21.2051, *Isodictya permollis*, Scarborough.

Kallypilidion De Laubenfels, 1954: 110. Type species: *Kallypilidion poseidon* De Laubenfels, 1954, by original designation. Material examined: USNM 23121, holotype, Palau Islands, Sta. M503. Junior synonym of *Siphonochalina fascigera* Hentschel, 1912: 398, pl. XVI fig. 3. No original material examined; several specimens in the ZMA collection.

'aquaeductus' group of De Weerd (1986, 1989; De Weerd et al., 1991).

Other North Atlantic species assigned to the subgenus *Reniera*: *Haliclona cinerea* (Grant, 1826, as *Spongia*), Mediterranean-Atlantic, cf. De Weerd, 1986; *H. citrina* (Topsent, 1892b, as *Reniera*), Mediterranean-Atlantic, see Griessinger, 1971, also specimens in the ZMA collection; *H. cratera* (Schmidt, 1862, as *Reniera*), Mediterranean-Atlantic, see Griessinger, 1971; De Weerd & Van Soest, 1986; Van Lent & De Weerd, 1987; several specimens in the ZMA collection; *H. griessingeri* Van Lent & De Weerd, 1987, Mediterranean, holotype ZMA Por. 6070; *H. mediterranea* Griessinger, 1971, Mediterranean-Atlantic, holotype, MNHN DJMG 8 examined, see also Van Lent & De Weerd, 1987; specimens in the ZMA collection; *H. neens* (Topsent, 1918, as *Reniera*), Azores, West Africa, see De Weerd & Van Soest, 1986; *H. primitiva* (Lundbeck, 1902, as *Gellius*), Arctic, see De Weerd, 1986; *H. subtilis* Griessinger, 1971, Mediterranean; holotype, MNHN DJMG 2 examined.

Caribbean species: *Haliclona (Reniera) implexiformis* (Hechtel); *H. (R.) manglaris* (Alcolado); *H. (R.) mucifibrosa* De Weerd et al.; *H. (R.) ruetzleri* n. sp.; *H. (R.) tubifera* (George & Wilson).

SUBGENUS *SOESTELLA* NEW SUBGENUS

DEFINITION (Figs. 1E-F). - Chalinidae with a sub-

anisotropic choanosomal skeleton consisting of ill-defined paucispicular primary lines, irregularly connected by paucispicular secondary lines. There is a slight but consistent tendency of the spicula to form rounded meshes. Ectosomal skeleton a discontinuous, tangential, rather open reticulation, due to many rounded meshes framed by spicula lines of 2-5 spicula thick. Spongin always present at the nodes of spicula, but never abundant. Oxeas usually slender. Microscleres, if present, sigmas, toxas or rhabdites.

ETYMOLOGY. - Named after Dr Rob W.M. van Soest for his dedication and contributions to the higher classification of sponges.

TYPE SPECIES. - *Reniera mamillata* Griessinger, 1971. Material examined: holotype, MNHN DJMG 4, Mediterranean, and specimens in ZMA (cf. Van Lent & De Weerd, 1987).

REMARKS. - Griessinger (1971) distinguished within the genus *Reniera* three groups of species which he named "*Reniera* du type *R. aquaeductus*", "du type *R. arenata*" and "du type *R. fulva*". All species assigned to the '*arenata*' group, among which *R. mamillata*, and most species assigned to the '*fulva*' group, show a high resemblance in skeletal architecture (see also Griessinger, l.c., figs. 5a-d, 8d2) conforming the above given definition of *Soestella*, which clearly sets this group of species apart from the other chalinids. Van Soest's (1980) emended definition of *Reniera*: "Halicionidae with an irregular ectosomal tangential spiculation supporting the exopinacoderm" is somewhat vague but he had this group of species in mind (Van Soest, pers. comm.). Van Soest (l.c.) placed three Caribbean species in *Reniera*. Of these, *Reniera curacaoensis* is transferred to the subgenus *Rhizoniera* (see below), whilst the new species *Reniera carmabi* is considered a synonym of *Chalinula molitba* (De Laubenfels, 1949, see below). Van Soest's record of *Reniera tubifera* George & Wilson, 1919, does not conform to *Haliclona* (*Reniera*) *tubifera*, but is a new species, *Haliclona* (*Soestella*) *vermeuleni* n.sp. (see below).

Soestella is here introduced for the so-called '*arenata*' group of De Weerd (1986, 1989; De Weerd et al., 1991), for which no name was available. *Reniera mamillata* is chosen as type species because

the holotype of this species is present in the MNHN and could be studied through the courtesy of Dr C. Lévi and Dr N. Boury-Esnault.

Other North Atlantic species assigned to the subgenus *Soestella*: *Haliclona arenata* (Griessinger, 1971, as *Reniera*), Mediterranean; *Haliclona implexa* (Schmidt, 1868, as *Reniera*), Mediterranean, Canary Islands; *Haliclona mucosa* (Griessinger, 1971, as *Reniera*), Mediterranean, holotype, MNHN DJMG 5 examined; *Haliclona valliculata* (Griessinger, 1971, as *Reniera*), Mediterranean, Azores, Canary Islands, holotype, MNHN DJMG 3 examined.

Caribbean species: *Haliclona* (*Soestella*) *caerulea* (Hechtel), *H. (S.) lehmeri* n.sp., *H. (S.) luciensis* n.sp., *H. (S.) melana* Muricy & Ribeiro, *H. (S.) piscaderaensis* (Van Soest); *H. (S.) smithae* n.sp., *H. (S.) twincayensis* De Weerd et al.; *H. (S.) vermeuleni* n.sp.

SUBGENUS *HALICHOCLONA* DE LAUBENFELS, 1932

Halichoclona; De Weerd et al., 1999: 49.

SUMMARIZED SYNONYMY. - *Neoadocia* De Laubenfels, 1950b; *Pellina* of authors (not Schmidt, 1870); '*fistulosa*' group (De Weerd, 1986).

TYPE SPECIES. - *Halichoclona gellindra* De Laubenfels, 1932, by monotypy. Material examined: USNM 22063, holotype, California.

DEFINITION (Figs. 1G, H). - Chalinidae with a choanosomal skeleton consisting of a subisotropic, somewhat confused reticulation, commonly intersected by many choanosomal spaces. Ectosomal skeleton of the same structure as the choanosome, usually very loosely overlaying the choanosome, from which it may be separated by extensive subectosomal spaces. Spongin absent or very scarce, at the nodes of the spicula. Megascleres usually acerate or hastate oxeas. Microscleres, if present, microxeas or sigmas. Sponges commonly somewhat crisp and brittle, only slightly compressible

SYNONYMS

Neoadocia De Laubenfels, 1950b. Type species:

Neoadocia mokuoloea De Laubenfels, 1950b, by original designation. Material examined: USNM 22745, holotype, Hawaii. 'fistulosa' group of De Weerd (1986, 1989; De Weerd et al., 1991).

REMARKS. - Griessinger (1971) used the name *Pellina* Schmidt, 1870 for sponges with a crisp, fragile consistency, large ectosomal spaces and a dense, irregularly meshed choanosome. He placed *Spongia semitubulosa* Lieberkühn, 1859 in this genus, together with the Mediterranean-Atlantic *Isodictya fistulosa* Bowerbank, 1866, *Reniera magna* Vacelet, 1969, and *Reniera parietalis* Topsent, 1893. Van Soest (1980) transferred *Pellina* to his new family Oceanapiidae and used the genus for fistule bearing sponges with a simple spicule complement of small oxcote megascleres. Van Soest & Sass (1981) listed the species which they considered to belong to *Pellina*, including *P. fistulosa*, which was reassigned to *Haliclona* by De Weerd (1986). In 1986 (l.c.) I reviewed the history of the genus *Pellina* and concluded that it is a synonym of *Halichondria* Fleming, 1828. It is obvious that the name *Pellina* cannot be used for haplosclerid sponges anymore.

North Atlantic species assigned to the subgenus *Halichoclona*: *Haliclona fistulosa* (Bowerbank, 1866, as *Isodictya*), Borcal East Atlantic, see De Weerd, 1986; *H. fulva* (Topsent, 1893, as *Reniera*), Mediterranean-Atlantic, see Griessinger, 1971; *H. magna* (Vacelet, 1969, as *Reniera*), Mediterranean; *H. perlucida* (Griessinger, 1971, as *Reniera*), Mediterranean, Azores, Canary Islands, holotype, MNHN DJMG 9 examined; *H. semitubulosa* sensu Topsent (1925b, as *Pellina*) and Griessinger (1971, as *Pellina*), Mediterranean, cf De Weerd, 1986).

Caribbean species: *Haliclona (Halichoclona) albifragilis* (Hechtel), *H. (Halich.) magnifica* De Weerd et al., *H. (Halich.) vansoesti* De Weerd et al., *H. (Halich.) stoneae* n.sp.

SUBGENUS GELLIUS GRAY, 1867

SUMMARIZED SYNONYMY. - *Orina* Gray, 1867; *Asychis* Gray, 1867; *Rhaphisia* Topsent, 1892b; 'angulata' group (De Weerd, 1986).

DEFINITION (Fig. 1J). - Chalinidae with a choanosomal skeleton consisting of a rather confused, subhalichondroid reticulation of pauci-multispicular primary lines, irregularly connected by unispicular secondary lines. Ectosomal skeleton, if present, either a regular, tangential, unispicular, isotropic reticulation, or consisting of irregularly strewn, tangentially orientated spicula. Spongin scarce or absent. Oxeas commonly robust needles. Microscleres, if present, toxas, sigmas or raphides or a combination of these.

TYPE SPECIES. - *Isodictya jugosa* Bowerbank, 1866, by original designation [= *Haliclona (G.) fibulata* (Schmidt, 1862), cf. De Weerd, 1986]. Material examined: BMNH 1910.1.1.294, holotype *Isodictya jugosa*, Shetland, figured specimen of Bowerbank, 1874, Pl. L fig. 11, designated as the type by Bowerbank on p. 128 of the same volume.

SYNONYMS

Orina Gray, 1867. Type species: *Halichondria angulata* Bowerbank, 1866, by original designation. Material examined: BMNH 1910.1.1.173, holotype *Halichondria angulata*, Guernsey, figured specimen of Bowerbank, 1874, pl. XLI fig. 4, designated as the type by Bowerbank on p.101 of the same volume.

Asychis Gray, 1867. Type species: *Reniera fibulata* Schmidt, 1862, by original designation. No original material examined, but see Topsent, 1925b and De Weerd, 1986)

Rhaphisia Topsent, 1892. Type species: *Rhaphisia laxa* Topsent, 1892b, by monotypy. Material examined: MNHN DT 300 (one microscope slide, labeled "Type", Banyuls), DT 299 (two microscope slides, Banyuls).

'angulata' group of De Weerd (1986, 1989).

Other north-eastern Atlantic species assigned to the subgenus *Gellius*: *Haliclona binaria* (Topsent, 1927, as *Gellius*), Azores, Canary Islands, material examined: MNHN DT 1271, two microscope slides labeled "Type", Azores; *Haliclona lacazei* (Topsent, 1893, as *Gellius*), Mediterranean, West Africa, no original material examined.

Caribbean species: *Haliclona (Gellius) tenerrima* Burton.

SUBGENUS *RHIZONIERA* GRIESSINGER, 1971

TYPE SPECIES. - *Reniera rhizophora* Vaccllet, 1969, by monotypy. Material examined: MNHN JV 68-13, holotype.

DEFINITION (Fig. 1I). - Chalinidae with an anisotropic, ladder-like choanosomal skeleton consisting of pauci-multispicular ascending primary lines, connected by unispicular secondary lines. Ectosomal skeleton usually absent, if present, consisting only of some vaguely strewn tangentially orientated oxes. Spongin scarce or absent. Megascleres usually slender oxes with accrated points. No microscleres. Consistency soft to moderately firm

SYNONYMS

'*rosea*' group (De Weerdt, 1986, 1989)

REMARKS. - The genus *Rhizoniera* was established for a pedunculate sponge with the stalk reinforced by thick spicular fibres. This character is considered as an autapomorphy of the species (though convergent, since stalked sponges occur throughout the phylum). The rest of the skeleton is the same as in the other species assigned to this subgenus. Because there are no other genera described with this kind of skeletal architecture, the name *Rhizoniera*, though perhaps not the most appropriate, is the only one available.

North Atlantic species assigned to the subgenus *Rhizoniera*: *Haliclona canaliculata* Hartman, 1958, North America, holotype, YPM 2017 examined; *H. grossa* (Schmidt, 1864, as *Reniera*), Mediterranean, see Griessinger, 1971; *H. indistincta* (Bowerbank, 1866, as *Isodictya*), north-eastern Atlantic, see De Weerdt, 1986; *H. rosea* (Bowerbank, 1866, as *Isodictya*), Arctic-Boreal, see De Weerdt, 1986; *H. sarai* (Pulitzer-Finali, 1969, as *Reniera*), Mediterranean, see Griessinger, 1971; *H. viscosa* (Topsent, 1888, as *Reniera*), north-eastern Atlantic, see De Weerdt, 1986.

Caribbean species: *Haliclona (Rhizoniera) curacaoensis* Van Soest, 1980

GENUS *CHALINULA* SCHMIDT, 1868

Chalinula; Griessinger, 1971: 122; Boury-Esnault & Lopes, 1985: 198

SUMMARIZED SYNONYMY. - *Acervochalina* Ridley, 1884; *Phylosiphonia* Lendenfeld, 1887; *Chalinodendron* Lendenfeld, 1887; *Nara* De Laubenfels, 1954; *Katiba* De laubenfels, 1954; *Acervochalina*' group (De weerdt, 1986, 1989).

TYPE SPECIES. - *Chalinula renieroides* Schmidt, 1868: 7 (by subsequent designation of De Laubenfels, 1936a: 47). Material examined: MNHN D.T.748, two microscope slides made by Topsent from Schmidt's specimen, labeled: "*Chalinula renieroides* O. Schmidt, Type, Muséum, Exp. sc.de l'Algérie". Synonym: *Chalinula fertilis* Keller, 1879: 318, pls. 18-20 (no original material examined).

DEFINITION (Fig. 1K). - Choanosomal skeleton a reticulation of primary and secondary lines; secondary lines more than one spiculum in length. Ectosomal skeleton absent. Oxes short, ranging from vestigial to cigar-shaped; a high variation in form and size may occur within the same species. Spongin usually abundant, with high variation within one species. No microscleres. Consistency spongy, elastic, or very soft and limp. Colour brown or purplish.

REMARKS. - The two MNHN slides, made by Topsent from Schmidt's specimen of *Chalinula renieroides* (cf. Topsent, 1938), contain cross-sections which show a rather regular reticulation of uni- to paucispicular primary lines, connected by secondary lines with 1-2 spicula lengthwise in a line; spongin moderate, at the nodes of the spicula, and enveloping some entire spicula or lines (Fig. 44A). The oxes are short, relatively thick, with a pronounced fusiform shape, straight or slightly curved, with long and sharp points, 81-93 by 3.3-5.4 μm . One slide contains embryo's.

The original material of *Chalinula fertilis* has not been studied, but Keller's (1879) description and figures give a good picture of the species. He described the species as tube-shaped or conical, 2-3 cm high, with oscula of 2-3 cm at the ends, the consistency very limp, the skeleton consisting of radiar spongin fibres with interconnecting lines, lined by oxes of 92-100 μm length. His fig-

ure of the skeleton (fig. 1) clearly shows that the secondary lines contain 3-4 oxeas in one line, and that the oxeas are short, thick and fusiform. He referred the name '*fertilis*' to the large number of larvae produced by the sponges.

Topsent's microscopic slides from specimens from Naples (MNHN D.T.517, D.T.2279, cf. Topsent, 1925a, as *Chalinula fertilis*) show almost the same skeletal architecture and exactly the same oxeas (size 87-99 x 4.5-5.7 μm) as *C. renieroides*; the only difference is a larger number of secondary lines consisting of more than one spiculum in length: most of them are 2-3 spicula long. In a later publication Topsent (1938) redescribed Schmidt's material and mentioned the strong resemblance of Keller's *Chalinula fertilis* with *Chalinula renieroides*. He considered them conspecific but noted also the variability in number of spicula lining the fibres.

This variability in skeletal architecture, together with Schmidt's (1868) remark: "Diese Fasern stehen meist nur um die Länge einer Nadel von einander ab,..." motivated De Weerd & Van Soest (1986) to refute *Chalinula* and to consider *C. renieroides*, as did Griessinger (l.c.), as an ill-known species, different from *C. fertilis*. They gave priority to *Acervochalina* (type species *Spongia limbata* Montagu, 1818) instead. Having seen the slides made by Topsent from Schmidt's material this view cannot be upheld anymore. Topsent's (1938) view (cf. also Pulitzer-Finali, 1978) to consider *C. fertilis* as a junior synonym of *C. renieroides* is followed here, which confirms the status of *Chalinula renieroides* as type species of *Chalinula*.

SYNONYMS

Acervochalina Ridley, 1884: 398. Type species: *Chalina limbata* Bowerbank, 1866, by original designation. Material examined: BMNH 47.9.7.88, labeled: "*Spongia limbata* Johnston, 14J. (Cf. Johnst. Brit. Sp. Pl. XIX.5), Types, Hab?, Dr. Johnston"; BMNH 1877.5.21.2086, *Chalina limbata*, BC, Cornwall, figured specimens of Bowerbank, 1874, pl. LXVII figs. 7-10. For further material, synonymy and description see De Weerd, 1986.

Phyllosiphonia Lendenfeld, 1887: 796. Type species: *Chalinula fertilis* Keller, 1879, by subsequent designation of Burton, 1934: 531). Junior synonym of *Chalinula renieroides* Schmidt, 1868 (see

above).

Chalinodendron Lendenfeld, 1887: 819. Type species: *Chalina gracilentata* Bowerbank, 1866, by subsequent designation of Burton, 1934: 530. Junior synonym of *Spongia limbata* Montagu, 1818. Material examined: BMNH 1877.5.21.2089, Torquay, holotype, figured specimen of Bowerbank, 1874, pl. LXVII fig. 4; BMNH 10.1.1.382, North Devon, figured specimen of Bowerbank, 1874, pl. LXVII fig. 5. For further material see De Weerd, 1986.

Nara De Laubenfels, 1954: 76, fig. 46. Type species: *Nara nematifera* De Laubenfels, 1954, by original designation. Material examined: USNM 22980, holotype, Ebon Lagoon, Marshall. Remarks: the enigmatic "threads" mentioned by De Laubenfels (l.c.) is a symbiotic fungus (pers. comm. Dr W.F. Prud'homme van Reine).

Katiba De Laubenfels, 1954: 186, fig. 124. Type species: *Katiba milnei* De Laubenfels, 1954: 186, by monotypy. Material examined: USNM 22948, holotype, Ebon Atoll, Marshall Islands. Remarks: The spicula are very small (about 50 x 0.4 μm and even smaller) reminding of the vestigial stronglyloxeas as occurring in sponges with spongin-dominated skeletons of *Chalinula molitba* (De Laubenfels, 1954), but I would not call them raphides. The exceedingly abundant trichodragmatas mentioned by De Laubenfels could not be found in the slides made from the holotype.

'*Acervochalina*' group of De Weerd (1986, 1989).

North Atlantic species assigned to *Chalinula*: *Chalinula limbata* (Montagu, 1818, as *Spongia*). Mediterranean-Atlantic, cf. De Weerd, 1986; *Chalinula loosanoffi* (Hartman, 1958, as *Haliclona*), North America, Netherlands, South Ireland, cf. Van Soest, 1976; De Weerd, 1986; *Chalinula nigra* Boury-Esnault & Lopes, 1985, Azores; *Chalinula parasimulans* (Lévi, 1959, as *Haliclona*), Canary Islands, West Africa.

Caribbean species: *Chalinula molitba* (De Laubenfels), *C. renieroides* Schmidt, 1868, *C. zaeae* n.sp.

REMARKS. - A high variability in skeletal architecture, amount of spongin, shape and size of the oxeas and external morphology is a common fea-

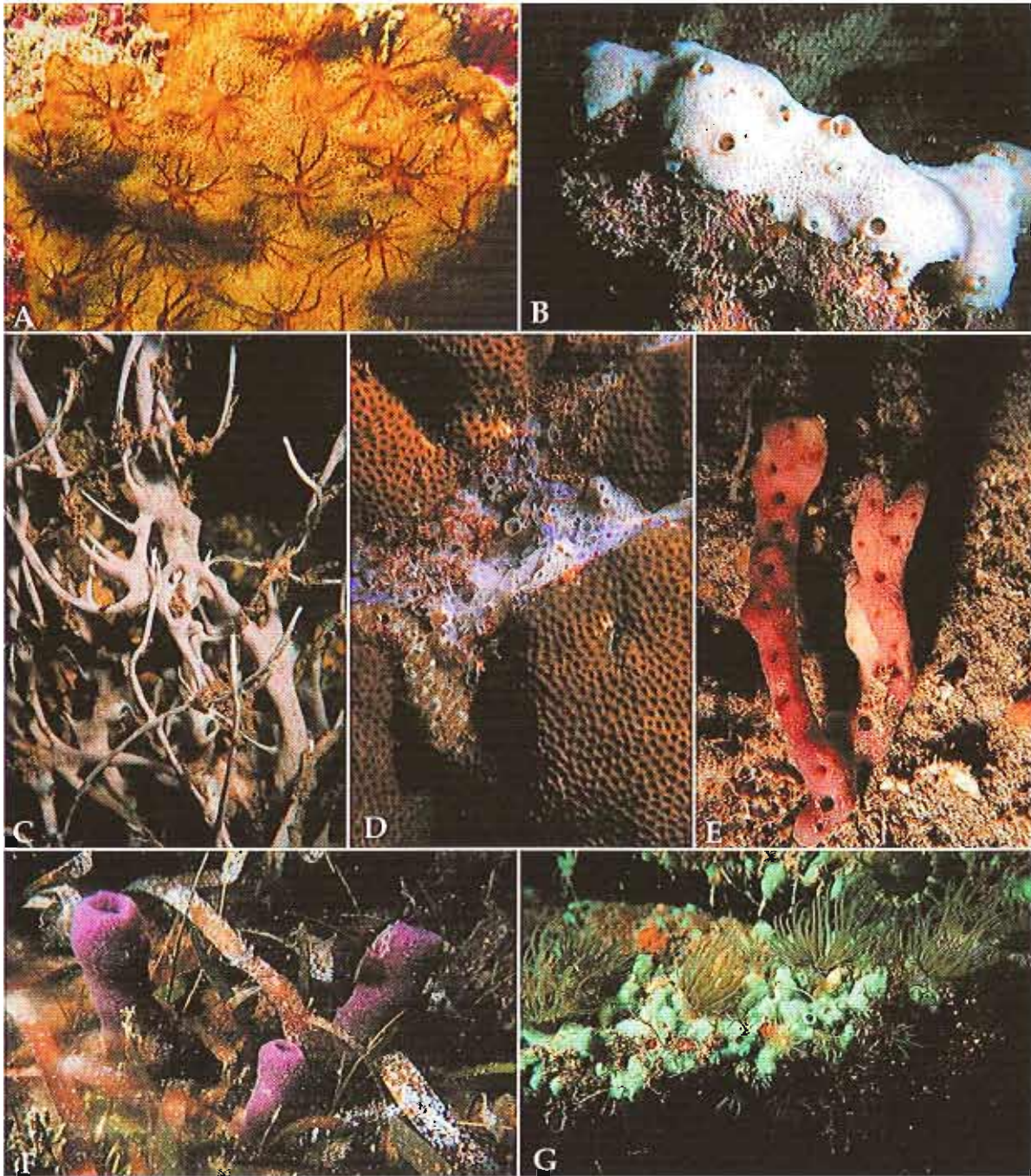


Fig. 2. In situ photographs of Caribbean chalinids. A, *Chalinula zea* n.sp.; B, *Haliclona (Halichoelona) stoneae* n.sp.; C, *Haliclona (Reniera) tubifera*; D, *Haliclona (Halichoelona) vansoesti*; E, *Chalinula molitba*, finger-shaped specimen; F, *Chalinula molitba*, tube-shaped specimen; G, *Haliclona (Reniera) manglaris*. Photos by H. Lehnert (A) and W.H. de Weerd (B-G).

ture in *Chalinula* species. It occurs not only in *C. renieroides* and in *C. molitba* (De Laubenfels, 1949; see below), but the North Atlantic *C. limbata* (Montagu, 1818) and *C. loosanoffi* (Hartman, 1958) also show a remarkable variation, in growth form, size and shape of the spicula, amount of spongin and the number of spicula in the secondary lines. The skeleton may, in extreme cases, even become entirely isotropic and unispicular, and very similar to the genus *Reniera*. It is unfortunate that *Chalinula* is defined on the basis of a character which shows such substantial variation. Until other, less variable, characters are found, this variation may possibly impede identification both at species and at genus level.

GENUS *DENDROXEA* GRIESSINGER, 1971

TYPE SPECIES. - *Reniera lenis* Topsent, 1892b, by monotypy. Material examined: Nationaal Natuurhistorisch Museum, Leiden, CANGAP 5 stat. 5, Azores (cf. De Weerd & Van Soest, 1986); ZMA Por. 5464, Banyuls, France (cf. Van Lent & De Weerd, 1987).

DEFINITION (Fig. 11.). - Chalinidae with a basal densely reticulated mass of spicules, from which arise multispicular, plumose, branching spicular tracts, which thin out towards the surface. Between the primary lines there is a reticulation of single spicula, with many irregularly spicula scattered in between. (After Griessinger, 1971, and Van Soest, 1980).

Caribbean species: none.

REMARKS. - Although the genus *Dendroxea* is known only from the single species *D. lenis*, recorded from the western Mediterranean and Azores, it is considered a valid chalinid genus and included in the key to the genera and subgenera of *Haliclona* given below.

GENUS *CLADOCROCE* TOPSENT, 1892

The genus *Cladocroce* Topsent, 1892a (type species *Cladocroce fibrosa* Topsent, 1892a, by monotypy) is retained by Fromont (1993) in the Chalinidae, and considered incertae sedis by Hooper & Wiedenmayer (1994). It was originally described

from deep water (1300 m) from the Azores, and a second species, *C. aculeata* was described by Pulitzer-Finali (1982) from shallow-water in the Great Barrier Reef. Fromont (1993) found this species again in the Great Barrier Reef at 13-18 m depth. The form of *C. fibrosa* was described as lamellate, with oxcas of 600 x 18 µm, *C. aculeata* as tube-shaped, with oxcas of 120-160 x 4-6.8 µm (Pulitzer-Finali, l.c.), and 107-170 x 3.1-6.1 µm, with thin strongyloxeas of 104-174 x 1-3.9 µm (Fromont, l.c.). The genus was redefined by Fromont (l.c., p. 15, fig. 5a) as: "Sponges with primary tracts accentuated to form a dendritic skeleton of spongin-encased spicules that occasionally anastomose. Between primary tracts the auxiliary skeleton is an isodictyal reticulation typical of the family Chalinidae. Megascleres oxcas or strongyloxeas." Fromont's description reminds of the reinforcement strategy in the form of thick spicular tracts developed by some tube-shaped chalinids, like the North Atlantic *Haliclona (Haliclona) urceolus* (Rathke & Vahl [in] Müller, 1806), which has otherwise a skeleton entirely agreeing with the subgenus *Haliclona*. Study of Topsent's original specimen is needed to assess the taxonomic status of *Cladocroce*, which will be done and presented in the forthcoming "Systema Porifera" contribution on Chalinidae.

KEY TO THE GENERA OF THE CHALINIDAE

- 1a. At the basis of the sponge there is densely reticulated mass of spicula, choanosomal skeleton consisting of almost plumose, branching spicular tracts, which thin out towards the surface *Dendroxea*
(not represented in the Caribbean)
- b. No densely reticulated mass of spicula at the basis of the sponge, choanosomal skeleton a rather delicate, iso- or anisotropic, ladderlike reticulation 2
- 2a. Secondary lines of the choanosomal skeleton more than one spiculum long *Chalinula*
- b. Secondary lines of the choanosomal skeleton one spiculum long *Haliclona*

KEY TO THE SUBGENERA OF *HALICLONA*

- 1a. Choanosomal skeleton an anisotropic, ladder-like reticulation of uni-paucispicular, ascending primary lines, regularly or less regularly connected by unispicular secondary lines 2

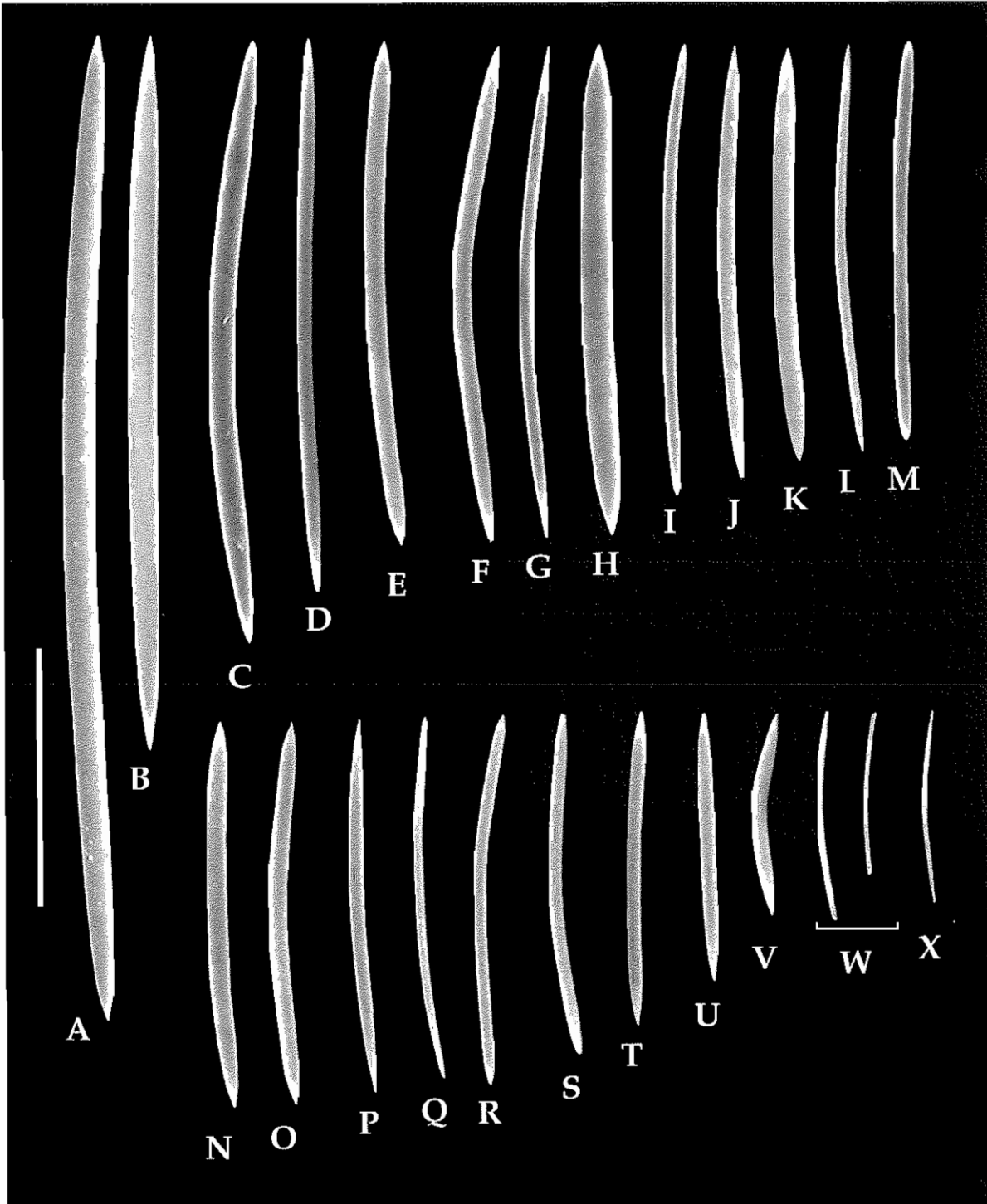


Fig. 3. Oxeas of the chalinid species treated in the present paper on the same scale (scale bar = 50 μ m) to show size and shape relative to each other. A, *Haliclona* (*Halichoelona*) *stoneae* n.sp. B, *H. (Gellius) tenerrima*. C, *H. (Halichoelona) vansoesti*. D, *H. (Remiera) mucifibrosa*. E, *II. (S.) luciensis* n.sp., F, *H. (S.) caerulea*. G, *H. (S.) piscaderaensis*. H, *H. (S.) twincayensis*. I, *H. (Halichoelona) magnifica*. J, *H. (S.) smithae* n.sp. K, *H. (R.) tubifera*. L, *H. (S.) curacaoensis*. M, *II. (R.) implexiformis*. N, *H. (S.) lehneri* n.sp. O, *Chalinula zeeae* n.sp. P, *H. (S.) vermeuleni* n.sp. Q, *H. (Halichoelona) albifragilis*. R, *H. (S.) melana*. S, *Chalinula molitba*, spicula-dominated skeleton, T, *II. (R.) ruetzleri* n.sp., U, *Chalinula renieroides*, V, *II. (Haliclona) epiphytica*. W, *Chalinula molitba*, spongin-dominated skeleton. X, *H. (R.) manglaris*.

- b. Choanosomal skeleton an iso- or subistropic reticulation without a clear distinction between primary and secondary lines 4
- 2a. Skeleton very regular, with straight, uni-paucispicular ascending primary lines, regularly connected by unispicular secondary lines; spongin always present, at the nodes of the spicula or more copious, oxeas usually short, relatively thick, cigar-shaped, microscleres, if present, toxas subgenus *Haliclona*
- b. Skeleton less regular, with pauci-multispicular primary lines, irregularly connected by unispicular secondary lines, with many spicula in confusion 3
- 3a. Primary lines pauci- multispicular, somewhat wavy, spongin scarce or absent, oxeas usually slender, with long points, no microscleres subgenus *Rhizoniera*
- b. Skeleton towards the inner parts of the sponge becoming a confused, subhalichondroid reticulation, oxeas usually long, stout, with hastate points, microscleres, if present, toxa, sigmas or raphides or a combination of these subgenus *Gellius*
- 4a. Both the ectosomal and choanosomal skeleton show a tendency to form rounded meshes; choanosomal skeleton consisting of ill-defined paucispicular primary lines, irregularly connected by unispicular secondary lines, with many choanosomal spaces; spongin scarce to more abundant, oxeas slender, microscleres, if present, toxas or raphides subgenus *Soestella* n.subg.
- b. Both the ectosomal and choanosomal skeleton a regular, iso- subistropic reticulation 5
- 5a. Ectosomal and choanosomal skeleton a very regular, delicate, unispicular, isotropic reticulation, spongin at the nodes of the spicula, oxeas slender, frequently blunt-pointed to strongly, microscleres, if present, toxa and sigmas; sponges usually soft, compressible but fragile subgenus *Reniera*
- b. Ectosomal and choanosomal skeleton forming a subisotropic, paucispicular reticulation; ectosome laying very loosely on the choanosome, with many subectosomal spaces; no spongin, oxeas usually rather stout, microscleres, if present, sigmas, sponges usually brittle, incompressible, fragile subgenus *Halichoelona*

SPECIES OF THE SUBGENUS *HALICLONA*

Haliclona (Haliclona) epiphytica Zea & De Weerd, 1999
Figs. 3V, 4A-D

Haliclona (Haliclona) epiphytica Zea & De Weerd, 1999: 172, figs. 1-2.

MATERIAL

COLOMBIA: ZMA Por. 15559 (holotype, Guajira, Carib-

bean); ZMA Por. 5139, ICN-MHN (Po) 0170, INV- 417, INV- 410 (paratypes, Santa Marta, Colombia, Caribbean).

DESCRIPTION. - Shape and size: small encrustations, up to 1-4 cm long, 0.2-1.1 cm wide and 0.15-1.1 cm thick, growing on seaweeds. Oscules numerous, sometimes up to 20 on each individual, even with the surface, 0.3-1.4 mm in diameter.

Consistency: somewhat compressible and elastic but fragile, easily damaged.

Surface: smooth, dense in aspect, generally even.

Colour: cream in the living state, light cream in spirit and dry.

Ectosomal skeleton: regular, tangential reticulation of single spicula joined by spongin at the nodes, forming triangular to polygonal meshes 30-80 µm in diameter.

Choanosomal skeleton: regular, ladder-like reticulation of uni- to paucispicular primary lines (1-3 spicula in cross-section), regularly connected by unispicular secondary lines.

Spongin: clearly present at the nodes of the spicula.

Spicula: thick, short oxeas with acerate points, slightly to rather strongly, evenly curved, 63-97 x 2.9-6.9 µm (see Zea & De weerd, 1999 for more detailed measurements).

Ecology: growing on seaweeds in intertidal to shallow-subtidal (to about 1 m deep) rocks or rock pavement in or near sandy beaches in sites of turbid waters and relatively strong water movement.

Distribution (Fig. 5): known only from Guajira and Santa Marta in the Colombian Caribbean.

REMARKS. - *Haliclona (Halicl.) epiphytica* stands out among other Caribbean chalinids by its exclusive occurrence on seaweeds, and by its skeletal architecture and thick, short oxeas. *Haliclona (Halichoelona) albifragilis* (Hechtel, 1965) is also encrusting but snow-white and brittle, with the subisotropic skeleton typical of the subgenus *Halichoelona*.

The subgenus *Haliclona* is in the Caribbean only represented by *Haliclona (Halicl.) epiphytica*, whilst there are several species in the north-eastern Atlantic (see above) and at least one in the Antarctic, viz. *Haliclona (Halicl.) gaussiana* (Hentschel). Preliminary studies of Indo-Pacific chalinids (unpublished) indicate that the subgenus

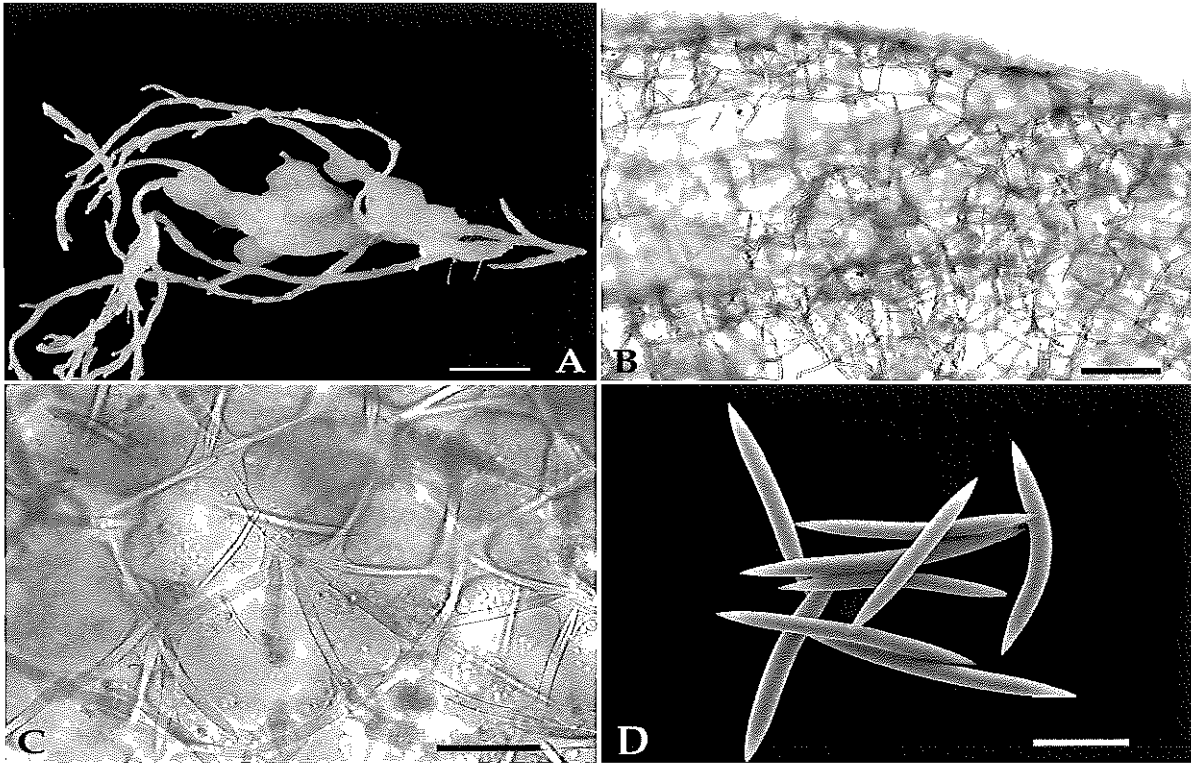


Fig. 4. *Haliclona (Haliclona) epiphytica*. A, holotype, ZMA Por. 15559. B, perpendicular section of choanosome. C, tangential view of ectosomal skeleton. D, scanning electron micrograph of oxeas (scale bars: A = 0.5 cm; B = 150 μ m; C = 50 μ m; D = 25 μ m).



Fig. 5. Known distribution of *Haliclona (Haliclona) epiphytica*.

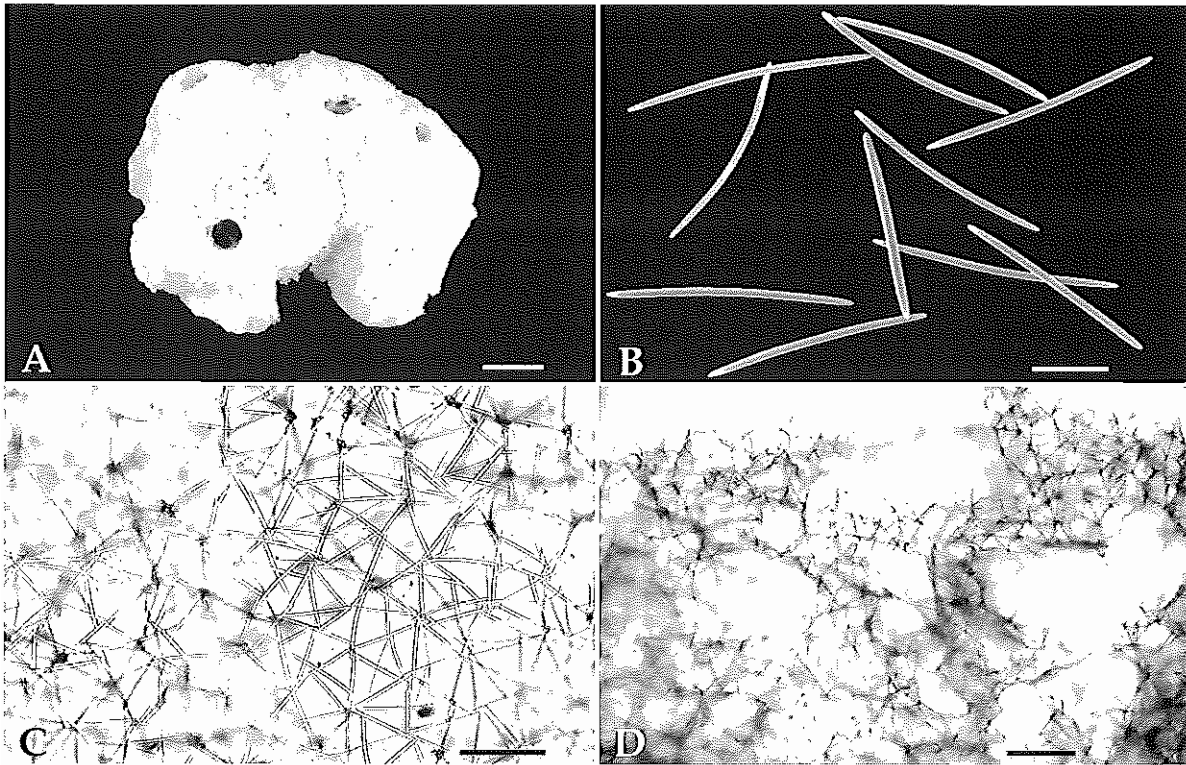


Fig. 6. *Haliclona (Reniera) implexiformis*. A, preserved specimen, USNM 31561. B, scanning electron micrograph of oxesas. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1 cm; B = 50 μ m; C = 150 μ m; E = 300 μ m).

is rare in this large area. It could therefore be restricted to cold and temperate waters. Zea & De Weerd (1999) mentioned as a possible reason for the restricted local occurrence of *H. (Halicl.) epiphytica* in the Colombian Santa Marta area the fact that the north-eastern Colombian coast is an area of seasonal upwelling, causing surface water temperature to be as low as 21°C (summer in Zea, 1993). The area may thus serve as a refugium for species that require lower water temperatures.

SPECIES OF THE SUBGENUS *RENIERA*

Haliclona (Reniera) implexiformis (Hechtel, 1965)

Figs. 3M, 6A-D

Adocia neens; De Laubenfels, 1936a: 67, pl. 12 fig. 1 [Non: *Reniera neens* Topsent, 1918: 536 = *Haliclona neens* (cf. Van Soest, 1980: 18 and De

Weerd & Van Soest, 1986: 8). Nec: *Adocia neens*; De Laubenfels, 1954: 105 = *Haliclona* spp.; Little, 1963: 43 = *Haliclona (Halicl.) albifragilis* (Hechtel, 1965)].

Haliclona permollis; De Laubenfels, 1950a: 46, fig. 20 [Non: *Isodictya permollis* Bowerbank, 1866: 278 = *Haliclona (Reniera) cinerea* (Grant, 1826) (cf. De Weerd, 1986). Nec: *H. permollis*; De Laubenfels, 1936b: 444 = *Haliclona* sp.; 1947: 34 = *H. (R.) ?tubifera*; 1951: 258, fig. 2 = *Haliclona* sp.; Wells et al., 1960: 209, fig. 5 = *H. (R.) tubifera* (George & Wilson, 1919); Little, 1963: 40 = *H. (R.) tubifera*; *Reniclona permollis*; De Laubenfels, 1954: 67 = *Rhizoniera* sp.].

Adocia implexiformis Hechtel, 1965: 27, text-fig. 2, pl. II fig. 2; (pars) Van Soest, 1980: 18, fig. 6, pl. II fig. 3; Zea, 1987: 67, fig. 15, pl. 7 fig. 6.

Haliclona implexiformis; De Weerd et al., 1991: 202, figs. 3h, 6a, b, d.

MATERIAL

BERMUDA: USNM 31662 (Hungry Bay, 1946, coll. W.

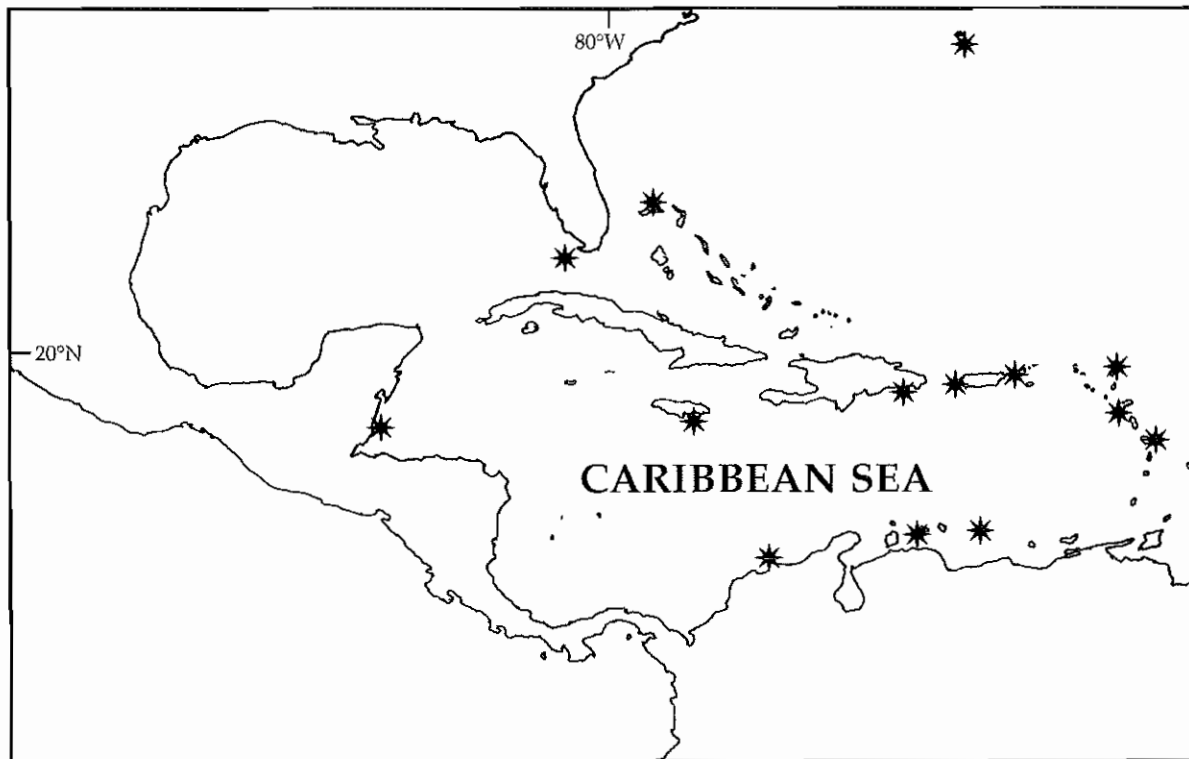


Fig. 7. Distribution of *Haliclona (Reniera) implexiformis*.

Bergmann, identified by De Laubenfels as *H. permollis* (microscope slide only); USNM 31663 (Walsingham Pond, 1946, coll. W. Bergmann, identified by De Laubenfels as *H. permollis* (microscope slide only)); USNM 43126 (Hungry Bay, under intertidal rocks, 23-XII-1966, coll. K. Rützler (BE 38)); USNM 43127 (same data as USNM 43126 (BE 40)).

FLORIDA: USNM 22469 (Moat at Fort Jefferson, Tortugas, 28-VI-1932, cf. De Laubenfels 1936a: 67, as *Adocia neens*); also one microscope slide numbered "32064" and two slides numbered "32069"; USNM 42295 (Tortugas, one microscope slide made by De Laubenfels, labeled: "*Reniera* sp. II").

BAHAMAS: USNM 33700, 33702 (Grand Bahama, E end, 1 mi N of Sweetings Cay, 4 m, in cave, December 1985, coll. Sara Cunliffe, British Cave Dive Exped./BBC).

JAMAICA: YPM 5034 (holotype, Mangrove boat channel, Jamaica); USNM 24495 (paratype); ZMA Por. 5754 (Kingston Harbour, inlet near Port Royal, 0-1 m, 7-V-1973, coll. P. Wagenaar Hummelinck, # 1678).

DOMINICAN REPUBLIC: USNM 32251 (Boca Chica, Bahía de Andres, on mangrove roots, 18-VII-1978, coll. V. Vincente).

PUERTO RICO: USNM 42365, 42367 (Parguera, N of Monkey Island, mangrove channel, 1 m, on mangrove roots, 14-II-1990, coll. W.H. de Weerd and K. Smith); USNM 42370 (Parguera, NE side Isla Magueyes, 1 m, on mangrove roots, 15-II-1990, coll. W.H. de Weerd and K. Smith).

ST. THOMAS: USNM 31561 (lagoon W of mangrove, 0-1 m,

5-IV-1967, coll. K. Rützler).

BARBUDA: ZMA Por. 7581 (lagoon near Codrington, partly under rock, 0.5 m, 13-III-1986, coll. J. Vermeulen, Sta. 86-199); ZMA Por. 7592 (lagoon near Codrington, under stones, 0.5 m, 19-III-1986, coll. J. Vermeulen, Sta. 86-252); ZMA Por. 7593 (lagoon near Codrington, under stones, 0.5 m, 19-III-1986, coll. J. Vermeulen, Sta. 86-251).

GUADELOUPE: USNM 41785 (Grand Cul-de-Sac Marin, ca. 0.5 mi N Petit Canal, E side bay, 16°23'5"N 61°30'60"W, site 1: mangrove, piling off dock and old house, 0.5-1.5 m, on piles, coll. HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson, fragment of HBOI 23-VI-89-2-4); ZMA Por. 13057 (same data as USNM 41785); USNM 41772, 42396, ZMA Por. 7591 (Rivière Salée, near mouth, on mangrove roots, 1 m, coll. HBOI/MBR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson, fragments of HBOI 18-VI-89-1-4).

MARTINIQUE: USNM 41788 (Baie du Marin, N side Pt. du Marin, 14°27'00"N 60°53'18"W, 0.5-1 m, mangrove roots and muddy bottom, 1-VII-1989, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson, fragment of HBOI 1-VII-89-2-10); USNM 41793 (same site as USNM 41788, 2-VII-1989, coll. W.H. de Weerd, # 2-VII-89-3-W3); ZMA Por. 13062 (fragment of USNM 41793); USNM 42296 (Baie de Fort-de-France, SE side Pte. des Nègres, 15 ft., vertical wall, 5-VII-1989, coll. J. Reed, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson).

VENEZUELA: USNM 41507 (Los Roques, Dos Mosquises Sur, W side, 3-5 m, under coral rubble, 23-IV-1989, coll. W.H. de Weerd); USNM 41821 (same site as USNM 41507, 21-IV-1989); USNM 41817 (Isla de Margarita, 11°48'0"N 64°35'53"W, 0-3 m, mangroves, 3-VI-1988, HBOI/ BMR Exped. Venezuela/Colombia, fragment of HBOI 3-VI-88-3-1); USNM 41818 (same data as USNM 41817, fragment of HBOI 3-VI-88-3-6).

BONAIRE: ZMA Por. 11137 (Kreek di Pedro, mangroves, March 1992, Coll. G. van Moorsel, # 048/102a).

CURAÇAO: ZMA Por. 6398, 6405, 6417, 6420, 13056 (Fuikbaai, 1 m, on mangrove roots, 13-I-1987, coll. W.H. de Weerd and P. Hoctjes); USNM 41727 (same data as ZMA Por. 6405).

COLOMBIA: USNM 41831, ZMA Por. 7594 (Bahia de Santa Marta, Punta de Betin, 20-25 m, on dead parts of corals, 15-VII-1989, coll. S. Zea # PSM 306); USNM 41833 (Islas de San Bernardo, Isla Tintipán, 1 m, on mangrove root, 6-X-1982, coll. S. Zea # PSB 052); ZMA Por. 13230 (Islas de San Bernardo, Isla Trintipán, coll. S. Zea # PSB 090).

BELIZE: several specimens in the USNM collection (see De Weerd et al., 1991); in addition: USNM 34619, 34627 (Twin Cays, 24-V-1985, coll. I. Goodbody, id. as *Haliclona hogarthi*); USNM 41819 (Twin Cays, mangroves, HBOI/BMR Exped. Belize, 18-XI-1985, fragment of HBOI 18-XI-85-3-4); ZMA Por. 13048 (Twin Cays, Hidden Creek, mangrove roots, 0.5 m, 12-XII-1988, coll. W.H. de Weerd); ZMA Por. 13061 (Twin Cays, The Lair, on mangrove roots, 1 m, 8-XII-1988, coll. W.H. de Weerd, fragment of USNM 41753).

DESCRIPTION. - Shape and size: thick cushions, 2-4 cm thick, with a well-defined, regular outline; rarely fingershaped. Oscula distinct, circular, rather large, 6-10 mm, regularly distributed, flush with the surface or on slightly elevated mounds. Consistency: soft, compressible.

Surface: even and smooth, sometimes with slight tuberculate areas; rather strongly punctate.

Colour: pinkish violet in the living state, occasionally with creamish shades, light tan in spirit.

Ectosomal skeleton: regular, tangential, unispicular, isotropic reticulation.

Choanosomal skeleton: regular, unispicular, isotropic reticulation,

Spongins: scarce but clearly visible, at the nodes of the spicula.

Spicula: slightly, evenly curved oxeas, with blunt points or strongylote, sometimes with a fair number of sharp-pointed oxeas intermixed, 95.5-167.1 (131.6 ± 14.9) x 3.7-9.3 (5.7 ± 1.2) µm.

Ecology: Reef and mangrove habitats. Depth range from very shallow to 25 m.

Distribution (Fig. 7): Jamaica (Hechtel, 1965),

Puerto Rico, Bonaire, Curaçao (Van Soest, 1980), Cuba (Alcolado, 1984), Belize (De Weerd et al., 1991), Bermuda, Florida, Bahamas, Dominican Republic, St. Thomas, Barbuda, Guadeloupe, Martinique, Venezuela, Colombia.

REMARKS. - *Haliclona implexiformis* is a fairly common and distinct species, well characterized by its regular cushion-shaped form, large oscula, bright violet-pink colour, and blunt-pointed to strongylote oxeas. The single other Caribbean chalinid with strongyles is *Haliclona strongylophora* Lehnert & Van Soest, 1996, a soft, dark brown, encrusting sponge, with strongyles of 150-200 x 4-10 µm, recorded from Jamaica at 77.7 m depth. It has the same skeletal architecture as *H. (R.) implexiformis*, making it a member of the subgenus *Reniera*, but the species are clearly not conspecific (holotype, ZMA Por. 11336 examined). *Haliclona (R.) neens* (Topsent, 1918, Azores, West Africa) has short, thick strongyles of ca. 110 x 7-8 µm, and *H. (R.) cratera* (Schmidt, 1868, Mediterranean, West Africa) characteristic long strongyles of ca. 300 by 8 µm (cf. De Weerd et al., 1986).

De Laubenfels' misinterpretation of *Reniera neens* Topsent was already mentioned by Van Soest (1980) and is probably due to the fact that he confused the type locality of *H. neens*, San Thomé (West Africa), with St. Thomas (Virgin Islands). De Laubenfels' 1954 Pacific records of *Adocia neens* (USNM 23001, 23008 (Marshall Islands) and USNM 23051 (Caroline Islands) conform to at least two different, chalinid species, the identity of which cannot be ascertained at present.

***Haliclona (Reniera) manglaris* Alcolado**

Figs. 2G, 3X, 8A-D

Haliclona manglaris Alcolado, 1984: 4, figs. 1B, 2A;

De Weerd et al., 1991: 198, figs. 3e, 5a, b, e.

MATERIAL

FLORIDA: USNM 41808 (Florida Keys, mangrove island 400 m E of Big Torch Key, on mangrove roots, 0.5 m, 13-VII-1989, coll. W.H. de Weerd and T. Clark).

CUBA: USNM 39225 (schizotype, Punta del Este).

PUERTO RICO: USNM 42366 (Parguera, W side Monkey Island, on mangrove oysters, 1 m, 14-II-1990, coll. W.H. de Weerd and K. Smith).

MARTINIQUE: USNM 41790 (Baie du Marin, N side Pt. du

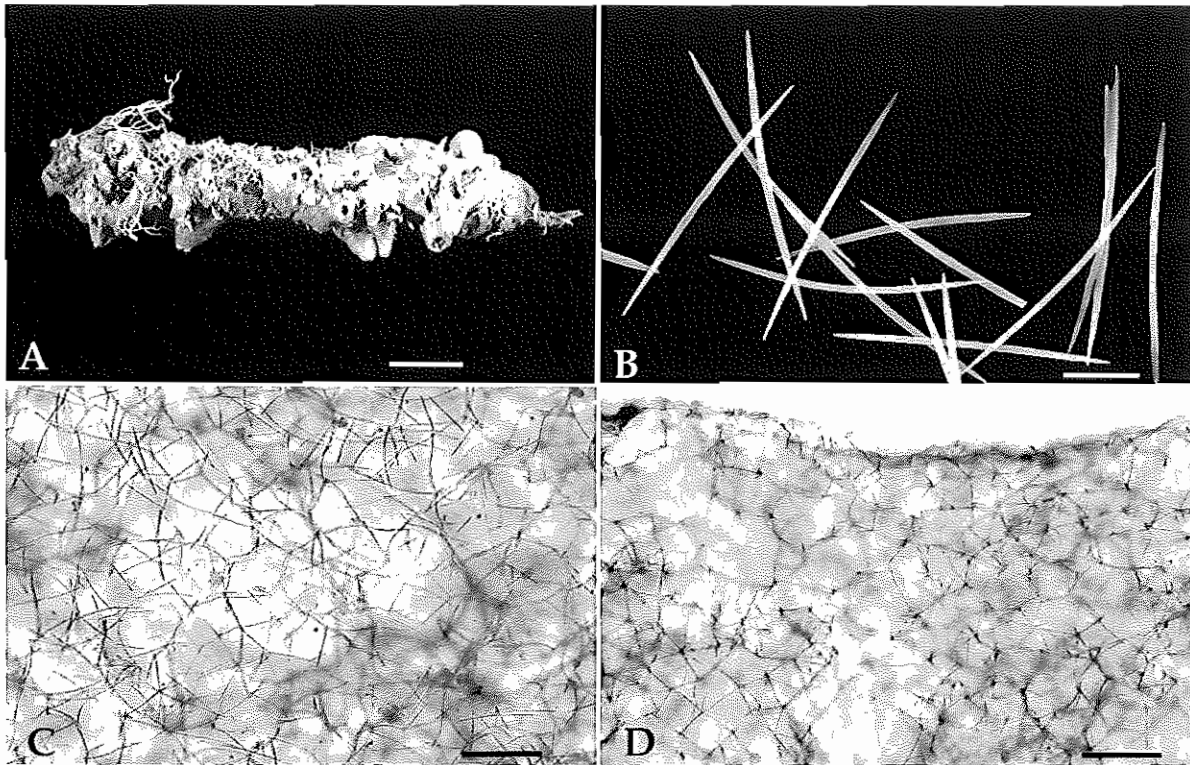


Fig. 8. *Haliclona (Reniera) manglaris*. A, preserved specimen, USNM 41759. B, scanning electron micrograph of oxeads. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 2 cm; B = 25 μm ; D, E = 200 μm).

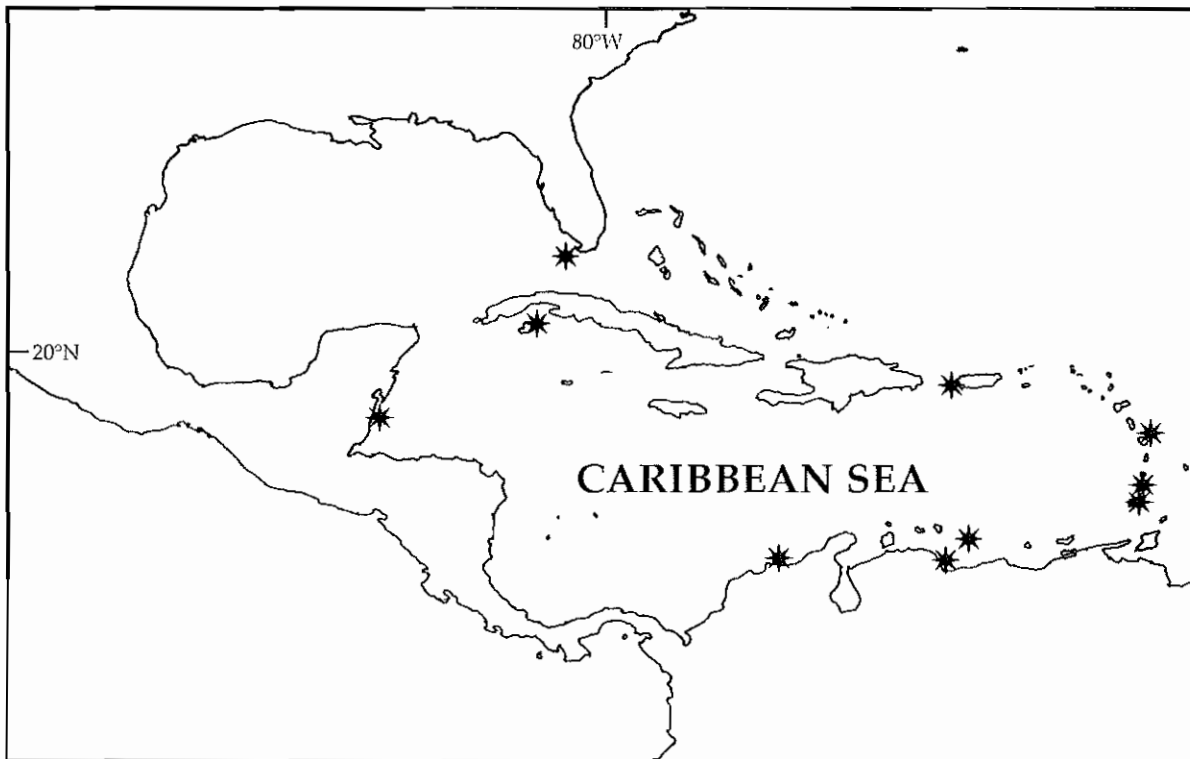


Fig. 9. Distribution of *Haliclona (Reniera) manglaris*.

Marin, 14°27'00"N 60°53'18"W, on mangrove root, 0.5-1 m, 1-VII-1989, coll. W.H. de Weerdt, HBOI/BMR Exped. Lesser Antilles, June/July 1989, R/V Seward Johnson; USNM 41792 (same data, 2-VII-1989).

GRENADA: USNM 41780 (S side, 12°00'20"N 61°43'42"W, on mangrove root, 0.3 m, coll. W.H. de Weerdt, HBOI/BMR Exped. Lesser Antilles, March/April 1989, R/V Seward Johnson).

GRENADINES: ZMA Por. 13452 (Tobago Cays, N side Baradel Isl., 12°38'20"N, 61°21'23"W, on mangrove roots, 2-IV-1989, coll. W.H. de Weerdt).

VENEZUELA: USNM 42294, ZMA Por. 13454 (Los Roques, inside bay S side Espenquí, on mangrove roots, 0.5 m, 20-IV-1989, coll. W.H. de Weerdt); ZMA Por. 13455 (Front of Pescadores Bay, Morrocoy, National Park, on mangrove roots, 1-V-1989, coll. M.C. Diaz).

COLOMBIA: USNM 41834 (Bahía de Chenguc, on mangrove root, 0.5 m, 13-VI-1989, coll. R. Reyes, don. S. Zea, # PSM 305).

BELIZE: several specimens in the USNM collection (cf. De Weerdt et al., 1991); in addition: ZMA Por. 13456 (Twin Cays, Grouper Gardens, on *Rhizophora mangle*, 0.5 m, 12-XII-1988, coll. W.H. de Weerdt).

DESCRIPTION. - Shape and size: laterally spreading, thickly encrusting sheets, 1-2 mm thick, around mangrove roots, frequently with low chimney- and volcano-shaped elevations, to about 0.8 cm high and 0.4-1.2 cm in diameter. Oscula small, circular, 0.1-0.25 cm in diameter, flush and irregularly scattered at the surface, and at the top of the elevations. Commonly there are several rope-like, short and thin proliferations branching off from the main body.

Consistency: soft, but not very fragile.

Surface: smooth, even, slightly punctate.

Colour: commonly bright turquoise green or green, sometimes brownish.

Ectosomal skeleton: a rather regular, tangential, unispicular, isotropic reticulation, with three- to five-sided meshes.

Choanosomal skeleton: a delicate, isotropic reticulation of single spicula forming three- to five-sided meshes, with numerous choanosomal spaces.

Spongium: scarce to moderate, at the nodes of the spicula.

Spicula: oxeas, fusiform, with long, very sharp points, slightly to rather strongly curved, of a very uniform shape and size, 76.6-108.8 (93.2 ± 7.8) x 2-4 (2.9 ± 0.5) μ .

Ecology: Growing on mangrove roots.

Distribution (Fig. 9): Cuba (Alcolado, 1984),

Belize (De Weerdt et al., 1991), Florida, Puerto Rico, Martinique, Grenada, Grenadines, Venezuela, Colombia.

REMARKS. - *Haliclona (R.) manglaris* stands out by its bright turquoise green colour and almost exclusive occurrence on roots of the red mangrove, *Rhizophora mangle*. The colour green is unusual for chalinid sponges and is so far known only from the Antarctic species *Reniera virens* Topsent, 1908 (= *Haliclona*, subgenus unknown; cf. Desqueyroux-Faúndez, 1976) and the Pacific *Adocia turquoisia* De Laubenfels, 1954 (= *Haliclona*, subgenus unknown). Specimens of the latter species were studied in the USNM (USNM 23100, holotype, USNM 22834, 22880, 22902, 22800, paratypes) and it is obvious that more than one species are present in this type series. USNM 22834 shows a striking resemblance to *H.(R.) manglaris*, with the same encrusting shape, skeletal architecture and slender, long-pointed oxeas of ca. 90 x 2.4 μ m.

Haliclona (Reniera) mucifibrosa De Weerdt et al., 1991
Figs. 3D, 10A-D

Haliclona mucifibrosa De Weerdt, Rützler & Smith, 1991: 190, figs. 2a-c, 3b, 4a, b.

MATERIAL

FLORIDA: USNM 41765 (Florida Keys, Sawyer Key, N side, mangroves and sand, 0-0.6 m, fragment of HBOI 17-X-86-3-5); ZMA Por. 7792 (Marquesas, 24°33'50"N 82°08'00"W, 2 ft., mangroves, coll. J. Reed c.s., 22-VII-1986, fragment of HBOI # 22-VII-86-2-3).

JAMAICA: ZMA Por. 13266 (Discovery Bay, blue hole near Columbus Park, 8-12 m, 7-VI-1993, coll. H. Lehnert).

COLOMBIA: ZMA Por. 5138 (Punta de Betin, Santa Marta, 20 m, on dead parts of corals, 13-II-1982, coll. S. Zea # PSM 146).

BELIZE: Several specimens in the USNM collection; in addition: USNM 41518 (Twin Cays, Batfish Point, 0-1 m, 28-IV-1986, coll. K. Rützler & K. Smith); USNM 41519 (Twin Cays, Grouper Gardens, 19-IV-1986, coll. K. Rützler & K. Smith); USNM 41520 (Twin Cays, Sponge Haven, 21-IV-1986, coll. K. Rützler & K. Smith).

DESCRIPTION. - Shape and size: an irregular, lumpy, massive base, typically about 10 cm in diameter, from which arise short (2-3 cm), truncate, rather thick-walled oscular chimneys.

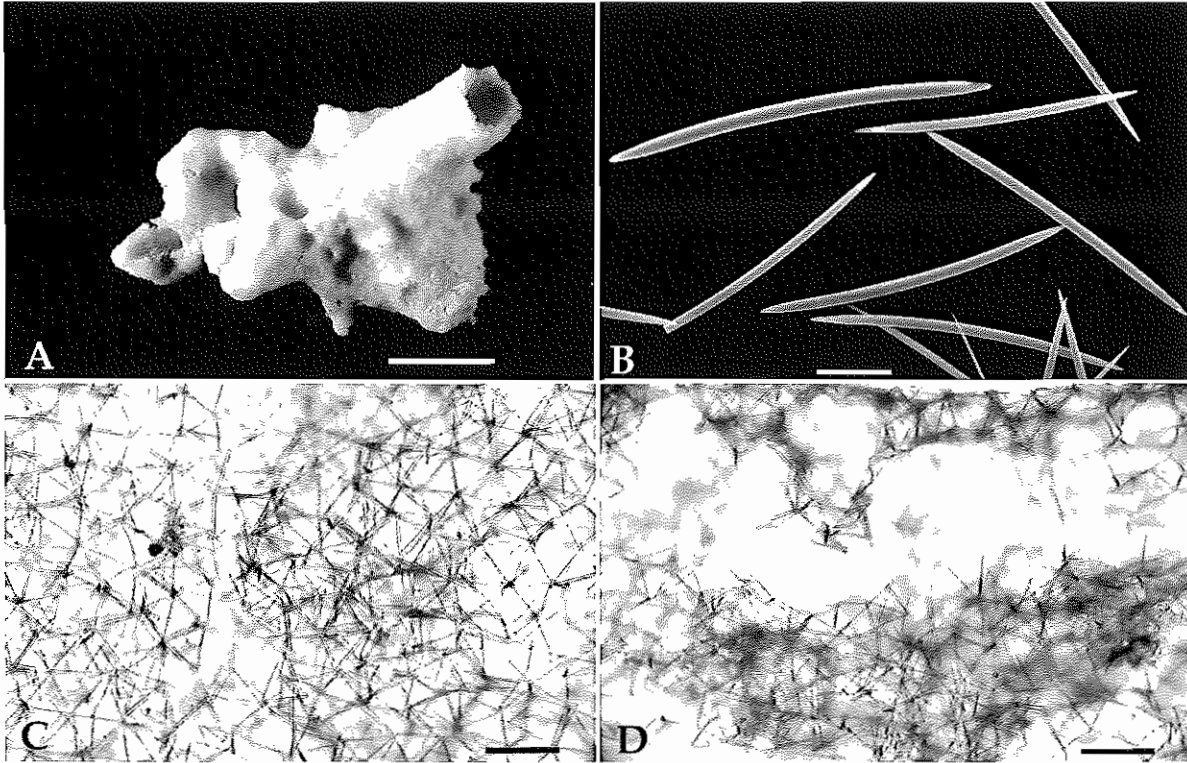


Fig. 10. *Haliclona (Reniera) mucifibrosa*. A, holotype, USNM 41517. B, scanning electron micrograph of oxeas. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 2.5 cm; B = 50 μm ; C, D = 300 μm).

Oscules to 1 cm in diameter. Lateral expansions (fistules) 10-15 cm or more.

Consistency: elastic compressible in the living state; preserved specimens rather brittle and less compressible. Pronounced mucus strands appear when fragments are torn apart.

Surface: smooth, but occasionally with tuberculate areas caused by short fistule-like projections.

Colour: greyish purple to bluish gray in the living state, light tan in spirit.

Ectosomal skeleton: regular, tangential, iso- to subisotropic reticulation.

Choanosomal skeleton: regular, uni- to paucispicular, iso- to subisotropic reticulation with many choanosomal spaces, in places reinforced by short spicula tracts of 4-6 spicula thick.

Spongin: not abundant, but distinct, in fair amounts at the nodes of the spicula.

Spicula: rather stout, straight or slightly curved oxeas with acerated points. Dimensions: 186-249 (214.1 ± 16.5) \times 7.4-13.5 (10.2 ± 1.4) μm .

Ecology: mangrove roots, peat banks, shallow sandy bays, reef caves.

Distribution (Fig. 11): Florida, Bahamas, Curaçao, Belize, (De Weerd et al., 1991), Jamaica, Colombia.

REMARKS. - *Haliclona (R.) mucifibrosa* may be confused with *H. (R.) tubifera* (George & Wilson, 1919, see below), since colour may be quite similar and both species excrete slime strands when torn apart. The main difference are the much heavier slime strands in *H. (R.) mucifibrosa* (hence its name), its much larger oxeas (in *H. (R.) tubifera* the measure ca. 67-180 \times 6.9-9.3 μm), and its skeleton which has a tendency to become paucispicular and subisotropic instead of entirely unispicular and isotropic, as in *H. (R.) tubifera*.

De Weerd et al. (1991) considered *H. (R.) mucifibrosa* as a member of the 'fistulosa' group (= subgenus *Halichoelona*, see below), but *Halichoelona* is characterized by a much denser and more subisotropic skeleton than occurs in *H. (R.) mucifibrosa*, even though it is somewhat less regular. The species is here reassigned to the subgenus *Reniera*.

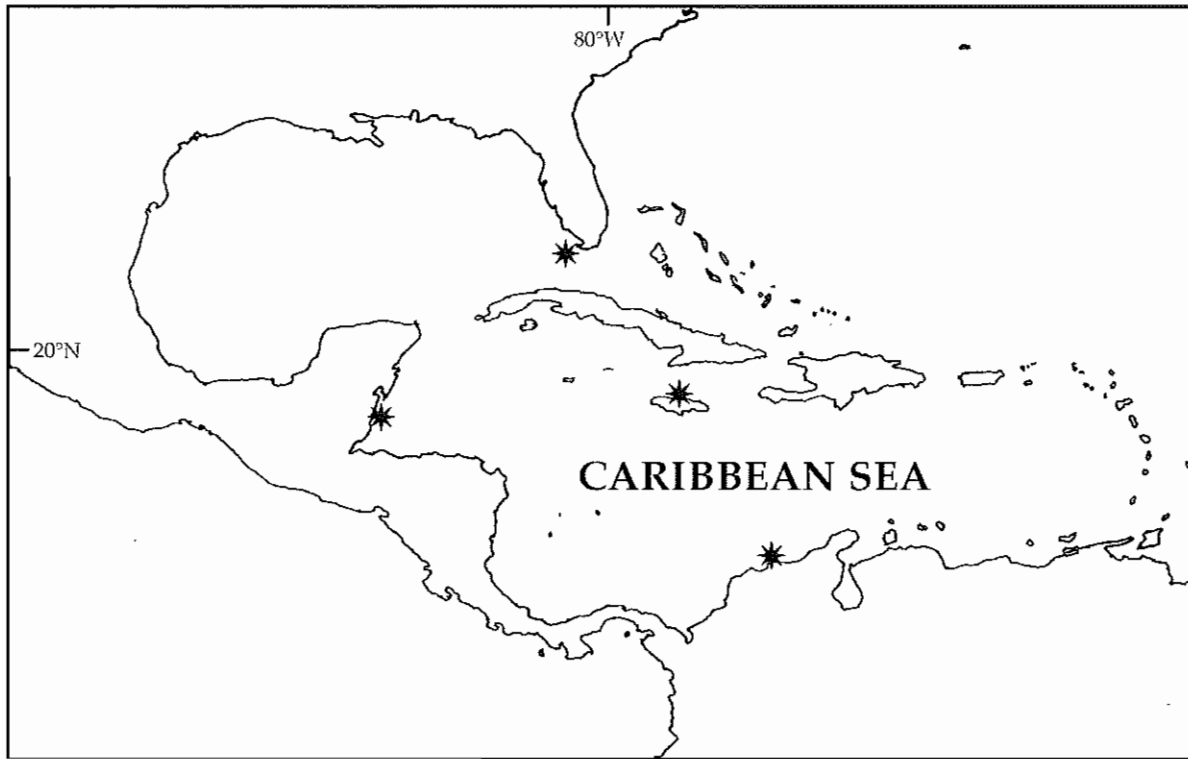


Fig. 11. Distribution of *Haliclona (Reniera) mucifibrosa*.

***Haliclona (Reniera) ruetzleri* n. sp.**

Figs. 3T, 12A-F

MATERIAL

BELIZE: Holotype: USNM 42490 (Twin Cays, Gator Creek, near E Lake, on *Rhizophora* root, 0.5 m, 18-VI-1984, coll. K. Rützler). Paratypes: USNM 42491, ZMA Por. 13267 (same data as holotype); USNM 42492 (Twin Cays, Grouper Gardens, bank, 1-2 m, 8-VII-1990, coll. K. Smith).

DESCRIPTION. - Shape and size: an extremely delicate sponge, consisting of very slender, anastomosing branches of 3-6 cm long and 1-3 mm thick. The oscula are circular to slightly elliptical, flush with the surface or very slightly elevated, rather numerous, scattered along the branches, 0.5-1.5 mm in diameter.

Consistency: very soft, easily torn.

Surface: smooth.

Colour: light brown.

Ectosomal skeleton: a very delicate, unispicular, tangential, isotropic reticulation.

Choanosomal skeleton: very delicate, unispicular, isotropic reticulation.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas: slender, straight or slightly curved, with rather long and sharp points, 104.4-168 (31.5 ± 19.7) x 3.3-6 (4.7 ± 0.7) μm . Toxas: common, but in one specimen more abundant than in the other, very slender, of very variable shape and size, weakly to strongly curved, with straight legs or slightly recurved apices, 20.9-96.3 (56.7 ± 19.2) x 0.5-1.9 (0.8 ± 0.3) μm . Sigmas: uncommon, regularly curved or slightly contorted, 9.5-18.6 (12.4 ± 2.2) x 0.5-1.3 (0.8 ± 0.2) μm .

Ecology: mangrove roots and peat banks, 0.5 - 2 m depth.

Distribution (Fig. 13): known only from Twin Cays, Belize.

ETYMOLOGY. - Named after Dr. Klaus Rützler, in recognition of his many contributions to different aspects in sponge biology and ecology.

REMARKS. - *Haliclona (R.) ruetzleri* n.sp. stands out by the combination of its delicate shape of slender branches and the possession of toxas and sigmas. The only other Caribbean chalinid with these microscleres is *Haliclona (Gellius) tenerrima*

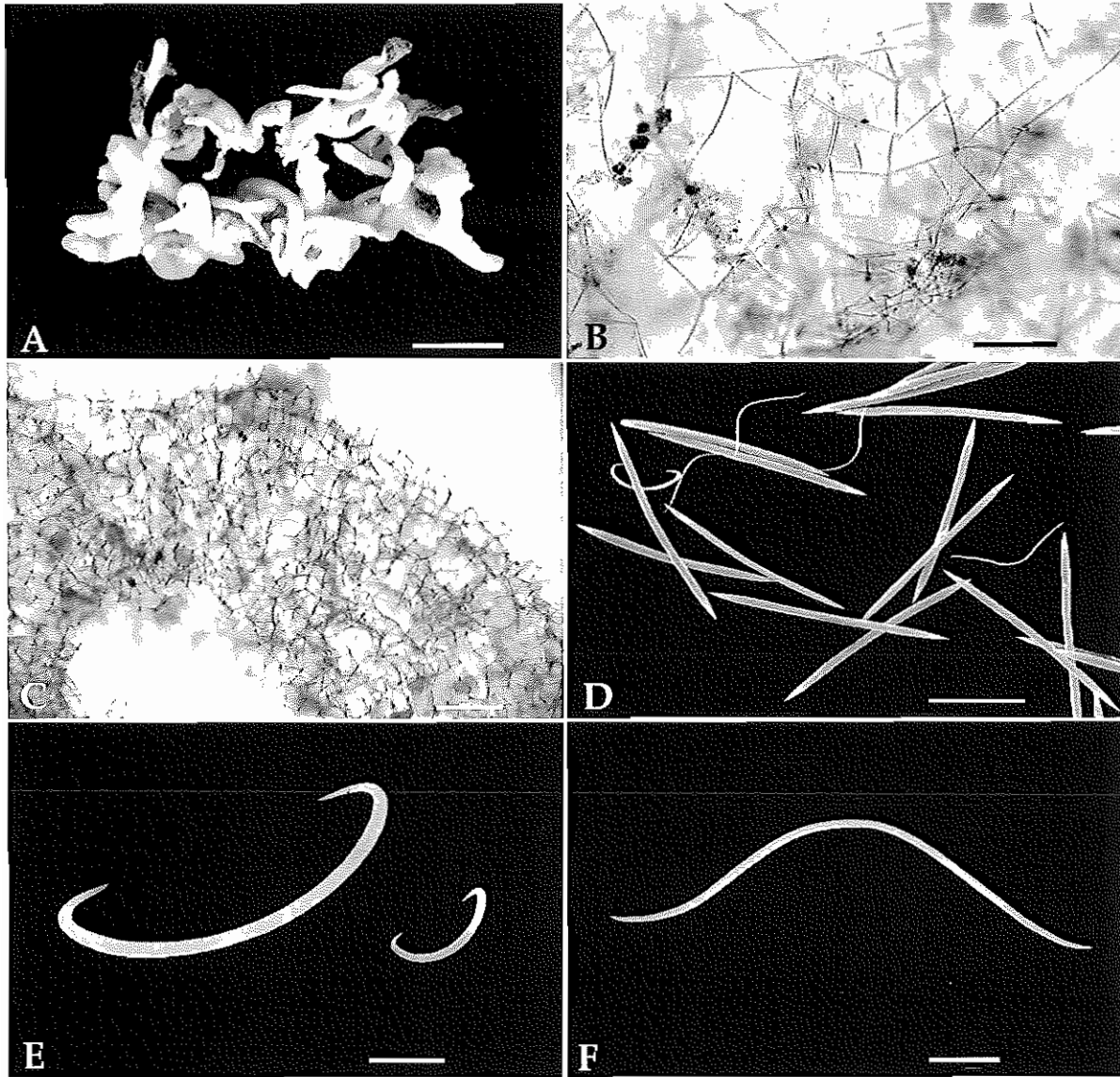


Fig. 12. *Haliclona (Reniera) ruetzleri* n.sp. A, holotype, USNM 42490. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, scanning electron micrograph of spicula; E, close-up of sigmas. F, close-up of toxas (scale bars: A = 1 cm; B = 150 μ m; C = 400 μ m; D = 50 μ m; E = 5 μ m; F = 10 μ m).

Burton, 1954 (see below). Other North Atlantic species are *Haliclona (Gellius) angulata* (Bowerbank, 1866, Mediterranean-Atlantic, see De Weerd, 1986, 1989) and *Haliclona (Gellius) rava* (Stephens, 1912, North East Atlantic, ?Mediterranean, cf. De Weerd, l.c.). *H. (G.) tenerrima* is cushion-shaped, with larger oxeas (ca. 195-260 x 5-9.3 μ m), toxas of similar size but different shape, viz. weakly bent with suddenly recurved apices, smaller sigmas (ca. 6.5-10.5 x 0.5-0.8 μ m), and the subhalichondroid skeleton characteristic for the sub-

genus *Gellius*.

Haliclona (G.) angulata is a brittle, fragile, massive sponge, with oxeas of ca. 200-350 x 3.5-14 μ m, sharply curved toxas of ca. 43-75 x 0.2-2.5 μ m, strongly curved sigmas of ca. 7-15 x 0.2-1.2 μ m and the skeleton of the subgenus *Gellius*.

Haliclona (G.) rava forms thinly encrusting patches, with oxeas of ca. 130-165 x 4.8-8.4 μ m, weakly curved toxas of ca. 38-120 x 0.5 μ m, irregularly curved sigmas of ca. 4.8-12 x 0.5 μ m and the skeleton of the subgenus *Gellius*.



Fig. 13. Known distribution of *Haliclona (Reniera) ruetzleri* n.sp.

Haliclona (Reniera) tubifera (George & Wilson)
Figs. 2C, 3K, 14A-D

Reniera tubifera George & Wilson, 1919: 145, pl. LVII fig. 12, pl. LVIII fig. 15, pl. LIX fig. 16, pl. LXVI figs. 55a-c; [Non: Van Soest, 1980: 15 = *Haliclona (Soestella) vermeuleni* n.sp.; see below].
Adocia tubifera; Wells et al., 1960: 210, fig. 17.

Haliclona tubifera; De Weerd et al., 1991: 200, figs. 3g, 6a-c [Non: *Haliclona tubifera*; Lerner, 1996: 114 = *Halichoelona* sp.].

Haliclona permollis; De Laubenfels, 1947: 34; 1949: 11 [Non: *Isodictya permollis* Bowerbank, 1866: 278 = *Haliclona cinerea* (Grant, 1826), cf. De Weerd et al., 1986. Nec: *Haliclona permollis*; De Laubenfels, 1936b: 444 = *Rhizoniera* sp.; 1950a: 46, fig. 20 = *Haliclona (H.) implexiformis* (Hechtel, 1965); 1951: 258, fig. 2 = *Halichoelona* sp.; Wells et al., 1960: 209, fig. 5 = *Haliclona (Soestella) vermeuleni* n.sp., Little, 1963: 40 = *Haliclona* cf. *curacaoensis* (Van Soest, 1980); *Reniclonia permollis*; De Laubenfels, 1954: 67 = *Rhizoniera* sp.]

Haliclona hogarthi Hechtel, 1965: 20, text-fig. 1, pl. II fig. 1; Van Soest, 1980: 6, fig. 1, pl. I figs. 1, 2; Pulitzer-Finali, 1986: 160; Zca, 1987: 65, fig. 14.

Haliclona sp. (?); Little, 1963: 40, figs. 10, 12.

MATERIAL

NORTH CAROLINA: USNM 23610 (original specimen of George & Wilson, 1919; cf. Wells et al., 1960; Beaufort Harbor, U.S. Fish. Biol. Sta., Beaufort, 22-XII-1959; here proposed as lectotype).

SOUTH CAROLINA: USNM 30370 (Murrel's Inlet, floating docks, 27-X-1984, coll. R. Fox, labeled: *Adocia tubifera*); USNM 32292 (Murrel's Inlet, washed ashore, July 1982, coll. R. Fox, labeled: *Haliclona hogarthi* Hechtel).

FLORIDA: USNM 23686 (grass flats at St. Mark's Lighthouse, Sta. SM-30, 1-3 ft, 4-XI-1956, coll. R. Hathaway and F.J. Little, cf. Little, 1963: 40, as *Haliclona* sp.); USNM 23687 (grass flats at St. Mark's Lighthouse, Sta. SM-29, 1-3 ft, 16-XI-1956, coll. R. Hathaway and F.J. Little, cf. Little, 1963: 40, as *Haliclona* sp.); USNM 41806 (Florida Keys, mangrove island 400 m E of Big Torch Key, 0.3 m, on mangrove roots, 12-VII-1989, coll. W.H. de Weerd et al. and S. Viada; fragment is ZMA Por. 10935); USNM 41807 (same site as USNM 41806, 13-VII-1989, coll. T. Clarke); ZMA Por. 3765 (Key Biscayne, N Point, on *Rhizophora*, 1-XI-1963, coll. P. Wagenaar Hummelinck, cf. Van Soest, 1980: 7, as *Haliclona hogarthi*).

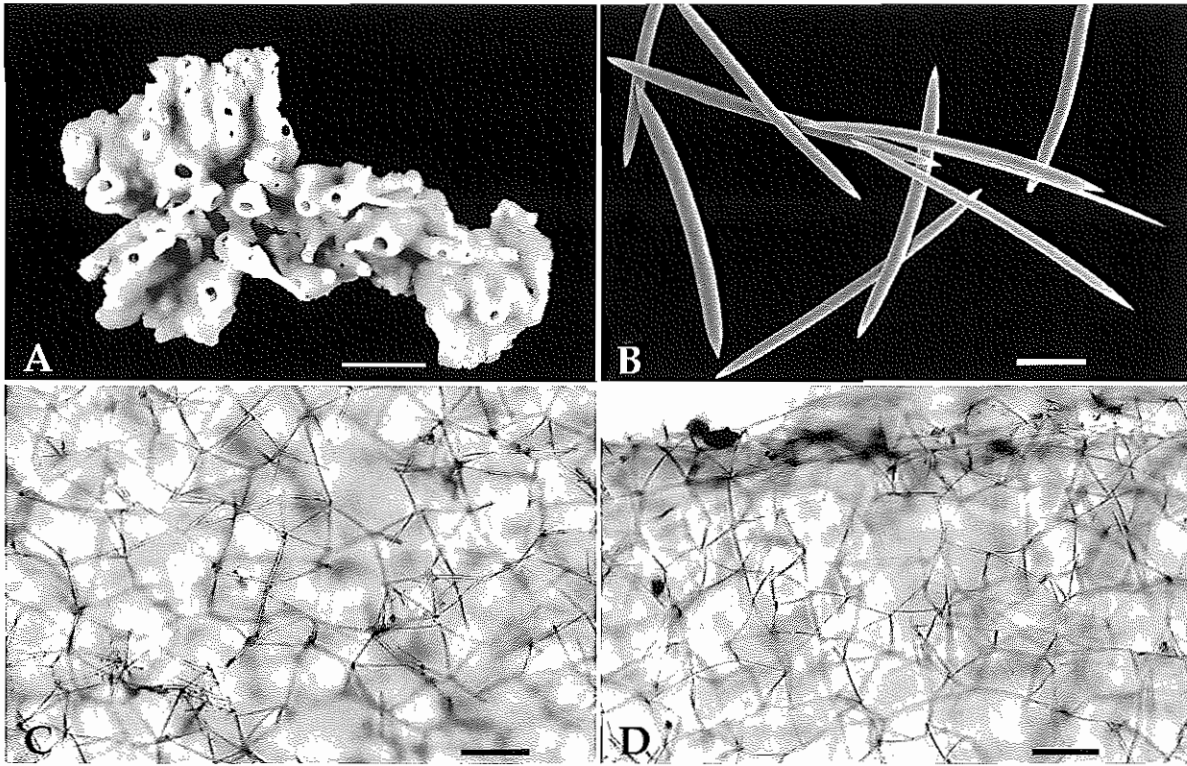


Fig. 14. *Haliclona (Reniera) tubifera*. A, preserved specimen. B, scanning electron micrograph of oxeas. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1.5 cm; B = 30 μ m; C, D = 150 μ m).

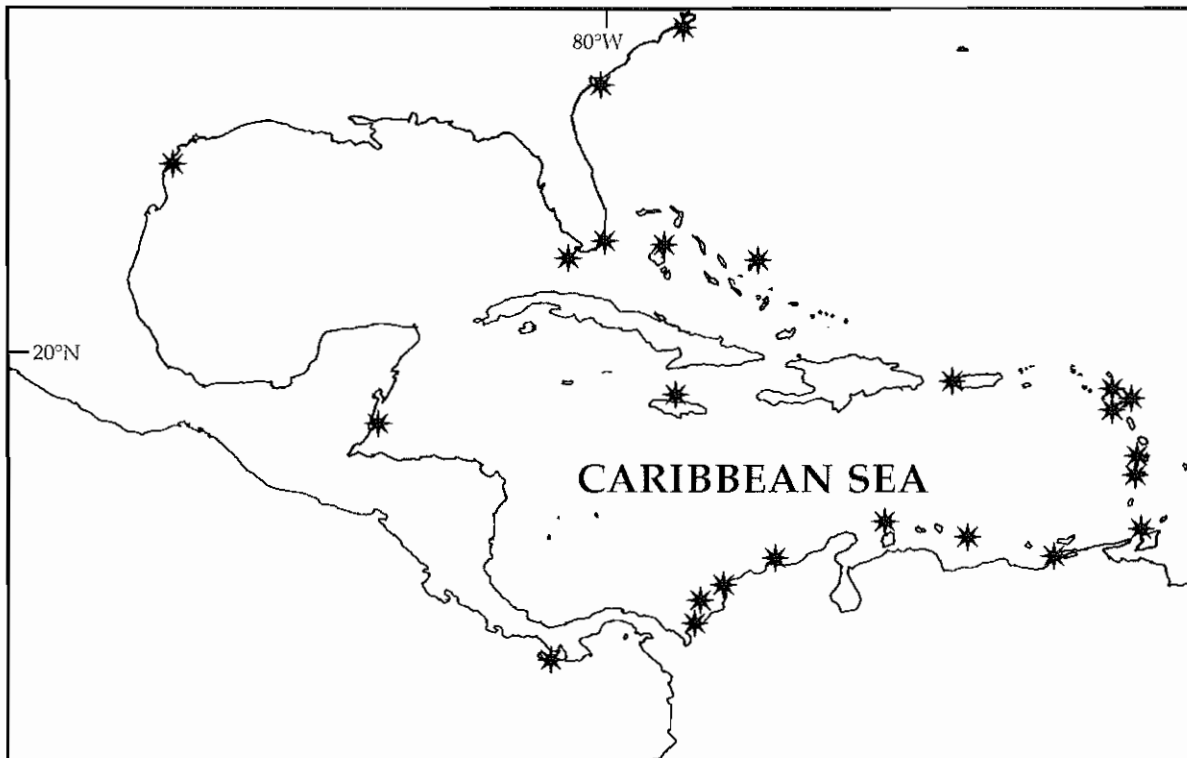


Fig. 15. Distribution of *Haliclona (Reniera) tubifera*.

TEXAS: USNM 22774 (South beach Corpus Christi, Sta. 2, 10-V-1949, coll. Aaron Seamster, id. by De Laubenfels as *Haliclona* sp.); USNM 23358 (Kingsville, from oyster shells, 1934, coll. C.T. Reed, labeled: *Haliclona permollis*? (Bow)).

BAHAMAS: USNM 30454 (Andros Island, British Cave Dive Exped., marine cave, 1981, labeled: *Pellina* sp.); USNM 42488 (San Salvador, near landing pier Bahamian Field Station, amongst seagrasses, 1.5 m, 17-XI-1990, coll. W.H. de Weerd); USNM 42489, (San Salvador, near landing pier Bahamian Field Station, amongst seagrasses, 1.5 m, 23-XI-1990, coll. W.H. de Weerd; fragment is ZMA Por. 10936).

JAMAICA: YPM 5033 (holotype *Haliclona hogarthi*, Port Royal, Jamaica).

PUERTO RICO: USNM 41849 (Parguera, W of Cayo Turrumote I, 40 ft., under coral rubble, 21-II-1990, coll. W.H. de Weerd and K. Smith); USNM 42369 (Parguera, W side Monkey Island, 1 m, on mangrove roots, 14-II-1990, coll. W.H. de Weerd and K. Smith).

ANTIGUA: ZMA Por. 7583 (harbor, 0.1 m, under stone, 18-III-1986, coll. J. Vermeulen, Sta. 86-208); ZMA Por. 15702 (jetty at little landing stage, 18-III-1986, coll. J. Vermeulen, Sta. 86-212).

GUADELOUPE: USNM 41783 (Rivière Salée, near mouth along N side and midway through channel on W side, intertidal, 18-VI-1989, coll. HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson, fragment of HBOI 18-VI-89-1-11).

ST. LUCIA: USNM 41724 (N of Soufrière Bay, Grand Caille Pt., 13°52'10"N 61°05'38"W, reef slope, 15 m, under coral rubble, 27-VI-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson).

ST. VINCENT: USNM 42300 (Kingstown Bay, 17°08'03"N 61°14'28"W, 3 m, under coral rubble, 30-III-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles March/April 1989, R/V Seward Johnson).

TRINIDAD: ZMA Por. 5834 (Gasparo Grande, 11-I-1955, coll. P. Wagenaar Hummelinck, # 655); ZMA Por. 10934 (Port of Spain, on wreck ca. 800 m off coast, 1.5-2.5 m, 8-II-1986, coll. J. Vermeulen, Sta. 86-92-1).

VENEZUELA: USNM 42362 (Mochima Bay, 10°21'05"N 64°20'05"W, 0.5 m, on mangroves, 6-VI-1988, HBOI/BMR Exped. Venezuela/ Colombia, fragment of HBOI 6-VI-88-3-12); USNM 42363 (Los Roques, Dos Mosquises Sur, NW side, 0.1 m, side stone, 21-IV-1989, coll. W.H. de Weerd).

BONAIRE: ZMA POR. 11143 (Kreek di Pedro, March 1992, coll. G. van Moorsel, #070/102b).

ARUBA: ZMA Por. 3846 (Lagoen Boekoeti, rock, sand, seagrasses, tidal area, 29-XII-1948, coll. P. Wagenaar Hummelinck).

COLOMBIA: USNM 41811 (10°10'05"N 75°44'02"W, 1-3 ft., on mangrove roots, 10-V-1988, HBOI/BMR Exped. Venezuela/ Colombia, fragment of HBOI 10-V-88-1-8); USNM 42394 (11°19'0"N 74°07'9"W, 0-3 ft., on mangrove roots, 16-V-1988, HBOI/BMR Exped. Venezuela/ Colombia, fragment of HBOI 16-V-88-2-2); ZMA Por. 13254 (Islas de San Bernardo, Isla T'ntipán, on mangrove root, 28-VIII-1989, coll. S. Zea # PSB 085); ZMA Por. 13255 (same data, coll. S. Zea # PSB 086).

BELIZE: numerous specimens in the USNM collection (see De Weerd et al., 1991). In addition: USNM 34632 (twin Cays, 24-V-1985, coll. I. Goodbody); ZMA Por. 13015 (fragment USNM 41747, Twin Cays, Grouper Gardens, on mangrove roots, 0.5 m, 7-XII-1088, coll. W.H. de Weerd).

PANAMA (PACIFIC SIDE): ZMA Por. 14981 (NW Uva Islands, Contreras Islands, Gulf of Chiriquí, *Psammocora* beds, 13-14.5 m, 13-XII-90, coll. W.H. de Weerd & P. W. Glynn); ZMA Por. 14982 (14981 (NW Uva Islands, Contreras Islands, Gulf of Chiriquí, 7.5-13.5 m, 14-XII-1990, coll. W.H. de Weerd & P.W. Glynn).

DESCRIPTION. - Shape and size: very variable; commonly the sponge consists of a cushion-shaped base with several volcano- or chimney-shaped oscular elevations, up to 5 cm or more. Diameter of the oscula 1-10 mm. Frequently there are numerous thin, long proliferations branching off from the main body, which may form large masses completely free from the substratum. The sponge may also form delicate clusters of anastomosing thin branches of 2-5 mm thick, with numerous small oscula of 0.5-1 mm in diameter, situated on the top of slight elevations or flush with the surface.

Consistency: soft, compressible, fragile; mucus strands appear when the sponge is squeezed or pulled apart.

Surface: smooth, even, slightly punctate.

Colour: different shades of purple and pink.

Ectosomal skeleton: a very regular, tangential, unispicular, isotropic reticulation.

Choanosomal skeleton: a very regular, unispicular, isotropic reticulation; skeleton commonly reinforced by short, loosely organized spicule tracts of 3-6 spicula thick.

Spongin: usually confined to the nodes of the spicula, occasionally more abundant.

Spicula: oxeas, sharply pointed, hastate, commonly thinner in the middle than near the ends, 104.4-171.7 (139 ± 14.6) x 4.1-9.5 (6.5 ± 1.2) µm.

Ecology: mangrove roots and peat banks, seagrass meadows, shallow sandy bays and fore reefs. Depth range from very shallow to ca. 10 m.

Distribution (Fig. 15): North Carolina (George & Wilson, 1919), Jamaica (Hechtel, 1965), Florida, La Désirade, Bonaire, Curaçao, (Van Soest, 1980), Belize (De Weerd et al., 1991), South Carolina, Bermuda, Texas, Bahamas, Jamaica, Puerto Rico, Guadeloupe, Barbuda, Antigua, St.

Lucia, St. Vincent, Trinidad, Venezuela, Colombia.

REMARKS. - *Haliclona (Reniera) tubifera* is a common species, occurring throughout the Caribbean, but it may be difficult to identify for the non-specialist. It shares certain characters with *H. (R.) mucifibrosa*, like colour, growth form and the production of slime strands, but the shape is more delicate, the consistency softer, the slime strands less pronounced, the skeleton more regular and more unispicular and the oxeas smaller. It also shows some resemblance to *Haliclona (Soestella) vermeuleni* n.sp., a species also erroneously referred to as *Haliclona permollis*, like *H. (R.) tubifera*, but this species has a more irregular, basically cushion-shaped growth form, it does not form long proliferations like *H. (R.) tubifera*, nor pronounced oscular chimneys like *H. (R.) mucifibrosa*, and its skeleton forms the somewhat irregular reticulation with ill-defined primary and secondary lines with rounded meshes typical for the subgenus *Soestella* n. subg. (see above).

The taxonomic history of the species is rather complicated, firstly because *H. (R.) tubifera* is closely related to the eastern Atlantic *Haliclona (R.) cinerea* (Grant, 1826), secondly, because Hechtel (1965) described his *Haliclona hogarthi* without paying attention to George & Wilson's (1919) description and material of *Reniera tubifera*. *H. (R.) tubifera* and *H. (R.) cinerea*, though not conspecific, share so many characters that they came up as sister species in the phylogenetic analysis of De Weerd (1986; *H. (R.) tubifera* was by that time named *H. hogarthi* by the present author). However, many species have been described in the past, especially by Bowerbank (1866), which are synonymous with *H. (R.) cinerea*, amongst which *Isodictya permollis* Bowerbank (1866) (cf. De Weerd, 1986 and De Weerd & Stone [in] De Weerd, 1987). In 1954, De Laubenfels introduced the name *permollis* for a cosmopolitan sponge, and made *Isodictya permollis* Bowerbank type species of a new subgenus *Reniclona* of the genus *Haliclona*. He explained that the name *cinerea* could not be used because *Isodictya cinerea* Bowerbank was made genotype of the genus *Adocia* by Burton (1934). Apart from De Laubenfels' 1947 and 1949 records of *H. permollis*, which conform to *H. (R.) tubifera*, all his other

records represent a variety of different chalinid species (material in the USNM has been studied). This makes it apparent that De Laubenfels overestimated the variability of characters in chalinid species.

H. (R.) tubifera is quite certainly not a cosmopolitan species, but it is not excluded that it has an eastern Pacific-western Atlantic distribution pattern. Specimens were found in the Gulf of Chiriquí, eastern Pacific, which are indistinguishable in skeletal architecture and size and shape of the oxeas from *H. (R.) tubifera*, though the sponges were much smaller. Whether these specimens are really conspecific with *H. (R.) tubifera* or represent so-called 'geminat' species can probably only be established by means of other techniques than the morphological characters used here. Advocates of the principles of cladistic biogeography (e.g., Humphries & Parenti, 1999) ascribe such repeated distribution patterns of closely related species at both sides of the Panamanian Isthmus to the separation of a previously continuous eastern Pacific-western Atlantic population by the rise of the Panamanian Isthmus during the Pliocene, 3.1 to 3.5 million years ago (e.g., Rosen, 1976; Lessios & Cunningham, 1990; Knowlton, et al., 1993). It is quite possible that *H. (R.) tubifera* follows this pattern, with either a sister-species at the other side of Panama (making it less closely related to the eastern Atlantic *H. (R.) cinerea*), or with a conspecific population at the other side, due to the lack of morphological divergence after the rise of the Isthmus. A similar pattern occurs in *H. (Soestella) caerulea* (see below).

KEY TO THE SPECIES OF THE SUBGENUS *RENIERA*

- 1a. Sponges bright turquoise green, soft, encrusting on mangrove roots, oxeas very slender, slightly to rather strongly curved, with long, sharp points, 75-108 x 2-4 µm *Haliclona (R.) manglaris*
- b. Sponges light brown, purple, pink or colour unknown, cushion-shaped, tubiform or branched, with or without microscleres, oxeas larger 2
- 2a. Sponges very delicate, consisting of slender, anastomosing branches, with or without microscleres 3
- b. Sponges consisting of less delicate, thicker branches, tubes or cushions, without microscleres 4

- 3a. Sponges light brown, consisting of extremely delicate, slender; anastomosing branches, spicula oxeas, toxas and sigmas; oxeas slender, with rather long and sharp points, 105-170 x 3.3-6 µm; toxas of variable shape and size, weakly to strongly curved, with straight legs or slightly recurved apices, 21-96.5 x 0.5-1.9 µm; sigmas regularly curved or slightly contorted, 9.5-18.5 x 0.5-1.3 µm *Haliclona (R.) ruetzleri* n.sp.
- b. Sponges bluish purple, pink, purplish gray or light brown, consisting of delicate, slender, anastomosing branches, but without microscleres, forming slime-strands when pulled apart, oxeas sharply pointed, hastate, commonly thinner in the middle than near the ends, size 105-170 x 4-9.5 µm.... *Haliclona (R.) tubifera*
- 4a. Thick cushions with a regular outline and large oscula flush with the surface, colour pinkish violet, oxeas blunt-pointed to strongly lute, 95-165 x 3.5-9.5 µm *Haliclona (R.) implexiformis*
- b. Thickly encrusting base with oscular chimneys, with or without long, rope-like proliferations, forming slime-strands when pulled apart 5
- 5a. Sponges bluish purple, pink, purplish gray or light brown, usually forming long, rope-like proliferations, producing delicate slime strands when pulled apart, oxeas sharply pointed, hastate, commonly thinner in the middle than near the ends, size 105-170 x 4-9.5 µm *Haliclona (R.) tubifera*
- b. Sponges grayish purple or bluish gray with pronounced, truncate oscular chimneys, without rope-like proliferations, producing abundant slime-strands when pulled apart, oxeas robust needles of 185-250 x 7.5-13.5 µm *Haliclona (R.) mucifibrosa*

SPECIES OF THE SUBGENUS *SOESTELLA*
N. SUBG.

Haliclona (Soestella) caerulea (Hechtel, 1965)
Figs. 3F, 16A-E

Sigmadocia caerulea Hechtel, 1965: 30, fig. 5; Pl. III fig. 4;

Sigmadocia caerulea; (erroneous spelling of *caerulea*)
Van Soest, 1980: 21, fig. 7, Pl. II fig. 4.

Sigmadocia caerulea; Zca, 1987: 69, fig. 16, Pl. 7 fig. 7.

Haliclona caerulescens; (pars) De Laubenfels, 1936b: 444 [Non: *Reniera caerulescens* Topsent, 1918 = *Haliclona (Reniera) caerulescens*]

Haliclona caerulea; Wulff, 1996: 167, Fig. 3; Lehnert & Van Soest, 1998: 91.

MATERIAL

JAMAICA: YPM 5037 (holotype, Port Royal, Rastais Wreck); USNM 42293 (fragment of holotype); YPM 5198 (paratype); USNM 24497, ZMA Por. 13356 (fragments of YPM 5198); ZMA Por. 12889 (Discovery Bay, lagoon, 1 m, 24-III-1993, coll. & don. H. Lehnert # 99); ZMA Por. 12895 (Discovery Bay, lagoon, 1.5 m, 22-III-1993, coll. & don. H. Lehnert # 90).

PUERTO RICO: USNM 42291, 42368 (Parguera, NE side Isla Maguycys, on mangrove roots, 1 m, 15-II-1990, coll. W.H. de Weerd and K. Smith).

VIRGIN ISLANDS: ZMA Por. 9988 (Tortola Island, Bluff Bay, 1991, coll. W. Gladfelter).

MARTINIQUE: USNM 41789, 41791, 41794, 41795 (Baie du Marin, 14°27'00"N 60°53'18"W, on mangrove root, 0.5 m, 2-VII-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July); USNM 41798 (Baie de Fort-de-France, Point des Sables, 14°3'50"N 61°02'30"W, grass flat, *Thalassia* predominant, 2 m, 4-VII-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989); USNM 41800 (Baie de Fort-de-France, 14°35'19"N 61°04'08"W, on buoy, 5-10 ft., 5-VII-1989, coll. J. Reed, HBOI/BMR Exped. Lesser Antilles June/July 1989, fragm. of HBOI 5-VII-89-2-4).

ST. VINCENT: USNM 42494 (NW De Volet Pt., below cliff on S wall, 13°21'85"N 61°12'70"W, 10-50 ft., 1-IV-1989, coll. HBOI/BMR Exped. Lesser Antilles March/April 1989).

GRENADA: USNM 41779 (S side, 12°00'20"N 61°43'42"W, on mangrove root, 0.1 m, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles March/April 1989); USNM 42299 (off St. George Harbour, 12°03'52"N, 61°45'58"W, side rock boulder, 1.5 m, 3-IV-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles March/April 1989); ZMA Por. 5727 (Hog Island, near Pt. Salinas, on *Rhizophora*, 0-0.5 m, 8-VII-1967, coll. P. Wagenaar Hummelinck, # 1550).

BOINAIRE: ZMA Por. 6410 (Lagoon, on mangrove root, 0.5 m, 30-XII-1986, coll. W.H. de Weerd).

CURAÇAO: ZMA Por. 4448 (St. Jorisbaai, NW side, muddy sand, rock, old tires, *Thalassia*, *Halophila*, 0.25-1 m, 25-II-1970, coll. P. Wagenaar Hummelinck); ZMA Por. 6412 (Fuikbaai, sandy bottom with stones, 3 m, coll. W.H. de Weerd); ZMA Por. 10759 (Spaanse Water, entrance, 1989, coll. M. Kucnen, 3A).

VENEZUELA: USNM 42292 (National Park Morrocoy, off coast between Tucacas and Chichirivichi, July 1987, on mangrove oyster, coll. B. Alvarez).

COLOMBIA: USNM 41810 (10°10'5"N 75°44'2"W, on mangrove root, 1-3 ft., 10-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia 1988, fragm. of HBOI 10-V-88-1-2); 41812 (10°10'05"N 75°44'02"W, on mangrove root, 1-3 ft., 10-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia 1988, fragm. of HBOI 10-V-88-1-12); USNM 41813 (10°10'05"N 75°44'2"W, on mangrove root, 1-3 ft., 10-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia 1988, fragm. of HBOI 10-V-88-1-22); USNM 41814 (10°10'68"N 75°45'01"W, mangrove channel, 1-15 ft., 10-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia,

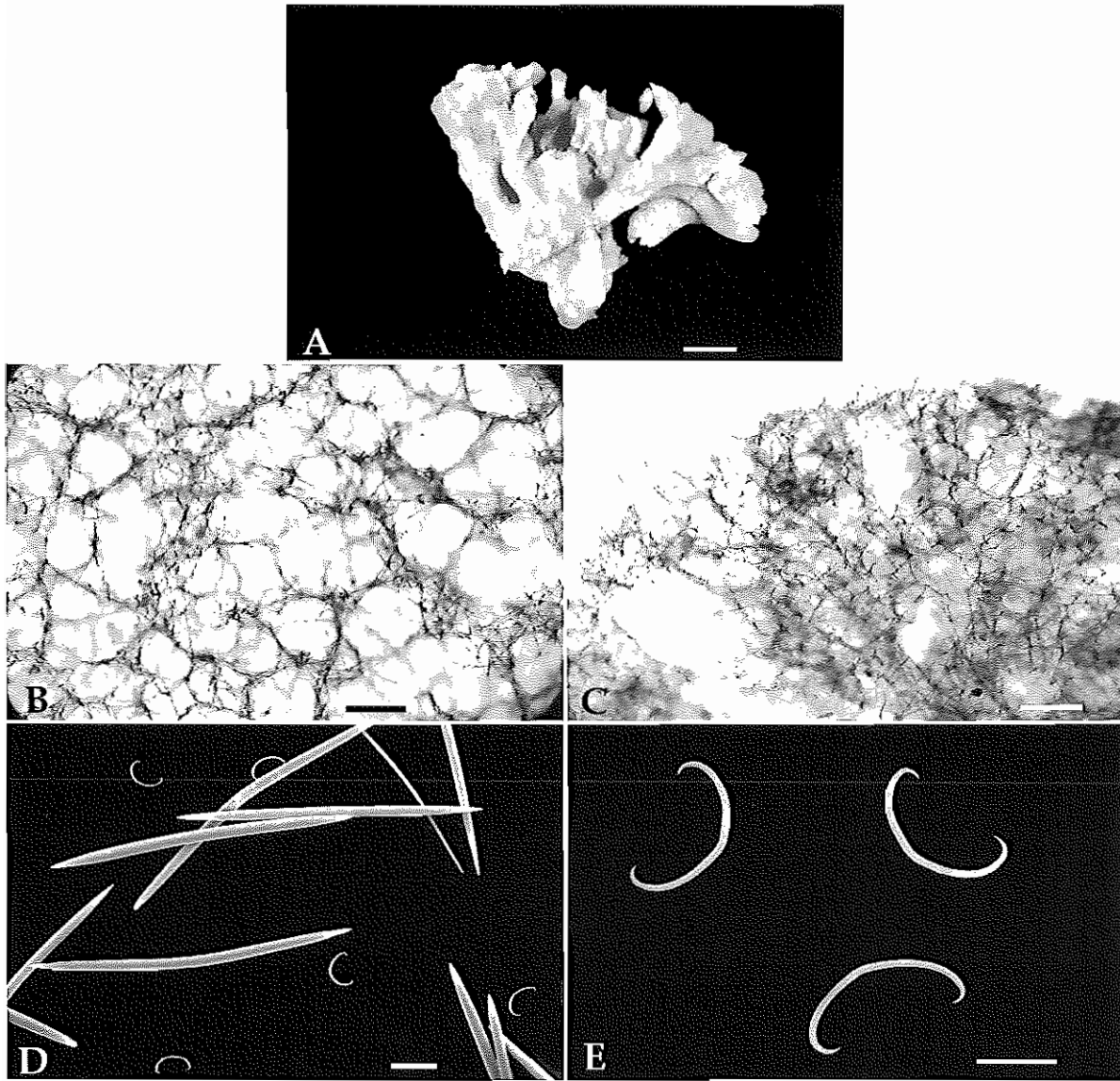


Fig. 16. *Haliclona (Soestella) caerulea*. A, preserved specimen, USNM 41789. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, scanning electron micrograph of oxeas and sigmas. E, close-up of sigmas (scale bars: A = 1 cm; B, C = 300 μ m; D, E = 25 μ m).

1988, fragm. of HBOI 10-V-88-2-21); USNM 41815 (10°10'65"N 75°43'73"W, on mangrove root, 0-3 ft., 12-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia 1988, fragm. of HBOI 12-V-88-2-2); USNM 41816 (10°10'65"N 75°43'73"W, mangrove root, 0-3 ft., 12-V-1988, coll. HBOI/BMR Exped. Venezuela/Colombia 1988, fragm. of HBOI 12-V-88-2-5).

BELIZE: USNM 51543 (Carric Bow Cay, outer fore reef, 90 ft., 27-VI-1995, coll. K. Smith, # KS 95-4).

PANAMA (PACIFIC SIDE): USNM 42476, ZMA Por. 14661 (Gulf of Chiriquí, NW side Uva Island, back reef flat, 6 m, 8-XII-1990, coll. W.H. de Weerd & P. W. Glynn); USNM 42477, 42478 (Gulf of Chiriquí, NW side Uva Island, *Caulerpa sertularioides* bed, sand and maerl, 12-15 m, 9-XII-

1990, coll. W.H. de Weerd & P. W. Glynn); USNM 42479, ZMA Por. 14983 (Gulf of Chiriquí, NW side Uva Island, *Psammocora* beds, 18-24 m, 10-XII-1990, coll. W.H. de Weerd & P. W. Glynn); USNM 42480, 42481 (Gulf of Chiriquí, Isla Cavada, Secas Island, sand bottom with large beds of the red algae *Acanthophora spicifera*, with scattered corals, 4.5-5 m, 15-XII-1990, coll. W.H. de Weerd & P. W. Glynn).

DESCRIPTION. - Shape and size: irregularly cushion-shaped with oscular mounds or chimneys, also digitate; the digitations are often fused in the basal parts with a tendency to become laterally

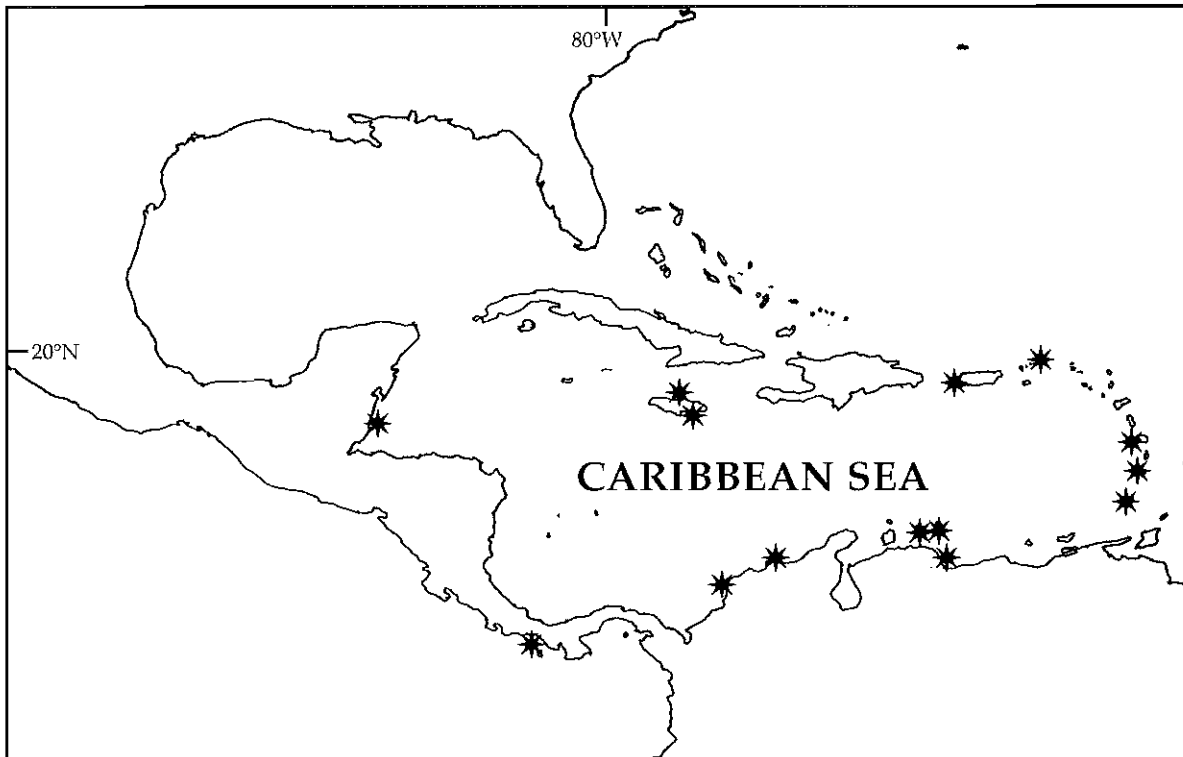


Fig. 17. Distribution of *Haliclona (Soestella) caerulea*.

compressed. Frequently, several thin, short proliferations branch off from the distal parts. Sponges to about 8 cm high, digitations 0.3-1 cm in diameter. Oscula not abundant, irregularly scattered along the branches, 1-4 mm in diameter, flush with the surface or slightly raised.

Consistency: soft to moderately firm, compressible, rather fragile.

Surface: smooth, even, somewhat punctate.

Colour: yellowish green to sky blue, rarely light purplish brown in the living state, light tan in spirit.

Ectosomal skeleton: a tangential, paucispicular reticulation with more or less clearly defined rounded to polygonal meshes of 170-400 μm in diameter; with many spicula in confusion.

Choanosomal skeleton: a paucispicular reticulation with ill-defined primary and secondary lines, with an intermediate amount of choanosomal spaces.

Spongin: scarce to moderately abundant, at the nodes of the spicula, occasionally forming a thin sheath around individual spicula.

Spicula: oxeas: slender, slightly curved, hastate,

with sharp or blunt-pointed endings, rarely strongly reticulate, 127.6-204.2 (167.2 ± 19.1) \times 3.0-9.5 (6.2 ± 1.3) μm . Sigmas: regularly C-shaped and slightly centrangulated, or more weakly bent, 12.8--27.8 (19.2 ± 2.6) \times 0.5-1.9 (1.0 ± 0.3) μm .

Ecology: on mangrove roots, rocks, and artificial substrates like buoys and tires, in shallow water to about 27 m.

Distribution (Fig. 17): Jamaica (Hechtel, 1965), Puerto Rico, Curaçao, (Van Soest, 1980), Virgin Islands, Martinique, St. Vincent, Grenada, Bonaire, Venezuela, Colombia, Belize; Pacific side Panama (Wulff, 1996, and pers. obs.).

REMARKS. - *Haliclona (Soestella) caerulea* is well characterized by the combination of shape, colour, skeletal architecture and the presence of sigmas. It cannot be confused with the two other Caribbean chalinids with sigmas as the only microsclere category, *H. (S.) piscaderaensis* (Van Soest, 1980) and *H. (Halichoelona) stoneae* n.sp. (see below). *H. (S.) piscaderaensis* is a thickly encrusting, purple sponge with a characteristic strongly reticulate surface. The oxeas are of similar size as in

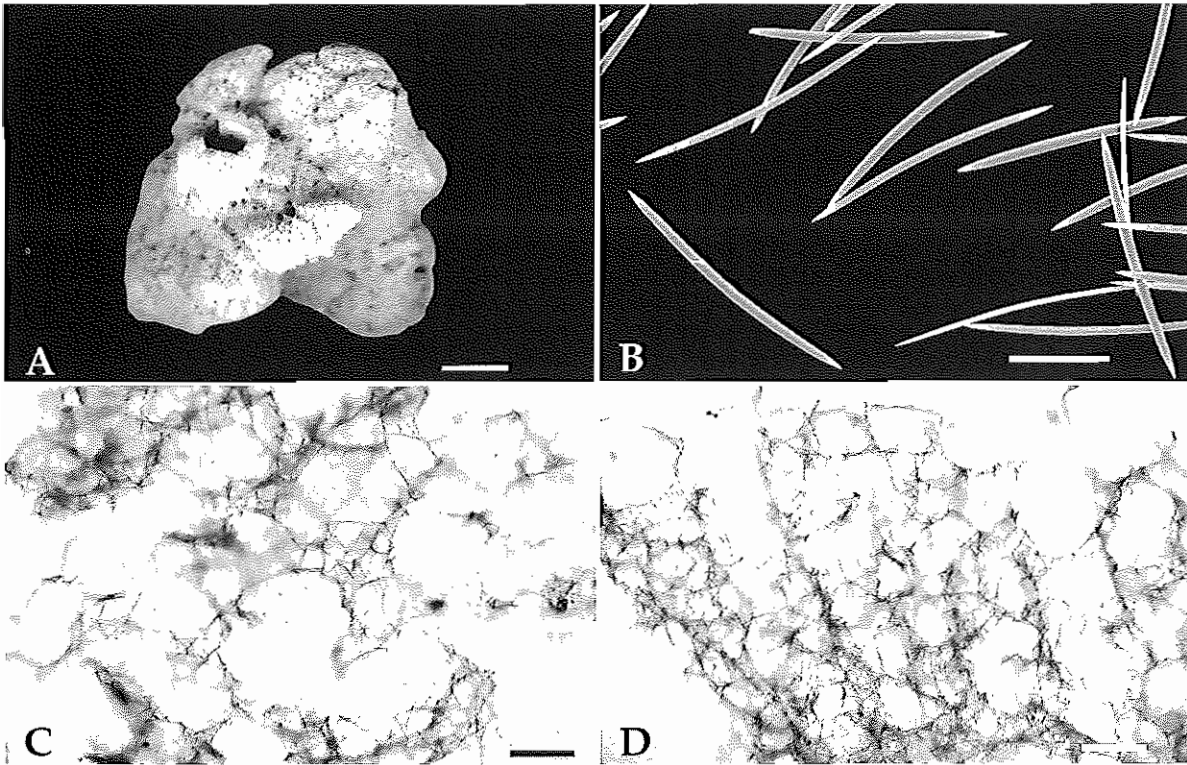


Fig. 18. *Haliclona (Soestella) lehneri* n.sp. A, holotype, ZMA Por. 13484. B, scanning electron micrograph of oxeas. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1 cm; B = 50 μ m, C, D = 200 μ m).



Fig. 19. Known distribution of *Haliclona (Soestella) lehneri* n.sp. (*) and *Haliclona (S.) luciensis* n.sp. (⊛).

II. (S.) caerulea (140-225 x 2.3-7.4 μm), but the sigmas are smaller (ca. 7-12.5 μm).

H. (H.) stoneae n.sp. forms thick cushions with a regular outline and conspicuous, large oscula; it has the subisotropic skeleton of the subgenus *Halichoclona*, much larger oxeas (ca. 320-360 x 7.5-13 μm) and smaller sigmas (ca. 12.5-21 μm).

From the material identified by De Laubenfels (1936b) as *Haliclona coerulescens* (Topsent, 1918), only USNM 22240 conforms to *II. (S.) caerulea* (see also Wulff, 1996). This specimen came from the Atlantic side of Panama (Ft. Randolph), whilst the other three were taken from the Pacific side. These, USNM 22250, 22208 and 22219, are a *Xestospongia* and two, probably conspecific chalinids respectively. As he did with his identification of specimens as *Adocia neens* (Topsent, 1918) (see discussion *Haliclona (Halicl.) implexiformis*), De Laubenfels probably mistook São Thomé (West Africa), the locality from which Topsent described *Haliclona coerulescens* (as *Reniera*) for St. Thomas, which is located in the Caribbean.

Wulff's (1996) observation that *H. (S.) caerulea* occurs at both sides of the Panamian Isthmus is confirmed by material collected by the present author in the Gulf of Chiriquí. Whether the two populations are conspecific or consist of geminate species cannot be solved at present, but in either case this distribution pattern may be the result of the Pliocene uplift of the Panamanian Isthmus, which is generally recognized as the vicariance event leading to sister-group relations at both sides of the Isthmus (e.g., Rosen, 1976; Lessios & Cunningham, 1990; Knowlton, et al., 1993).

***Haliclona (Soestella) lehnerti* n.sp.**

Figs. 3N, 18A-D

MATERIAL

JAMAICA: Holotype: ZMA Por. 13484 (Discovery Bay, blue hole near Columbus Park, 8 m, 7-VI-1993, coll. H. Lehnert # J.255). Paratype: ZMA Por. 13485 (Discovery Bay, blue hole near Columbus Park, 12 m, 7-VI-1993, coll. H. Lehnert # J.259).

DESCRIPTION. - Shape and size: thick elevated cushions of constricted diameter with low digitations which are partly hollow. Size of holotype 3 x 3 x 1.8; oscula circular, 0.1 to 0.4 cm in diame-

ter, at the top of the elevations.

Consistency: moderately firm, incompressible in the dried state.

Surface: somewhat uneven, slightly hispid, with conspicuous meandering and anastomosing grooves.

Colour: dark red alive, dark yellowish cream in the dried state.

Ectosomal skeleton: a very incomplete, uni-paucispicular, tangential reticulation with ill-defined rounded to elliptical meshes of 190-570 μm in diameter, framed by spicula lines of 2-4 spicula thick.

Choanosomal skeleton: ill-defined paucispicular primary lines, irregularly connected by ill-defined paucispicular secondary lines, with numerous rounded to subelliptical meshes of 200-300 μm in diameter.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas, straight to slightly, evenly curved, hastate, with sharp points, 126.9-156 (141.2 \pm 7) x 3.3-6.3 (5 \pm 1) μm .

Ecology: the two specimens were found at 8-12 m depth in a reef habitat.

Distribution (Fig. 19): known only from Jamaica.

ETYMOLOGY. - Named after its collector, Helmut Lehnert, for his contributions to the knowledge of Jamaican sponges.

REMARKS. - *Haliclona (S.) lehnerti* n.sp. is especially characterized by the conspicuous meandering aquiferous canals at the surface and by its life colour (dark red). The shape is somewhat similar to that of *Haliclona (S.) smithae* n.sp. (see below), but this species has a smooth surface, a yellow-greenish colour and rhabdites next to the oxeas.

***Haliclona (Soestella) luciensis* n.sp.**

Figs. 3E, 20A-D

MATERIAL

ST. LUCIA: Holotype: USNM 41719 (Petit Piton, 13°50'38"N 61°04'72"W, fringing reef, shallow slope to 60 ft., 27-VI-1989, coll. J. Reed, HBOI/BMR Exped. Lesser Antilles, June/July 1989, R/V Seward Johnson, fragment of HBOI 27-VI-89-2-4). Paratype: ZMA Por. 7586 (same data as the holotype).

DESCRIPTION. - Shape and size: laterally spreading, thickly encrusting to lobate/cushion-shaped,

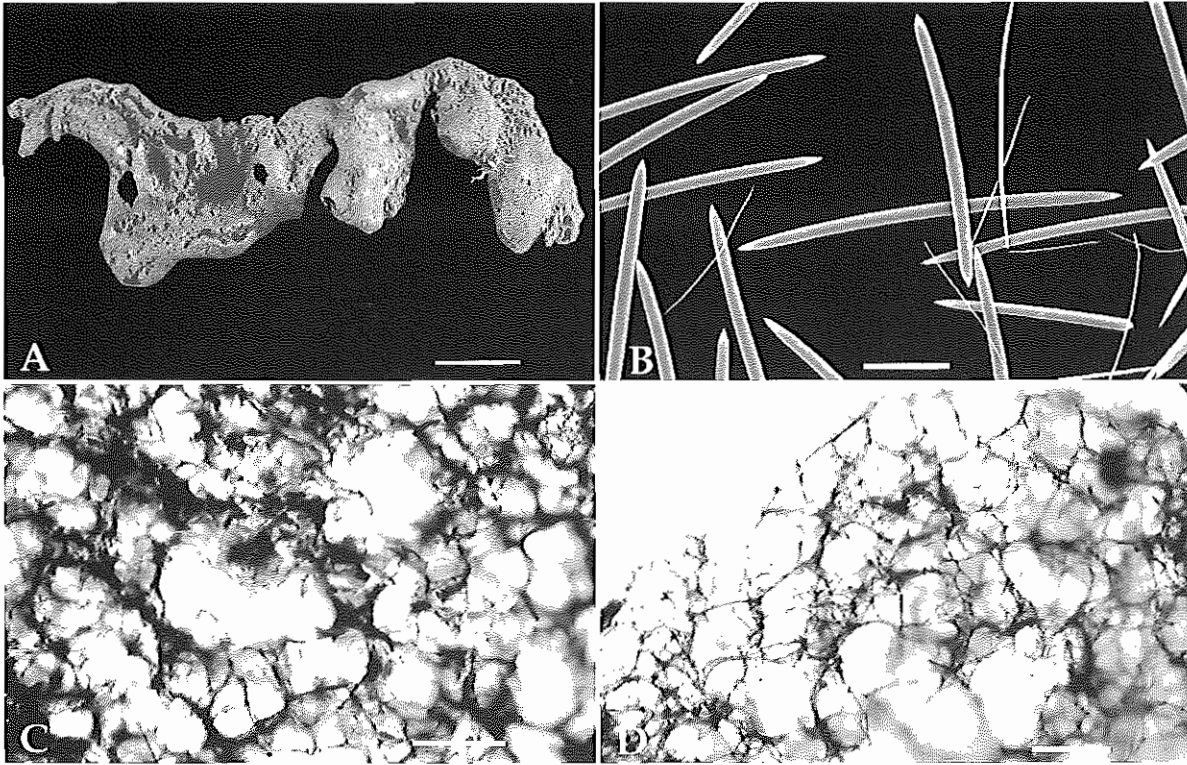


Fig. 20. *Haliclona (Soestella) luciensis* n.sp. A, holotype, USNM 41719. B, scanning electron micrograph of oxeas and rhaphides. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 2 cm; B = 50 μ m; C = 350 μ m; D = 250 μ m).

to 2.5 cm high and 1.5 cm thick. Oscula rather wide and conspicuous, circular, to 0.8 cm in diameter.

Consistency: very soft, fragile.

Surface: smooth, even.

Colour: dark brown alive and in spirit.

Ectosomal skeleton: a tangential, rather incoherent reticulation of vaguely strewn oxeas around and in between irregularly shaped meshes of 250-665 μ m in diameter.

Choanosomal skeleton: a subanisotropic reticulation of ill-defined paucispicular primary lines, irregularly connected by unispicular primary ones, with many spicula in confusion and many rounded to elliptical meshes and choanosomal spaces.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas, straight or slightly curved, with short, conical points, 144.1-174 (161.6 \pm 8.8) \times 4.4-7 (6.2 \pm 0.8) μ m. Rhaphides, not abundant, but clearly present, mainly in the ectosome, 51-92.8 (73.3 \pm 11.3) \times ca. 0.3 μ m.

Ecology: known only from a shallow reef slope to 18 m depth.

Distribution (Fig. 19): known only from the type locality, St. Lucia.

ETYMOLOGY. - Named after the type locality, St. Lucia.

REMARKS. - *Haliclona (S.) luciensis* n.sp. is remarkably similar in shape, colour, consistency and skeletal architecture to *H. (S.) melana* Muricy & Ribeiro (see below), a species originally described from Brazil. *H. (S.) melana* was also found in St. Lucia, but not elsewhere in the Caribbean, like *H. (S.) luciensis*. The differences between the two species are the presence of toxas and absence of rhaphides in *H. (S.) melana*, opposed to the presence of rhaphides and absence of toxas in *H. (S.) luciensis*, the presence of pigment grains in *H. (S.) melana*, and the shape and size of the oxeas: 144-174 μ m in *H. (S.) luciensis*, with short, conical points, 118-154 μ m in *H. (S.) melana*, with long,

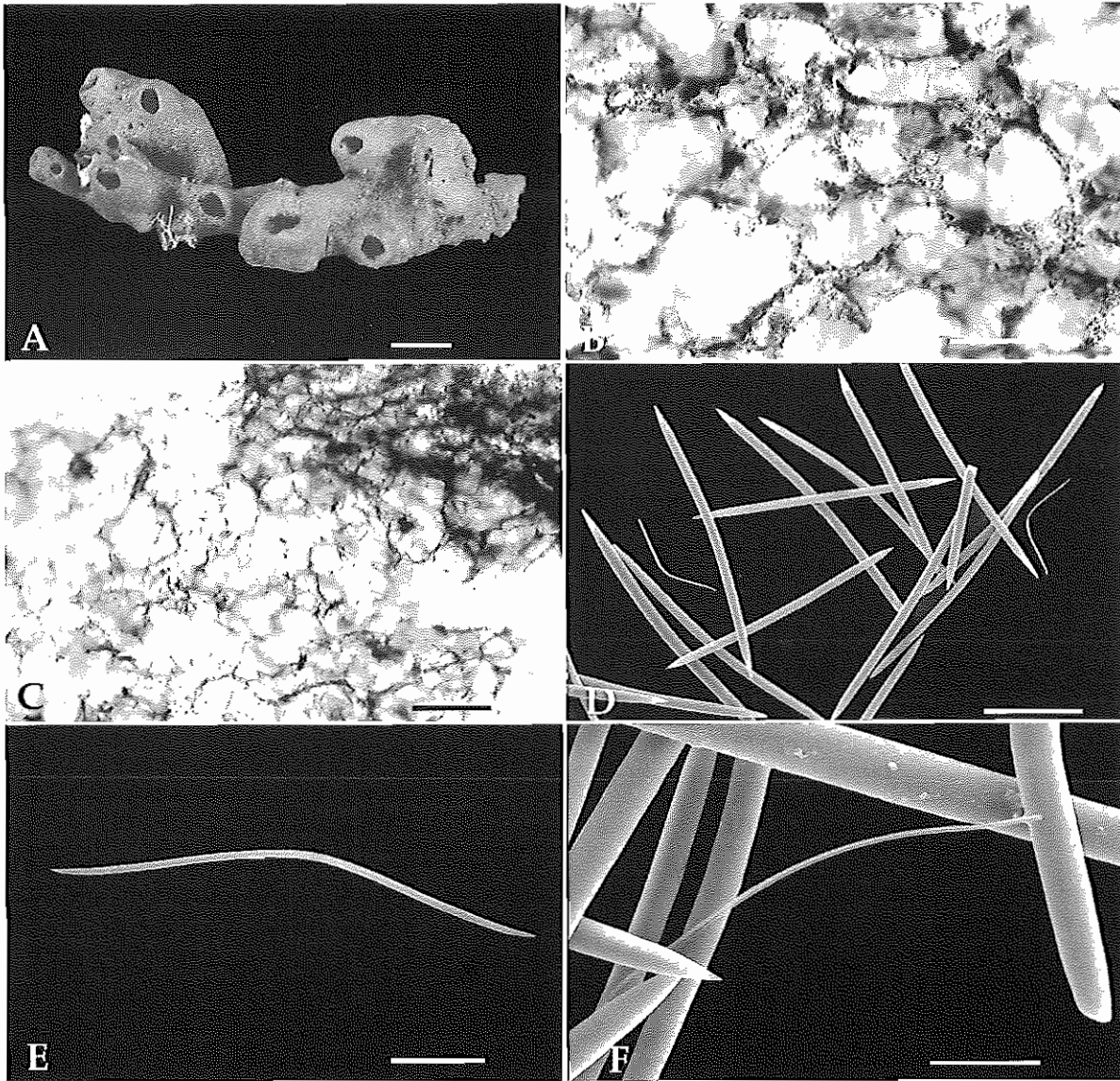


Fig. 21. *Haliclona (Soestella) melana*. A, preserved specimen, USNM 41720. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, scanning electron micrograph of oxes and toxas. E, detail of toxa. F, toxa of Brazilian specimen, ZMA Por. 13483 (scale bars: A = 1 cm; B, C = 350 μ m; D = 50 μ m; E, F = 10 μ m).

sharp points. Although the differences are very subtle the species are considered as being different, but it is striking that two such dark coloured species, with the same shape and soft consistency, were in the Caribbean exclusively found in St. Lucia.

The single other Caribbean species with raphides is *Haliclona (S.) smithae* n.sp. (see below). This species differs clearly from *H. (S.) luciensis* by its shape (tubiform), firm, incompressible, fragile consistency and yellow-greenish colour.

***Haliclona (Soestella) melana* Muricy & Ribeiro, 1999**

Figs. 3R, 21A-F

Haliclona melana Muricy & Ribeiro, 1999: 101, Figs. 2E, 11-12.

MATERIAL

ST. LUCIA: USNM 41720, ZMA Por. 7587 (Castrics, Vigie Point, 50 m from shore, 14°01'69"N 61°00'82"W, on top of coral heads, 10 ft., 26-VI-1989, coll. J. Reed, IIBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward

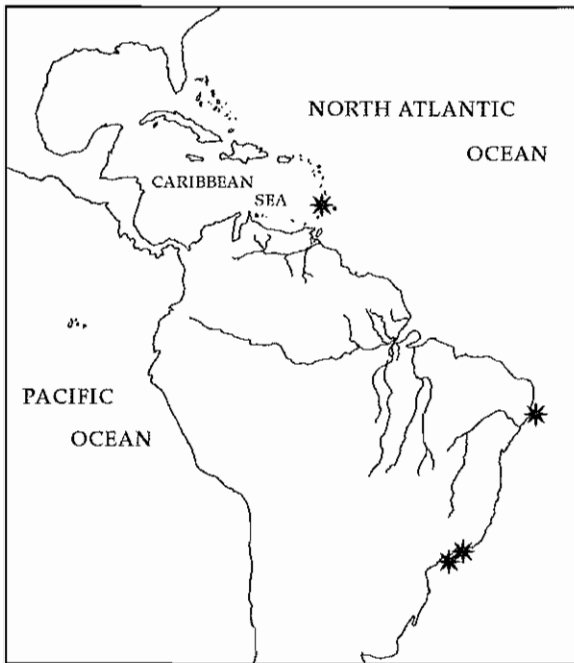


Fig. 22. Known distribution of *Haliclona (Soestella) melana*.

Johnson, fragment of HBOI 26-VI-89-1-3).

BRAZIL: ZMA Por. 13483 (São Paulo, São Sebastião, between Ponta do Baleeiro and Praia de Baraquegaba, 5-I-1995, coll. & don. E. Hajdu, fragment of UFRJ POR. 4538).

DESCRIPTION. - Shape and size: repent/lobate base from which arise several oscular chimneys and anastomosing branches, to 7 cm high and 1 cm in diameter. Oscula at the end of the chimneys, to 4 mm in diameter, and irregularly scattered on the surface of the sponge.

Consistency: soft, compressible, fragile.

Surface: smooth, even.

Colour: black alive, dark brown in spirit; in microscopic preparations a large amount of dark pigment grains can be seen in both the ectosomal and choanosomal region.

Ectosomal skeleton: a tangential, discontinuous reticulation with irregularly distributed meshes, 228-513 μm in diameter, which are framed by single spicula.

Choanosomal skeleton: ill-defined, paucispicular primary lines, irregularly connected by unispicular primaries, with many rounded meshes and choanosomal spaces, and many spicula in confusion.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas, slightly curved, hastate, with long,

very sharp points, 118.8-154.3 (131.8 ± 8.9) x 2.8-4.6 (4 ± 0.5) μm in the specimen from St. Lucia, 105-159 (146.3 ± 11.8) x 4.2-6 (5.3 ± 0.6) μm in the specimen from Brazil. Texas: weakly curved, with straight legs or with slightly recurved apices, 30.2-71.9 (50.6 ± 11.4) x 0.6-1.3 (0.9 ± 0.3) μm .

Ecology: shallow-water rocky substrates, to 6 m depth.

Distribution (Fig. 22): known only from St. Lucia and Brazil.

REMARKS. - The presence of toxas in *H. (S.) melana* was not mentioned by Muricy & Ribeiro (1999), but they are consistently, though not abundantly, present in both the specimens from St. Lucia and Brazil (see Fig. 20 F). The species shows a striking resemblance with *H. (S.) luciensis* n.sp (see above), but can otherwise not be confused with other Caribbean chalinids. *Chalinula nigra* Boury-Esnault & Lopes, 1985, described from the Azores, is also black, but clearly a *Chalinula*, with long secondary fibres of spicula and spongin (a fragment of the holotype is present in the ZMA through the courtesy of Dr Nicole Boury-Esnault).

Although *H. (S.) melana* is in the Caribbean known only from St. Lucia, it is not excluded that it has a distribution pattern comparable to that of the hydrocoral *Millepora squarrosa*. This species occurs in Brazil from Pernambuco in the north to Recife in the south, with a restricted distribution in the Caribbean, viz. from Puerto Rico along the entire Lesser Antilles arc south to Grenada. It is positively absent from other parts in the Caribbean (cf. De Weerdt, 1990). The distribution of *M. squarrosa* was hypothesized by De Weerdt to be the result of fragmentation of a continuous western Tethyan distribution of an ancestral population by the Pliocene uplift of the Panamanian Isthmus, followed by extinction of *M. squarrosa* in the western part of the Caribbean due to its life strategy and competition with *M. complanata*, and extinction in the northern part of Brazil due to the Amazone-Orinoco barrier which took place in the Miocene (cf. Laborel, 1970). It is quite possible that *H. (S.) melana* also had a continuous (eastern?) Caribbean-Brazilian distribution but that it has disappeared from northern Brazil by the Amazone-Orinoco barrier.

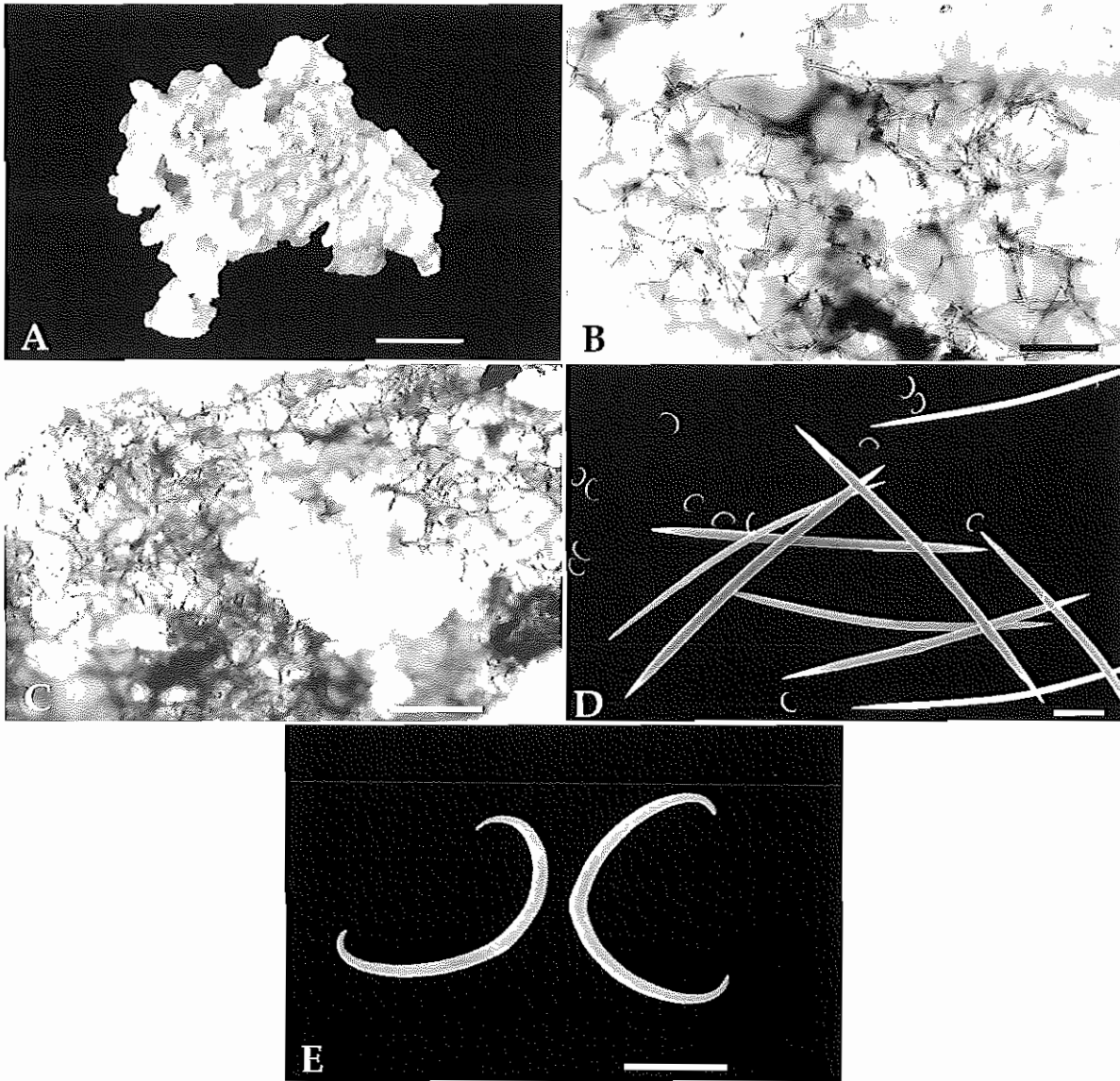


Fig. 23. *Haliclona (Soestella) piscaderaensis*. A, preserved specimen, ZMA Por. 5387. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, scanning electron micrograph of oxaeas and sigmas. E, close-up of sigmas (scale bars: A = 0.5 cm; B = 250 µm; C = 500 µm; D = 25 µm; E = 5 µm).

er. This speculation needs, of course, be further investigated for which much more collecting activities at different localities are required.

Haliclona (Soestella) piscaderaensis (Van Soest, 1980)

Figs. 3G, 23A-E

Sigmatocia piscaderaensis Van Soest, 1980: 22, Fig. 8, Pl. III fig. 1; Zea, 1987: 71, fig. 17.

Haliclona piscaderaensis; Lehnert & Van Soest, 1998: 91.

MATERIAL

JAMAICA: ZMA Por. 12874 (Discovery Bay, blue hole near Columbus Park, 20 m, 18-II-1993, coll. H. Lehnert, # J26); ZMA Por. 12961 (Discovery Bay, lagoon, 1 m, 25-III-1993, coll. H. Lehnert, # J104); ZMA Por. 12962 (Discovery Bay, 1.5 m, 25-III-1993, coll. H. Lehnert, # J103).

CURAÇAO: ZMA Por. 3666 (holotype, Piscadera Baai); ZMA Por. 3676 (paratype, same data as holotype); ZMA Por. 4024 (Piscadera Baai, W entrance, 1 m, in *Thalassia* beds, 14-XII-1963, coll. P. Wagenaar Hummelinck); ZMA Por. 4594 (Santa Martha Baai, entrance channel, under stone, 1 m, 1-I-1981, coll. R.W.M. van Soest); ZMA Por. 5386, 5387 (Barbara Beach, 1-3 m, 3-VI-1984, coll. J.H. Stock & J. Vermeulen); ZMA Por. 5757 (coll. P. Wagenaar

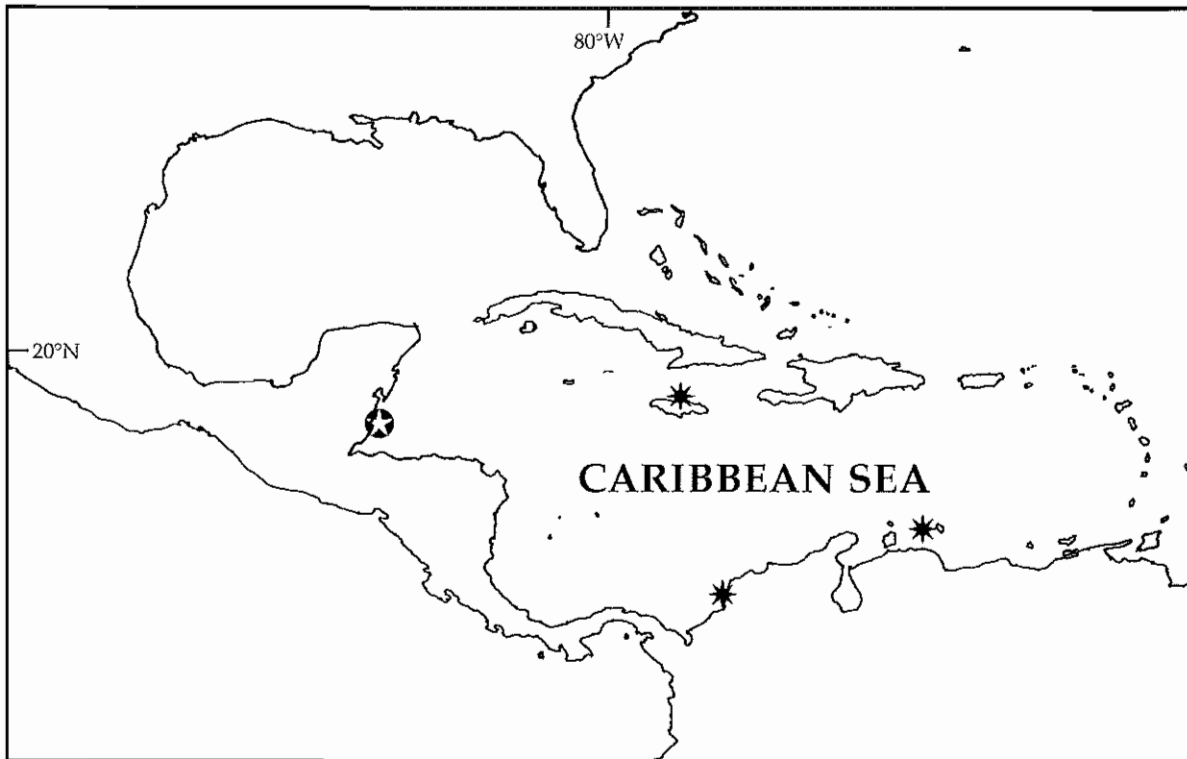


Fig. 24. Known distribution of *Haliclona (Soestella) piscaderaensis* (*) and *H. (S.) smithae* n.sp.(⊗).

Hummelinck, # 1469a); ZMA Por. 6423 (Fuikbaai, 1986, coll. P. Hoetjcs).

DESCRIPTION. - Shape and size: flat cushions, to approx. 5.5 cm in diameter and 1-4 mm thick, with few, circular oscula, flush or on slightly raised elevations, 1-2 mm in diameter.

Consistency: very soft and fragile.

Surface: even, strongly reticulate.

Colour: varying from greyish yellow to light purplish brown.

Ectosomal skeleton: consisting only of some vaguely strewn, tangentially orientated spicula.

Choanosomal skeleton: a rather confused reticulation with ill-defined paucispicular primary lines and many spicula in confusion.

Spongin: scarce to moderate, at the nodes of the spicula.

Spicula: oxeads, slightly curved or somewhat sinuous, hastate, with very long and sharp points, 139.2-226.5 (176.8 ± 12.2) x 2.3-7.4 (5.1 ± 1.7) µm. Sigmas: regularly C-shaped, numerous, small, 7.2-12.3 (9.9 ± 1.0) x 0.3-1.2 (0.7 ± 0.2) µm.

Ecology: on and under stones and corals, in reef habitats and in *Thalassia* beds, known depth range 1-20 m.

Distribution (Fig. 24): Jamaica, Curaçao (Van Soest, 1980), Colombia (Zea, 1987).

REMARKS. - *Haliclona (S.) piscaderaensis* stands out among other Caribbean chalinids by its strongly reticulated surface, a character which it shares with the eastern Atlantic *Haliclona (S.) fibulata* (Schmidt, 1862, as *Gellius*, cf. De Weerd, 1986). This species forms also thick, purple encrustations, but it has larger oxeads (160-270 x 5-11 µm) and sigmas (9.6-37 x 1-2.4 µm). The sigmas are furthermore irregularly and weakly curved, as opposed to the regular C-shape in *H. (S.) piscaderaensis*.

Other Caribbean species with sigmas as the only microsclere category are *Haliclona (S.) caerulea* (Hechtel, 1965) and *H. (Halichoelona) stoneae* n.sp. (see below). *H. (S.) caerulea* forms oscular chimneys and branch-like outgrowths, it has a greenish-bluish colour and larger sigmas (13-28 µm).

H. (Halich.) stoneae n.sp. forms much thicker

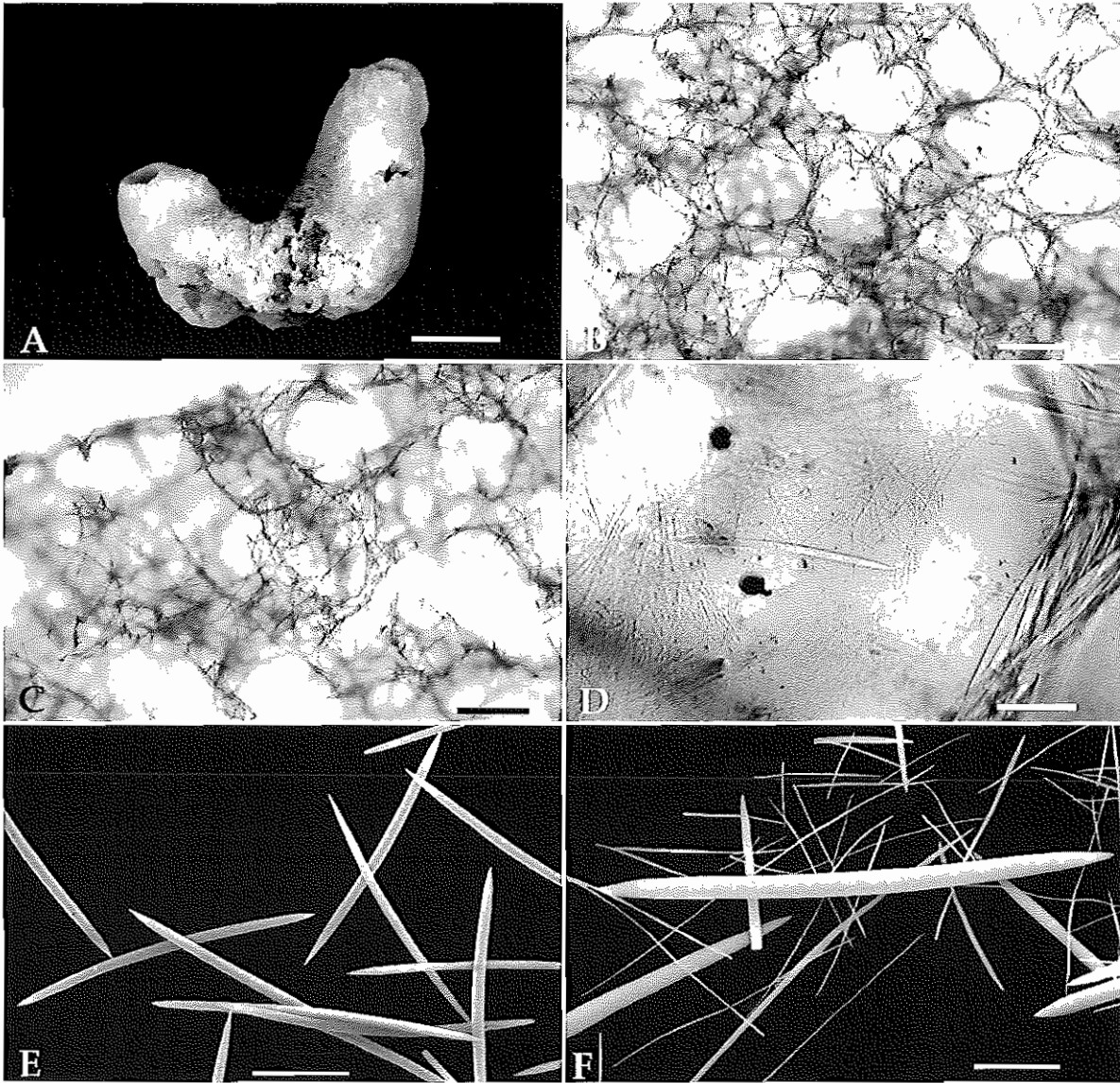


Fig. 25. *Haliclona (Soestella) smithae* n.sp. A, holotype, USNM 51540. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, rhaphides. E, scanning electron micrograph of oxeas. F, scanning electron micrograph of oxeas and rhaphides (scale bars: A = 1 cm; B, C = 300 μ m; D = 50 μ m; E = 50 μ m; F = 25 μ m).

cushions with very large oscula, it has a brittle consistency and the subisotropic skeleton typical of the subgenus *Halichoelona*, and much larger oxeas and sigmas (oxeas: 285-359 x 7.7-13 μ m; sigmas: 12-21 μ m).

***Haliclona (Soestella) smithae* n. sp.**
Figs. 3J, 25A-F

MATERIAL.

BELIZE: Holotype: USNM 51540 (Pelican Cays, Manatee Cay, 1 m, 18-XI-1996, coll. K. Smith # KS 96-54).

Paratype: ZMA Por. 13473 (Pelican Cays, Manatee Cay, on mangroves, 18-XI-1996, coll. K. Smith and M.C. Diaz # KS 96-55).

DESCRIPTION. - Shape and size: low, partly fused tubes or oscular mounds arising from a cushion-shaped base; the tubes taper towards the distal parts where they end in an osculum of 1-3 mm in diameter; height of the tubes 1-2 cm, diameter 0.7-1 cm.

Consistency: firm but fragile, incompressible.
Surface: smooth, punctate.

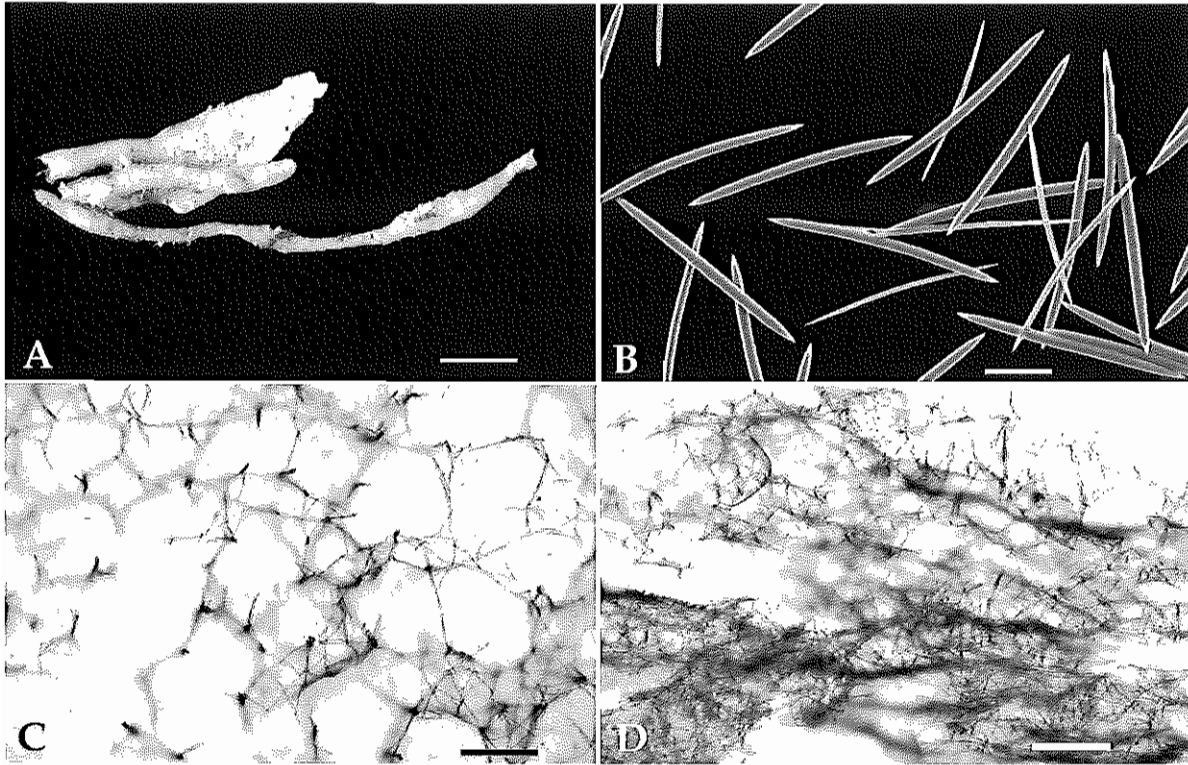


Fig. 26. *Haliclona (Soestella) twincayensis*. A, holotype, USNM 41515. B, scanning electron micrograph of oxeads. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1 cm; B = 50 μm ; C, D = 250 μm).

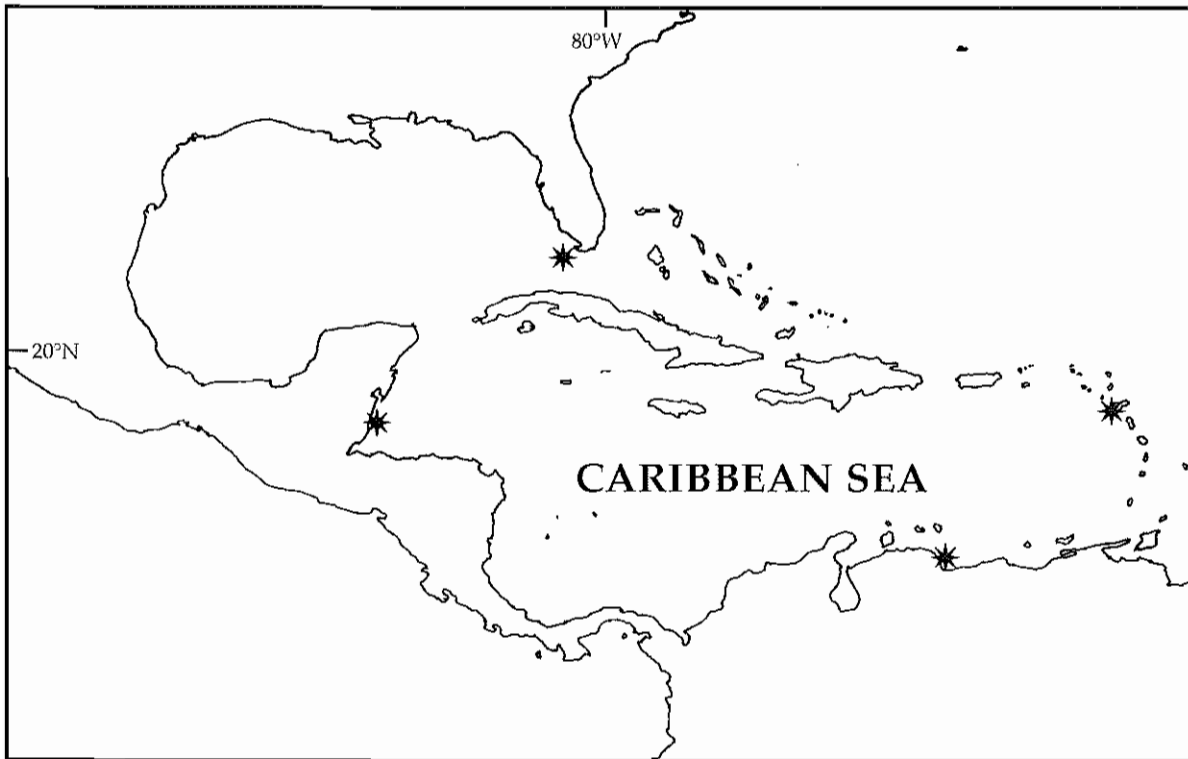


Fig. 27. Distribution of *Haliclona (Soestella) twincayensis*.

Colour: yellow-green in the living state, drab in spirit.

Ectosomal skeleton: a rather stout, tangential, paucispicular reticulation with conspicuous, well-defined rounded to elliptical meshes, 247-513 μm in diameter, with many spicula in confusion.

Choanosomal skeleton: also a rather stout reticulation with ill-defined paucispicular primary lines, irregularly connected by uni- paucispicular secondary lines, with many spicula in confusion and many choanosomal spaces.

Spongin: not visible.

Spicula: oxeas, straight to slight curved, with hastate, sharp points, 138-171.6 (154.9 ± 10.3) x 3.9-8.8 (5.8 ± 0.9) μm . Rhaphides: abundant in the ectosome, absent in the choanosome, ca. 70 x 0.3 μm .

Ecology: mangrove roots.

Distribution (Fig. 24): known only from its type locality, Pelican Cays, Belize.

ETYMOLOGY. - Named after Kathleen Smith, for her discovery of so many new chalinid species.

REMARKS. - *Haliclona (S.) smithae* n.sp. is well characterized by the combination of its tube-like shape, firm, incompressible, but fragile consistency, and the abundant presence of rhaphides in the ectosome. The single other Caribbean chalinid with rhaphides is *H. (S.) luciensis* n.sp., but this species is brownish-black and very soft.

Haliclona (Soestella) twincayensis De Weerd et al., 1991
Figs. 3H, 26A-D

Haliclona twincayensis De Weerd, Rützler & Smith, 1991: 196, Figs. 3c, 4e, f, 5a-c.

MATERIAL

VENEZUELA: USNM 42397 (Front of Cayo Pescadores, Morrocoy, National Park, on mangroves, 1-V-1989, coll. M.C. Diaz).

BELIZE: USNM 41515 (holotype, Twin Cays, Hidden Creek); ZMA Por. 13472 (Twin Cays, Blue Ground, July 1997, coll. R.W.M. van Soest).

DESCRIPTION. - Shape and size: slender to very thin, erect, partly fused branches, 2-12 mm thick, 5-10 cm long, projecting without an apparant base directly perpendicular from the substratum.

Oscula inconspicuous, rare, ca. 1mm, irregularly distributed along all sides of the branches.

Consistency: moderately firm, slightly compressible, fragile.

Surface: smooth, rather strongly punctate, with pronounced longitudinal subectosomal spaces.

Colour: whitish gray to pinkish alive, light tan in spirit.

Ectosomal skeleton: a discontinuous, tangential, reticulation of oxeas which have the tendency to form short paucispicular lines of 2-5 spicula thick around wide and conspicuous meshes of 190-475 in diameter.

Choanosomal skeleton: a rather irregular, somewhat confused reticulation of paucispicular primary lines, running longitudinal through the branches, irregularly connected by unispicular secondary lines, with many spicula in confusion.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas, slightly curved, hastate, 160.8-186 (170.9 ± 6.1) x 6-9 (7.8 ± 0.9) μm .

Ecology: stilt roots of red mangrove, peat undercuts and banks, artificial wood piling from just below tide level to 3 m depth.

Distribution (Fig. 27): Florida, Guadeloupe, Belize, (De Weerd et al., 1991), Venezuela.

REMARKS. - *Haliclona (Soestella) twincayensis* stands out by the combination of its growth form of erect, slender branches and fragile consistency.

Haliclona (Soestella) vermeuleni n.sp.

Figs. 3P, 28A-E

Haliclona sp.; Hartman, 1958: 71

Haliclona permollis; Wells et al., 1960: 209, fig. 5 [Non: *Isodictya permollis* Bowerbank, 1866 = *Haliclona (Reniera) cinerea* (Grant, 1826), cf. De Weerd & Stone [in] De Weerd, 1987].

Reniera tubifera; Van Soest, 1980: 15, Fig. 5, Pl. II fig. 2.

MATERIAL

BARBUDA: Holotype, ZMA Por. 10933 (S side island 2 mi. E of Palmatto Point, near harbour, 4-7 m, on calcareous algae, 13-III-1986, coll. J. Vermeulen). Paratypes: ZMA Por. 40 (NORTH CAROLINA, Boguc Sound, off Morehead City, 3-5 m, on shells, 1-IX-1963, coll. J.H. Stock; several specimens; Cf. Van Soest, 1980: 15, as *Reniera tubifera*).

Additional material: NORTH CAROLINA: USNM 23636 (Beaufort, July 1959, coll. I.E. Gray, originally identified by

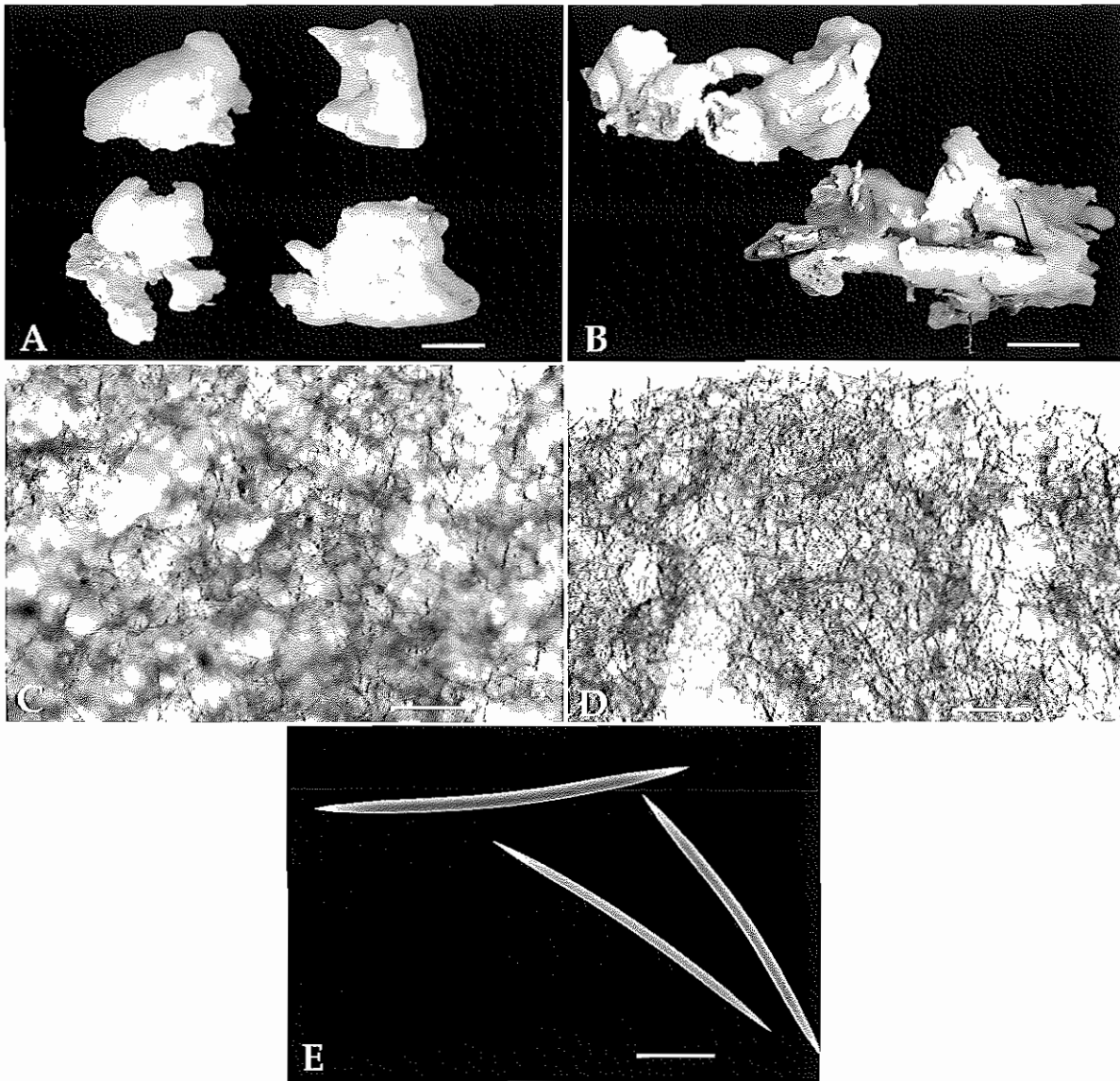


Fig. 28. *Haliclona (Soestella) vermeuleni* n.sp. A, Holotype, ZMA POR. 10933. B, Paratype, ZMA POR. 40. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome. E, oxeas (scale bars: A, B = 1 cm; C, D = 150 μ m; E = 30 μ m).

H.W. Wells and M.J. Wells as *Haliclona permollis* (Bowerbank), see Wells et al., 1960).

BERMUDA: ZMA Por. 5860 (Ferry Point, 0.3 m, under stones, 25-XI-1985, coll. R.W.M. van Soest); USNM unregist. (Harrington Sound, BBS 79, photo 376/12, acc. # 305463, coll. W. Sterrer, originally identified as *Reniera aquaeductus* Schmidt); USNM 32849 (Point Shares, 3-12 ft., August 1983, coll. J.H. Cardellina, associated with *Halimeda*, originally identified by K. Rützler as *Haliclona hogarthi* Hechtel).
 PUERTO RICO: USNM 22261 (N side, 18°31'00"N 66° 10'15"W, Sta. TT74A, 38 fms., on *Madracis*, 3-II-1933, coll. Johnson Smithsonian Deep Sea Exped., originally identified by M.W. de Laubenfels as *Reniera* sp.); USNM 31616 (Laurel

Cay Reef, 3.5 km SSW of La Parguera, 0-1 m, 11-IV-1967, on *Porites*, originally identified by K. Rützler as *Reniera aquaeductus* Schmidt).

GRENADA: ZMA Por. 5728 (Hog Island, near Pt. Salinas, on *Rhizophora*, 0-0.5 m, 8-VII-1967, coll. P. Wagenaar Hummelinck, # 1550).

CURAÇAO: ZMA Por. 15875 (Plaja Djerimi, N corner, rock, sand, tidal and lower zone, 11-XII-1948, collector unknown)

DESCRIPTION. - Shape and size: laterally spreading, thickly encrusting or cushion-shaped base, from which arise several small outgrowths in the

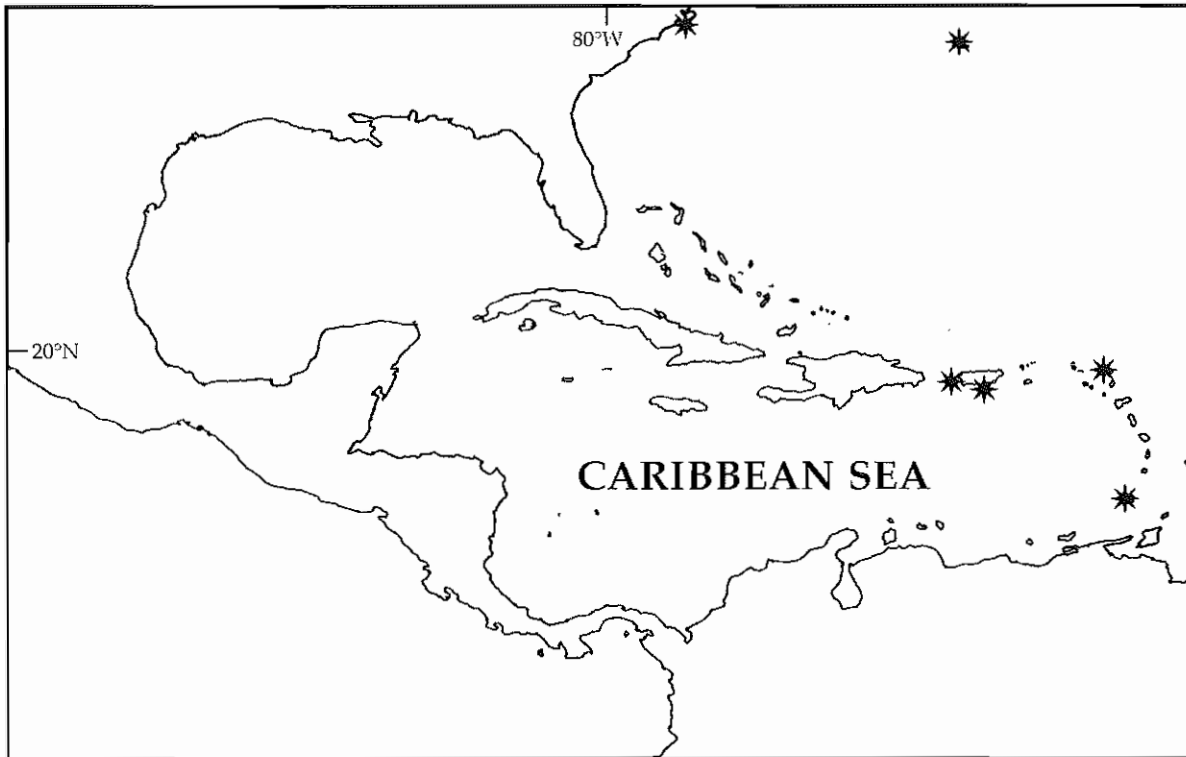


Fig. 29. Distribution of *Haliclona (Soestella) vermeuleni* n.sp.

form of oscular chimneys, hollow fistules, blind-ending digitations and lobes, to 1.5 cm high and 1-4 mm in diameter. Oscula small, not numerous, circular, 1-2 mm in diameter, at the end of the chimneys and alongside the other outgrowths.

Consistency: very soft, fragile.

Surface: smooth, even, slightly punctate.

Colour: blue to sky blue in the living state, light cream in spirit.

Ectosomal skeleton: a rather dense, tangential reticulation, with a slight tendency of the spicula to form rounded meshes of 130-215 μm in diameter, with many spicula in confusion.

Choanosomal skeleton: a somewhat irregular, rather dense reticulation with ill-defined, paucispicular primary lines, irregularly connected by uni-paucispicular secondary lines, with many spicula in confusion.

Spongin: in fair amounts at the nodes of the spicula.

Spicula: oxeas, very slender, with long, sharp points, straight or slightly, evenly curved, 75.4-167 (112.8 ± 21.4) \times 2.1-5.7 (3.4 ± 1.0) μm .

Ecology: usually growing on other organisms

(shells, calcareous algac, corals, etc.) in reefal and mangrove habitats and near harbours; known depth range 0-68 m.

Distribution (Fig. 29): North Carolina, Bermuda, Puerto Rico, Barbuda, Grenada, Curaçao.

ETYMOLOGY. - The new species is named after Jan Vermeulen, collector of the holotype, in acknowledgement of his invaluable help during the many years that he was technical assistant at the Department of Porifera and Coelenterata of the Zoological Museum Amsterdam.

REMARKS. - *Haliclona (Soestella) vermeuleni* n. sp. has a relatively wide geographical distribution, occurring from North Carolina south to Grenada, but it is not a very common species. Another species with a similar distribution pattern, occurring from North Carolina south to Venezuela, is *Haliclona (Reniera) tubifera* (George & Wilson, 1919) (*H. hogarthi* sensu Van Soest, 1980). This species is much more common with records throughout the Caribbean. The two species show a superficial resemblance in consistency and shape, which

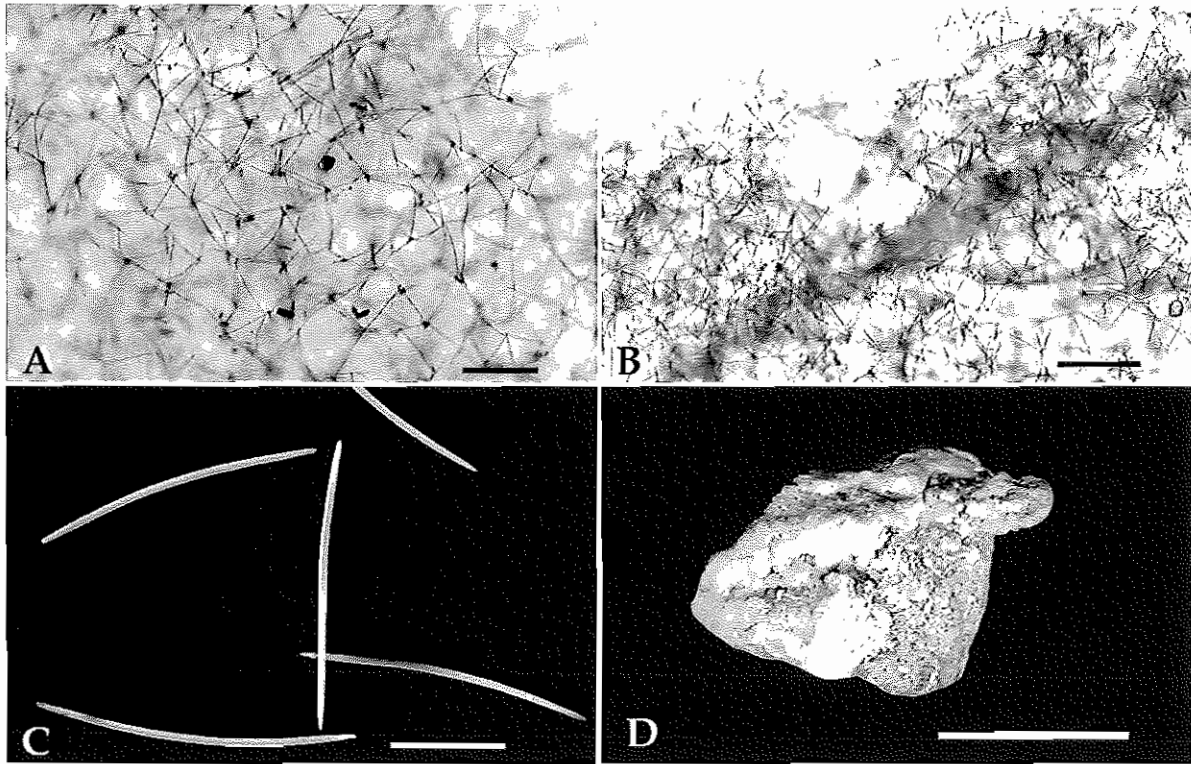


Fig. 30. *Haliclona (Halichoelona) albifragilis*. A, tangential view of ectosomal skeleton. B, perpendicular section of choanosome. C, scanning electron micrograph of oxeas. D, preserved specimen, ZMA Por. 13268 (scale bars: A = 150 µm; B = 250 µm; C = 50 µm; D = 0.5 cm).

may be the reason for misinterpretation of specimens by, e.g., Wells et al., 1960, who identified their material as *Haliclona permollis* (Bowerbank, 1866, as *Isodictya*) and by Van Soest, who identified ZMA Por. 40 (several specimens from North Carolina) as *Reniera tubifera*. *Isodictya permollis* is one of several synonyms of the northeastern Atlantic *Haliclona (Reniera) cinerea* Grant, which is very similar to *H. (R.) tubifera* (cf. De Weerd, 1989). The existence of another species in Beaufort, North Carolina, next to *H. (R.) tubifera* was already mentioned by Hartman 1958 (: 71), who noted that *R. tubifera* was “not very soft, but fragile” with “large” spicula and a “distinct, unispicular ectosomal skeleton”, whilst the other species was “very soft, fragile”, with “small” spicula and “without a distinct ectosomal skeleton”. It is quite likely that Hartman’s undescribed species conforms to *H. (S.) vermeuleni* n.sp. Although the oxeas in *H. (R.) tubifera* are not large, they appear larger than in *H. (S.) vermeuleni* n.sp., because they are much thicker (length: 70-180 µm, width: 7.0-9.5 µm). Also, the noted absence of an ectosomal

skeleton in the other species is understandable, because it is much less coherent in *H. (S.) vermeuleni* n.sp., in places absent and with a tendency to form rounded meshes, opposed to a very regular and isotropic skeleton in *H. (R.) tubifera*. Because of the differences in skeletal structure the new species is assigned to the subgenus *Soestella* and *tubifera* to the subgenus *Reniera*.

KEY TO THE SPECIES OF THE SUBGENUS *SOESTELLA* N. SUBG.

- 1a. Microscleres raphides or toxa, but no sigmas 2
- b. Microscleres sigmas or absent 4
- 2a. Sponges dark brown or black, also after preservation, forming laterally spreading cushions with low oscular elevations 3
- b. Sponges yellow-green, forming partly fused tubes or oscular mounds arising from a cushion-shaped base, megascleres sharply pointed oxeas of 140-171 x 4-9 µm, microscleres raphides of ca. 70 x 0.3 µm *Haliclona (S.) smithae* n.sp.
- 3a. Microscleres raphides, 50 - 95 x 0.3 µm, oxeas with short, conical points, 145-175 x 4.5-7



Fig. 31. Distribution of *Haliclona (Halichoelona) albifragilis*.

- | | |
|---|---|
| <p>µm <i>Haliclona (S.) luciensis</i> n.sp.</p> <p>b. Microscleres toxas, weakly curved, with straight legs or with slightly recurved apices, 30-70 x 0.6-1.3 µm, oxeas with long, sharp points, 130-155 x 3-4.5 µm <i>Haliclona (S.) melana</i></p> <p>4a. Sponges yellowish green or purplish, cushion-shaped with oscular chimneys or digitations, or flat cushions, with sigmas 5</p> <p>b. Sponges dark red, blue, whitish gray or pinkish, cushion-shaped or forming hollow branches, but without sigmas 6</p> <p>5a. Sponges yellowish green to sky blue, irregularly cushion-shaped with oscular mounds or chimneys, or digitate, digits with a tendency to become laterally compressed, surface smooth, oxeas sharply, occasionally blunt-pointed, 125-205 x 3-9.5 µm, sigmas regularly C-shaped, centrangulated, 12.5-30 x 0.5-2 µm <i>Haliclona (S.) caerulea</i></p> <p>b. Sponges light purplish brown (occasionally greyish yellow), forming flat cushions with few, circular oscula flush with the surface or on slightly raised elevations, with a strongly reticulated surface, oxeas with very long and sharp points, 140-225 x 2.5-7.5 µm, sigmas regularly C-shaped, centrangulated, 7-12.5 x 0.3-1.2 µm <i>Haliclona (S.) piscaderaensis</i></p> <p>6a. Sponges forming slender, erect, partly fused branches, projecting without an apparent base perpendicular from the substratum, oscula inconspicuous, irreg-</p> | <p>ularly distributed along the branches, oxeas hastate, 11-185 x 4.4-9 µm <i>Haliclona (S.) twincayensis</i></p> <p>b. Sponges blue, irregularly cushion-shaped with differently shaped outgrowths and a smooth surface or dark red thick cushions with tube-like elevations and conspicuous meandering grooves at the surface 7</p> <p>7a. Sponges blue, forming laterally spreading thick cushions from which arise several small outgrowths in the form of oscular chimneys, hollow fistules and blind-ending digitations, surface smooth, even, oxeas very slender, with long, sharp points, 75-165 x 2-5.7 µm <i>Haliclona (S.) vermeuleni</i> n.sp.</p> <p>b. Sponges dark red, forming thick cushions with low, tube-like, osculiferous elevations, with conspicuous meandering grooves at the surface, oxeas hastate, with sharp points, 125-155 x 3.3-6.3 µm <i>Haliclona (S.) lehmerti</i> n.sp.</p> |
|---|---|

SPECIES OF THE SUBGENUS *HALICHOCLONA*

Haliclona (Halichoelona) albifragilis
(Hechtel, 1965)
Figs. 3Q, 30A-D

Adocia albifragilis Hechtel, 1965: 28, fig. 3 [Non:
Adocia albifragilis; Pulitzer-Finali, 1986: 160 =

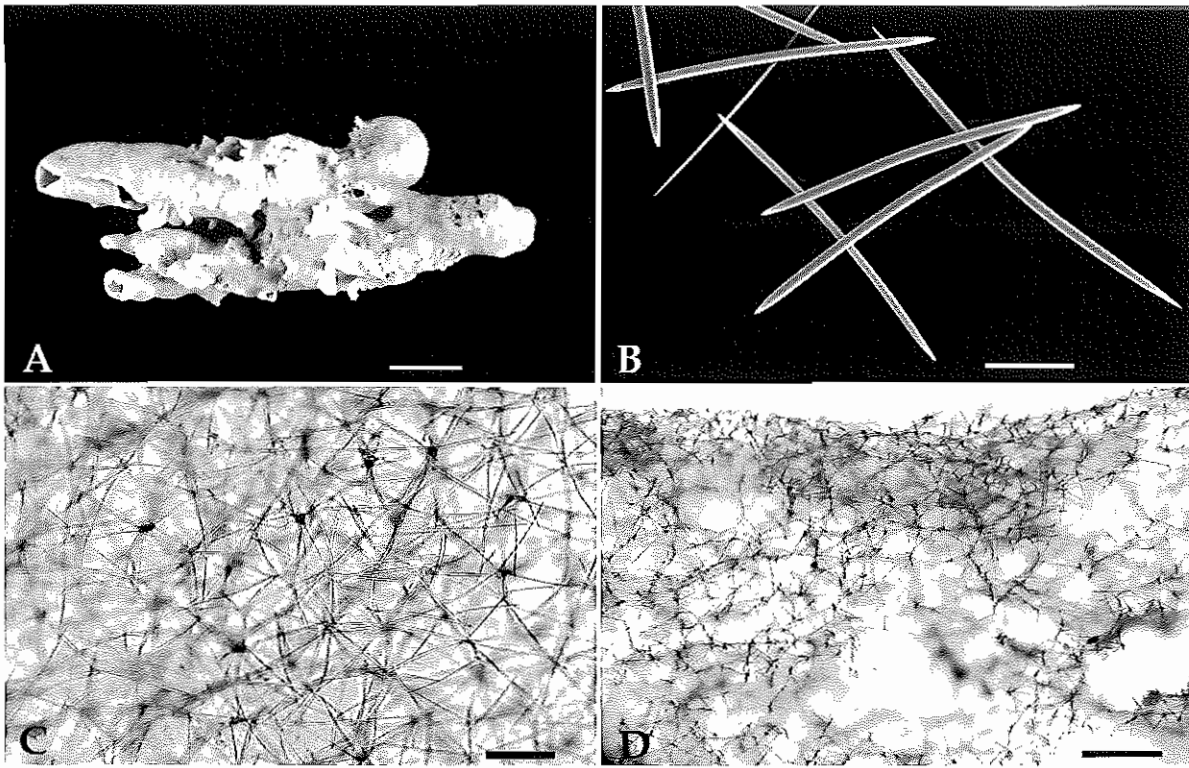


Fig. 32. *Haliclona (Halichoelona) magnifica*. A, preserved specimen, USNM 41502. B, scanning electron micrograph of oxeas. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 3 cm; B = 50 μ m; C = 250 μ m; D = 500 μ m).

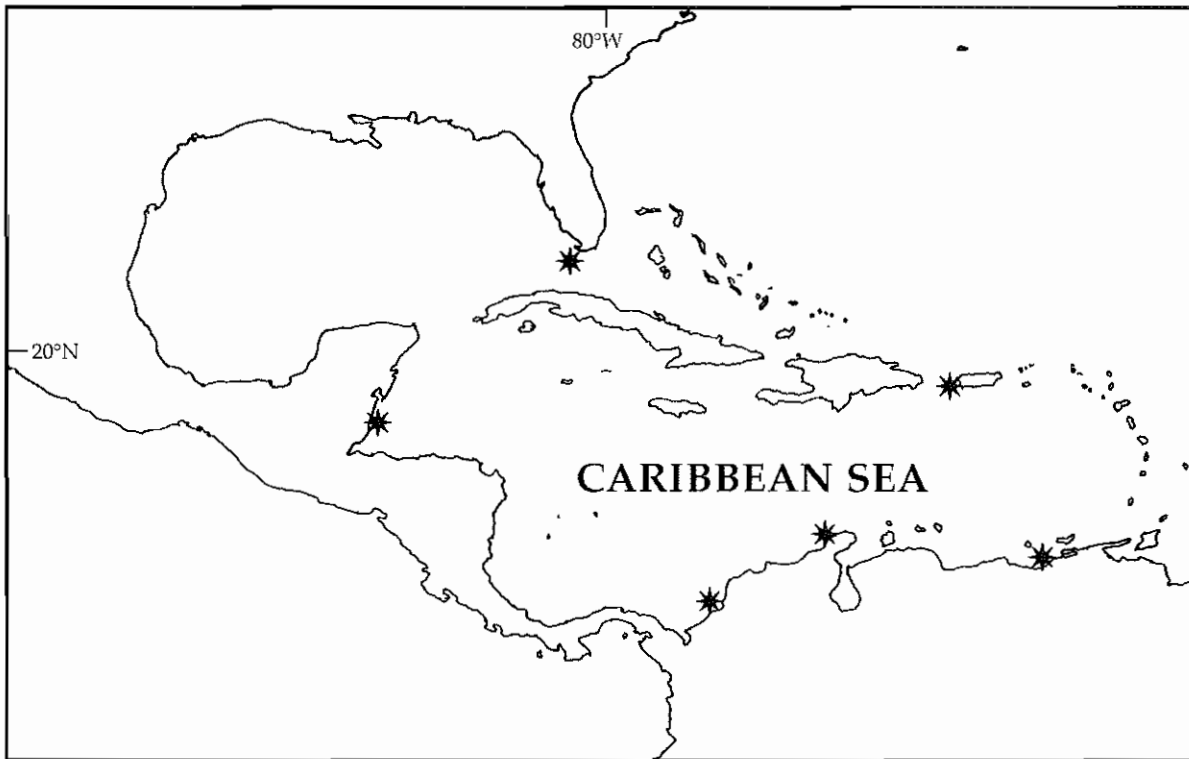


Fig. 33. Distribution of *Haliclona (Halichoelona) magnifica*.

H. (R.) ?tubifera (George & Wilson, 1919)]
Adocia neens; Little, 1963: 43 [Non: *Reniera neens*
Topsent, 1918 = *Haliclona (Reniera) neens*; cf. De
Weerd and Van Soest, 1986. Nec: *Adocia neens*;
De Laubenfels, 1936a = *Haliclona (Reniera)*
implexiformis (Hechtel, 1965); De Laubenfels,
1954 = *Haliclona* (subgenus?) spcc.].

MATERIAL

FLORIDA: USNM 23601 (14 mi. ESE of St. Mark's Lt., 8 ft.,
31-X-1957, cf. Little, 1963: 43, as *Adocia neens*).

JAMAICA YPM 5035 (holotype, Drunkenman's Cay); USNM
24506 (schizotype); ZMA POR. 10920 (schizotype).

BARBADOS: USNM 42471 (W coast, 14°14'54"N, 59°39'12"
W, 74 m, 19-IV-1989, coll. I. Macyntire, HBOI, R/V JSL II,
3A).

VENEZUELA: USNM 41512 (Los Roques, W Side Cayo
Nube Verde, 20 m, under coral rubble, 19-IV-1989, coll.
W.H. de Weerd).

BOINAIRE: ZMA POR. 13268 (Karpata, 5 m, under coral
rubble, 1987, coll. R. Pennartz & G.-J. Roebbers, # 132).

CURAÇAO: ZMA POR. 10919 (Kaap Malmeeuw, 12-15 m,
23-XII-1980, coll. R.W.M. van Soest, # 116).

DESCRIPTION. - Shape and size: small, thinly
encrusting patches, not exceeding 1 cm in diame-
ter, and less than 1 mm thick. Oscules not appar-
ent.

Consistency: friable, slightly brittle.

Surface: very even and smooth.

Colour: opaque white or light cream.

Ectosomal skeleton: a rather dense, tangential,
subisotropic reticulation; easily detachable, but
without large subectosomal spaces.

Choanosomal skeleton: subisotropic, rather dense
reticulation, with few choanosomal spaces.

Spongins: scarce, at the nodes of the spicula.

Spicula: oxeas, slender, weakly to rather strongly
curved, with long, sharp points, 63-168.1 (117.8
± 21.6) × 2.1-8.4 (4.0 ± 1.5) µm.

Ecology: under corals and coral rubble, to 74 m
depth.

Distribution (Fig. 31): Florida (Little, 1963),
Jamaica, (Hechtel, 1965), Barbados, Venezuela,
Bonaire, Curaçao.

REMARKS. - *Haliclona (Halichoelona) albifragilis*
seems to be of a consistently small size with a
preference for cryptic habitats. The species is nev-
ertheless well characterized by the combination
of the opaque white colour; friable consistency
and slender oxeas and cannot be confused with

other species of the subgenus *Halichoelona*, nor
with other Caribbean chalinids.

Little's (1963) material of *Adocia neens* corre-
sponds in every respect with *H. (H. albifragilis)*, and
is without any hesitation assigned to this species.
The eastern Atlantic *Haliclona (Reniera) neens*
(Topsent, 1918, as *Reniera*, cf. De Weerd and Van
Soest, 1986) is massively encrusting with oscula-
bearing lobes, soft consistency, and strongyles of
110-8 µm in a delicate, unispicular, isotropic
choanosomal reticulation, typical of the subgenus
Reniera. This species is so far known only from
West Africa and the Azores.

Pulitzer-Finali's (1968) record of *Adocia albifrag-*
ilis from Puerto Rico does not conform to the
species. He described it as a thickly encrusting,
soft, fragile sponge with a regular tangential retic-
ulation of single spicules with little spongins at the
nodes, a similar choanosomal skeleton and oxeas
of 140-170 × 4-6.5 µm. It reminds of *H. (R.)*
tubifera.

Mothes & Lerner (1994) described a white
Haliclona from Santa Catarina, Brazil, *Haliclona*
mammillaris, but this is a much thicker sponge,
forming cushions with mammillate, osculiferous
elevations, with a fragile, compressible consisten-
cy, belonging to the subgenus *Rhizoniera* (the holo-
type, MCN 1482 could be examined through the
courtesy of Cléa Lerner).

Haliclona (Halichoelona) magnifica De
Weerd, Rützler & Smith, 1991

Figs. 3I, 32A-D

Haliclona magnifica De Weerd, Rützler, & Smith,
1991: 194, figs. 2a, b, d, 3a, 4c, d.

MATERIAL

PUERTO RICO: USNM 41841 (S coast, NE side Isla
Magueyes, mud banks, 1 m, 15-II-1990, coll. W.H. de
Weerd & K. Smith); USNM 41842 (mangrove island next to
Monkey Island, mud bank, 0.8 m, 14-II-1990, coll. K. Smith
& W.H. de Weerd).

VENEZUELA: ZMA POR. 15887 (Bahía Manare, W of
Mochima Bay, coll. S. Pomponi & A. Wright, fragment of
HBOI 8-VI-88-3-8).

COLOMBIA: USNM 41828, ZMA POR. 5175 (Islas de San
Bernardo, Isla Tintipán, on mangrove root, 0-1 m, 6-X-
1982, coll. S. Zea, # PSB 047); ZMA POR. 13349 (Bahía
Portete, Guajira Peninsula, on dead coral among *Thalassia*
beds, 0.5 m, 26-VII-1987, coll. S. Zea, # PPT 12).

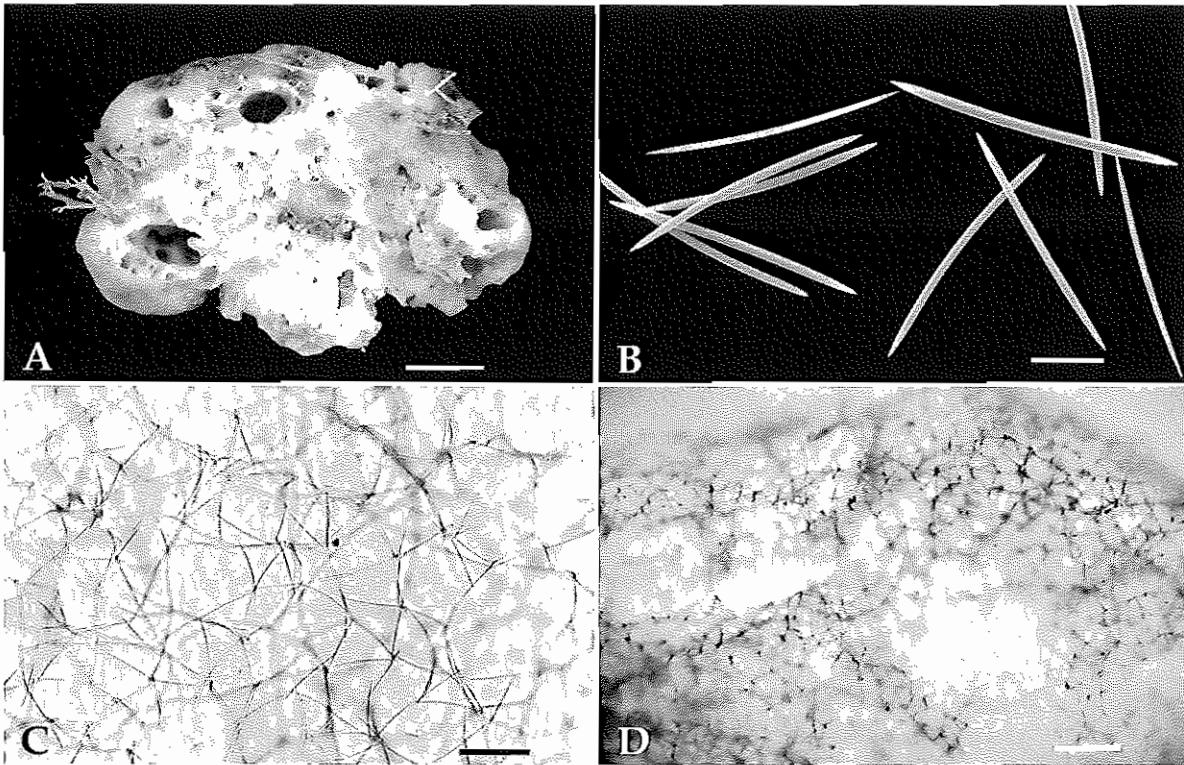


Fig. 34. *Haliclona (Halichoelona) vansoesti*. A, preserved specimen, ZMA Por. 7584. B, scanning electron micrograph of oxeads. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1 cm; B = 50 μ m; C = 200 μ m; D = 500 μ m).



Fig. 35. Distribution of *Haliclona (Halichoelona) vansoesti*.

DESCRIPTION. - Shape and size: a rather large species, consisting of an irregular massive base, from which arise one or more thickwalled tubes, to 15 cm high and 5 cm thick. Each tube tapers towards an osculum of 1-2 cm in diameter. Characteristically, the oscula have an extended, membranous rim. In addition, several smaller fistules may arise at irregular distances from all parts of the sponge.

Consistency: slightly crisp, very fragile, only very slightly compressible.

Surface: smooth.

Colour: pink, to dull pink and drab, oscular fistules whitish transparent.

Ectosomal skeleton: a rather dense, subisotropic reticulation; very loosely lying on the choanosomal skeleton; easily detachable.

Choanosomal skeleton: a rather dense, subisotropic reticulation, with only few choanosomal spaces.

Spongin: scarce, at the nodes of the spicula.

Spicula: oxeas, rather long, slender, slightly flexuous, fusiform, 146.6-220.6 (189.4 ± 16.5) x 3.6-6.7 (5.1 ± 0.7) μm .

Ecology: mangrove peat undercuts and banks, occasionally in seagrass beds, on dead coral heads; probably confined to shallow water.

Distribution (Fig. 33): Florida, Belize, (De Weerd et al., 1991), Puerto Rico, Venezuela, Colombia.

REMARKS. - *Haliclona (Halichoelona) magnifica* is well characterized by the combination of its growth form, crispy consistency and slender, somewhat flexuous oxeas. De Weerd et al. (1991) suggested a close relationship of *H. magnifica* with *H. (Reniera) mucifibrosa* De Weerd et al., 1991, but the latter species is transferred to the subgenus *Reniera* on basis of its mainly unispicular, isotropic skeleton (see above).

Haliclona (Halichoelona) vansoesti De Weerd et al., 1999

Figs. 2D, 3C, 34A-D

Haliclona (Halichoelona) vansoesti De Weerd, De Kluijver & Gomez, 1999: 49, figs. 1-3.

MATERIAL

See De Weerd et al., 1999

DESCRIPTION. - Shape and size: thick, highly cavernous cushions with a very loose structure, to 15 cm in diameter and 2-3 cm thick, with several large, circular to elliptical oscula, 0.8-1 cm in diameter, on slightly raised elevations.

Consistency: crispy, fragile, only slightly compressible.

Surface: smooth but somewhat irregular due to the ectosomal skeleton which is extremely loosely connected to the choanosome, from which it becomes detached at many places to form slightly, irregularly raised 'roofs' over the acquiferous canals and slightly raised collars around openings in the ectosome of 0.5-1 mm in diameter.

Colour: choanosome purple; ectosome white, transparent.

Ectosomal skeleton: a delicate, tangential, subisotropic reticulation, extremely loosely lying on the choanosomal skeleton.

Choanosomal skeleton: subisotropic reticulation, of a denser structure than the ectosome, but with many subectosomal and choanosomal spaces.

Spongin: not observable.

Spicula: oxeas, slightly curved, hastate, 120-221.6 (175.9 ± 22.7) x 3.6-10.7 (7.2 ± 1.7) μm .

Ecology: in reef environments, occupying (and possibly also excavating) reef crevices, under coral overhangs, on dead corals and other hard substrata, also overgrowing other sponges; known depth range 2-52 m.

Distribution (Fig. 35): Jamaica, Martinique, St. Vincent, Curaçao (De Weerd et al., 1999)

REMARKS. - *Halichoelona vansoesti* is well characterized by the cavernous, purple choanosome, very loosely roofed-over by the whitish, transparent ectosome. The species is well distinguished from the other Caribbean chalinids, but it shows certain similarities with the eastern Atlantic *Haliclona (Halichoelona) fistulosa* (Bowerbank, 1866; cf. De Weerd, 1986). This species is roundish massive, with fistules arising from all parts of the body (cf. De Weerd, 1986, Pl. 1, Fig. 1), and with a yellowish-brown to purplish choanosome, covered with a whitish, transparent ectosome. *H. fistulosa* is not cavernous, less fragile, and both the ectosomal and choanosomal skeleton have a denser structure; the oxeas are of similar length (140-220 μm), but they are thicker (5-12 μm).

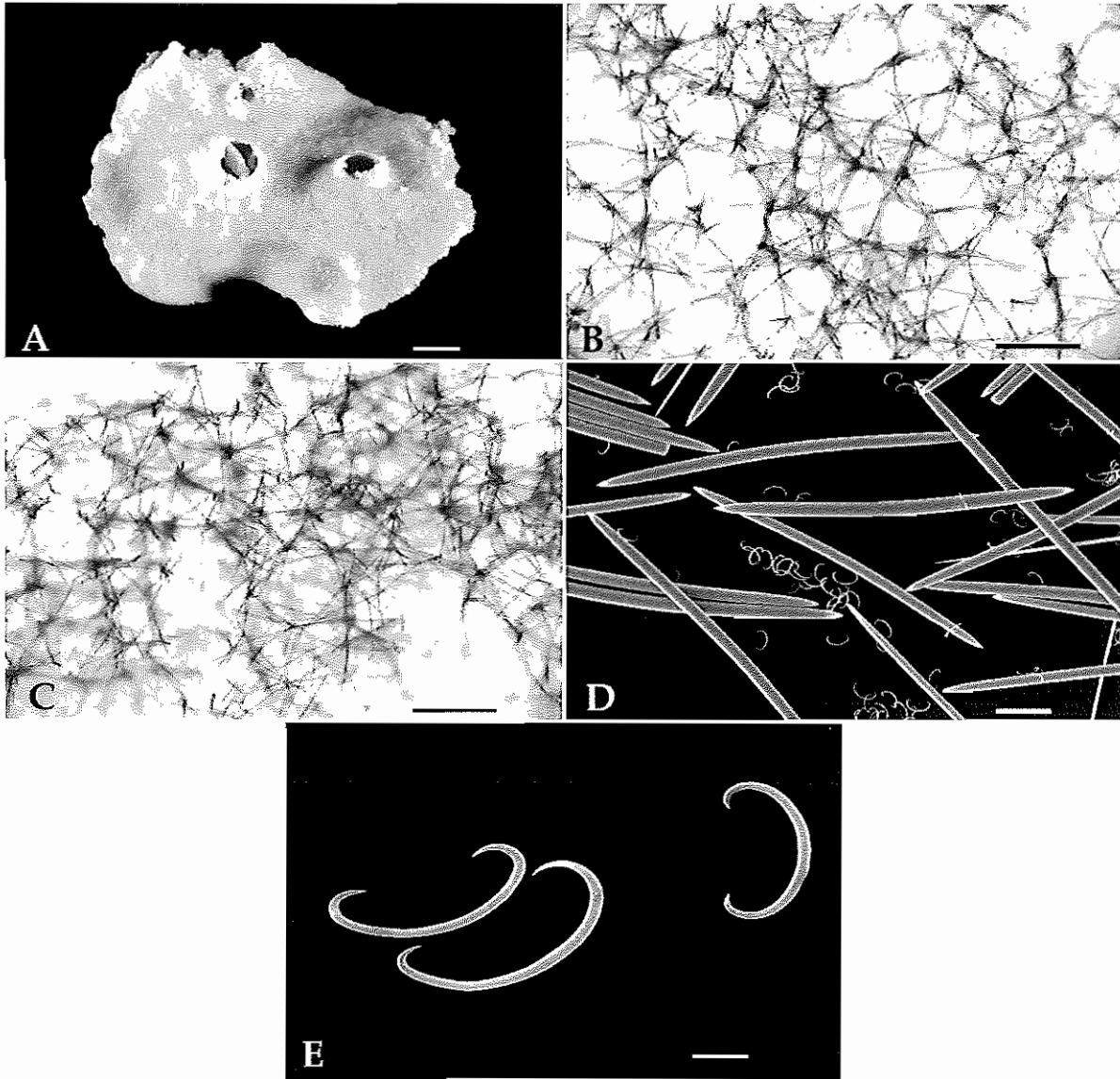


Fig. 36. *Haliclona (Halichoclona) stoneae* n.sp. A, holotype, ZMA Por. 15886. B, tangential view of ectosomal skeleton. C, perpendicular section of choanosome. D, scanning electron micrograph of oxeas and sigmas. E, close-up of sigmas (scale bars: A = 1 cm; B, C = 50 μ m; D = 50 μ m; E = 5 μ m).

***Haliclona (Halichoclona) stoneae* n.sp.**
Figs. 2B, 3A, 36A-D

MATERIAL

BELIZE: Holotype: ZMA Por. 15886, Carrie Bow Cay, 500 m E of Carrie Bow Cay, 21 m, under coral overhang, 10-XII-1988, coll. W.H. de Weerd. Paratypes: USNM 51541, ZMA Por. 13503 (same data as holotype); USNM 51542, ZMA Por. 13502 (same site as holotype, 9-XII-1988).

DESCRIPTION. - Shape and size: thick, laterally spreading cushions with a regular outline, to

about 12 cm in diameter and 2 cm thick, with large and conspicuous, circular oscula, 0.4-0.9 cm in diameter, flush with the surface or on low, volcano-shaped elevations.

Consistency: brittle, rather fragile, only slightly compressible.

Surface: smooth, even, punctate.

Colour: whitish-pink in the living state, light greenish in spirit.

Ectosomal skeleton: a tangential, subisotropic, paucispicular reticulation.

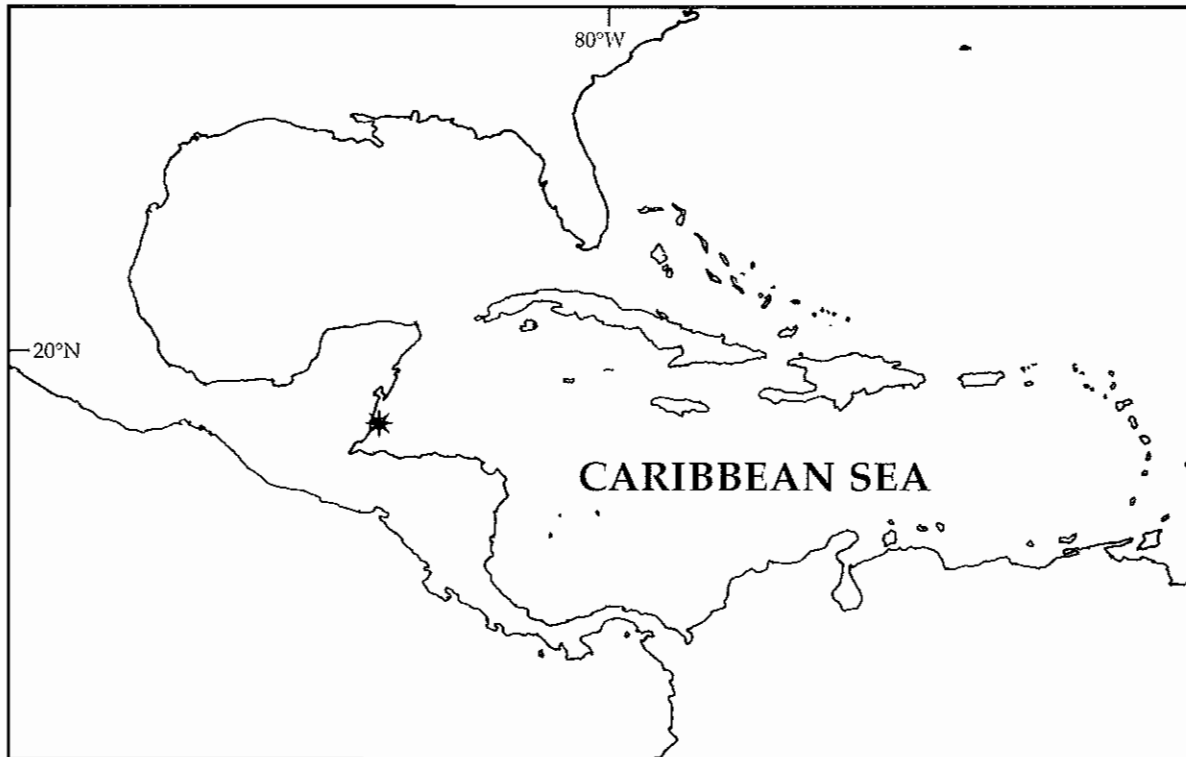


Fig. 37. Known distribution of *Haliclona (Halichoelona) stoneae* n.sp.

Choanosomal skeleton: a paucispicular, subisotropic reticulation.

Spongins: not visible.

Spicula: large oxeas, straight or slightly, evenly curved, with short, acerated points, 285.7-358.8 (320.7 ± 15.7) x 7.7-12.8 (10.1 ± 1.1) μm . Sigmas, weakly to rather strongly curved, abundant in both ectosome and choanosome, 12.3-20.9 (16.8 ± 2.2) x 0.6-1.5 (1 ± 0.2) μm .

Ecology: found under coral overhangs at 21 m depth.

Distribution (Fig. 37): known only from Carrie Bow Cay, Belize.

ETYMOLOGY. - The new species is named after Miss. S.M. Stone (now retired) for her many years of dedication as curator of the highly important Porifera collection of the Natural History Museum, London.

REMARKS. - *Haliclona (Halichoelona) stoneae* n.sp. stands out by its very regular cushion-shaped form with the conspicuous oscula, whitish pink colour, large oxeas and the presence of sigmas. It

is the only species of the subgenus *Halichoelona*, so far known, with sigmas. Despite its apparent preference to grow under coral overhangs, *H. (H.) stoneae* n.sp. is not easily overlooked because of its considerable size and conspicuous light whitish-pink colour. Since it was found only in one place in Carrie Bow Cay, Belize, it is probably a rare species.

A second species with such large oxeas is *Haliclona megasclera* Lehnert & Van Soest, 1996. This is a deep-water species, recorded from 77.7 m at Jamaica, with a leather-like consistency and massive growth form and oxeas of 282-370 x 9-12 μm , without sigmas. It belongs to the subgenus *Gellius* and is clearly different from *H. (Halich.) stoneae* n.sp.

KEY TO THE SPECIES OF THE SUBGENUS *HALICHOELONA*

- 1a. Sigmas present, sponges forming thick, laterally spreading cushions with a regular outline and conspicuous, large, circular oscula, colour whitish-pink, oxeas very large, with short, acerated points, 320-360 x 10-13 μm , sigmas weakly to rather strongly curved, 12.3-21 x 0.6-1.5 μm *Haliclona (Halich.) stoneae* n.sp.

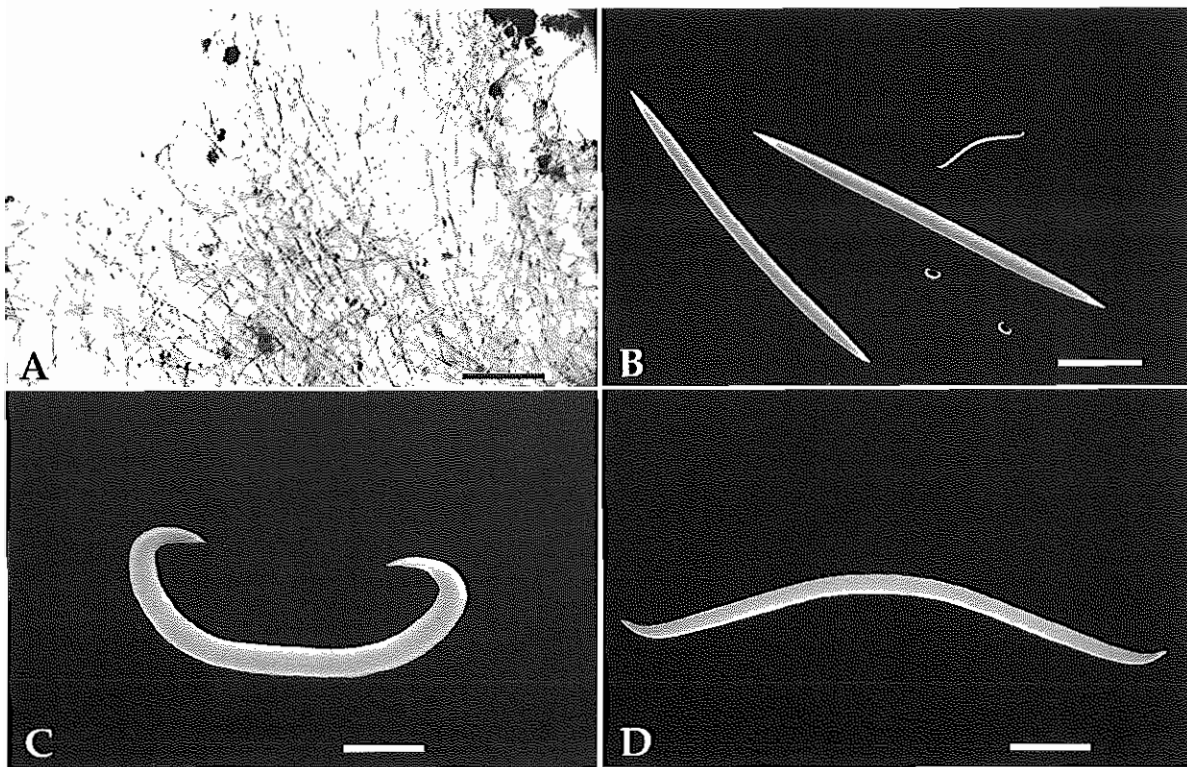


Fig. 38. *Haliclona (Gellius) tenerrima*. A, perpendicular section of choanosome. B, scanning electron micrograph of spicula. C, close-up of sigma. D, close-up of toxa (scale bars: A = 400 μm ; B = 50 μm ; C = 2 μm ; D = 10 μm).

- b. Sigmata absent, sponges encrusting, tube- or cushion-shaped, off-white, pink to dull pink, or with a two-colour combination of a transparent whitish ectosome and purplish choanosome, oxcas smaller 2
- 2a. Sponges forming small encrusting patches at the undersides of coral rubble and other hard substrata, without apparent oscula, colour opaque white, oxcas slender; with long, sharp points, 65-170 x 2-8.5 μm *Haliclona (Halich.) albifragilis*
- b. Sponges forming more substantial biomasses, not opaque white 3
- 3a. Sponges forming thick, highly cavernous cushions with several large, circular oscula, also occupying reef crevices, with a conspicuously loosely connected ectosomal skeleton and a two-colour combination of a whitish, transparent ectosome and purplish choanosome, oxcas robust, with hastate points, 120-220 x 3.5-10.7 μm *Haliclona (Halich.) vansoesti*
- b. Sponges forming large, pink to dull pink and drab, thick-walled tubes with an extended, membranous rim and with several smaller fistules arising at irregular distances from all parts of the sponge, oxcas slender, slightly flexuous, 145-220 x 3.5-6.7 μm *Haliclona (Halich.) magnifica*

SPECIES OF THE SUBGENUS *GELLIUS*

***Haliclona (Gellius) tenerrima* Burton, 1954**
Figs. 3B, 38A-D

Haliclona tenerrima Burton, 1954: 225, Pl. 9, fig. 2; text-fig. 3.

MATERIAL

BARBUDA: ZMA Por. 7588 (Godrington, lagoon near pavilion, 8.5 m, 13-III-1986, coll. J. Vermeulen, Sta. 86-202).
BELIZE: BMNH 1938.6. 30.42 (holotype, Turneffe Islands).

DESCRIPTION. - Shape and size: the holotype is a small fragment of 0.8 x 0.6 cm in diameter, ca. 0.2 cm thick, without visible oscula. The ZMA specimen is a thickly encrusting, low cushion of 1.3 x 1 x 0.1 cm, also without visible oscula in the preserved state.

Consistency: soft, fragile.

Surface: even.

Colour: greyish alive, light drab in spirit.

Ectosomal skeleton: absent.

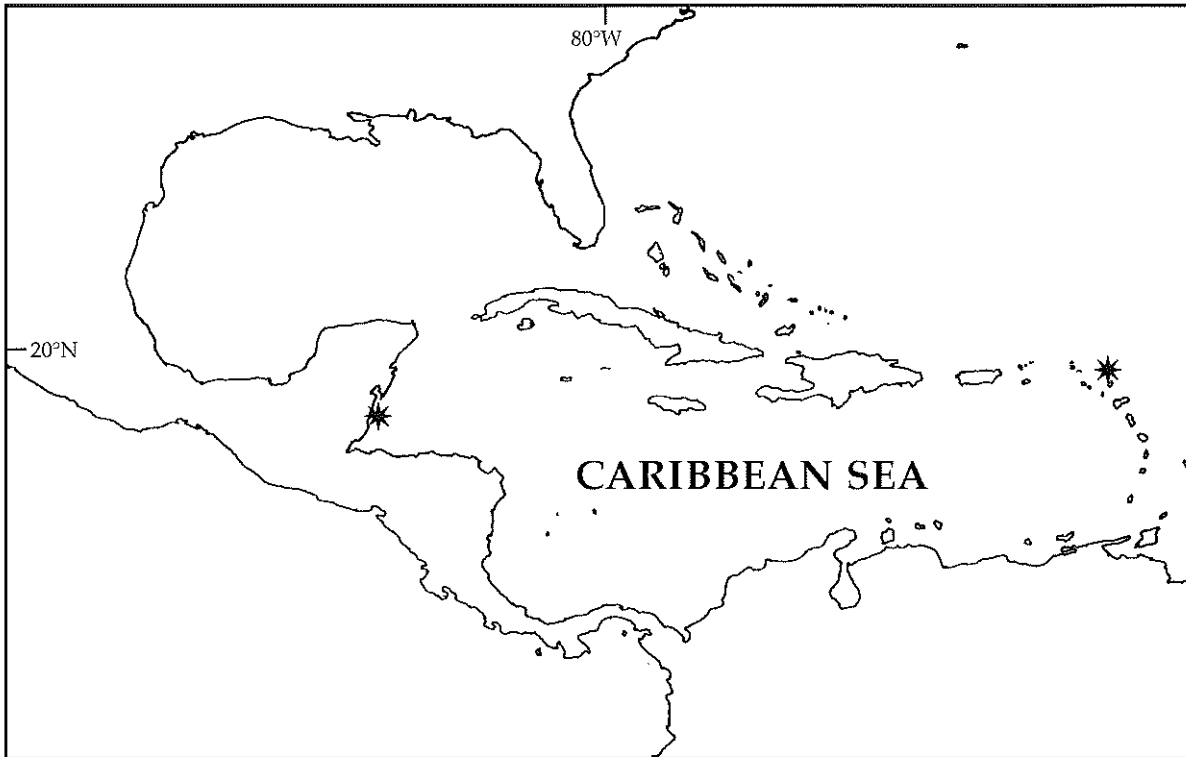


Fig. 39. Known distribution of *Haliclona (Gellius) tenerrima*.

Choanosomal skeleton: loosely organized, ascending paucispicular primary lines, irregularly connected by uni- paucispicular secondary lines, with many spicula in confusion; towards the inner parts of the sponge the skeleton becomes denser and more confused, subhalichondroid.

Spongin: not observable.

Spicula: oxeas, straight or slightly, evenly curved needles, hastate, with sharp points, 194.9-258.1 (227.1 ± 20.0) x 5.1-9.3 (7.7 ± 1.1) μm (both specimens). Sigmas, very small, numerous, double-bent with a straight middle-part or irregularly curved, 6.7-10.7 (8.4 ± 1.1) x 0.5-0.8 (0.6 ± 0.1) μm . Toxas, rather numerous, commonly double-bent, with slightly recurved apices, of variable length and width, 25.5-100.9 (55.4 ± 15.2) x 0.5-2.6 (1.5 ± 0.6) μm .

Ecology: known depth range 3.5-8.5 m; the ZMA specimen was collected in a lagoon.

Distribution (Fig. 39): Belize (Burton, 1954), Barbuda.

REMARKS. - The ZMA specimen is without hesitation assigned to *H. (G.) tenerrima*, because exter-

nal features (shape, consistency), but especially the skeletal characters (shape and size of the oxeas, sigmas and toxas, skeletal architecture), conform entirely to Burton's specimen. Burton (1954) did not mention the presence of sigmas, but they can be easily observed in both the holotype and the ZMA specimen.

The only other Caribbean chalinid with sigmas and toxas is *H. (Reniera) ruetzleri* n.sp. This species consists of soft, slender branches and it has the delicate, unispicular, isotropic skeleton typical of the subgenus *Reniera*. It is clearly different from *H. (G.) tenerrima*.

The specimen collected by J. Vermeulen is the first record of *H. (G.) tenerrima* since Burton's description, from which it may be concluded that *H. (G.) tenerrima* is a rare species.

The subgenus *Gellius* is poorly represented in the shallower parts of the Caribbean, like the subgenera *Haliclona* and *Rhizoniera*, but in deeper water it is represented by *Haliclona calcinea* Burton (1954), described from Grenada from 720-800 m depth (holotype, BMNH 1938.6.30.31 examined), and by *Haliclona megasclera* Lehnert & Van

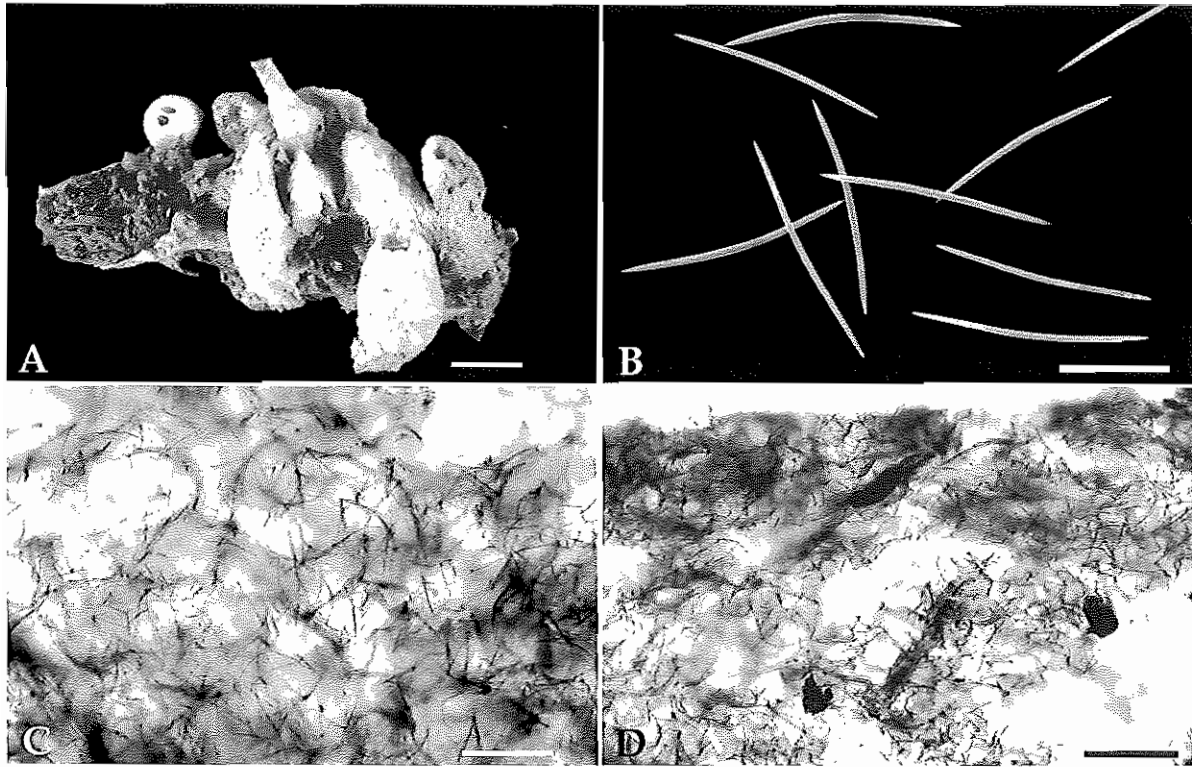


Fig. 40. *Haliclona (Rhizoniera) curacaoensis*. A, preserved specimen, USNM 41755. B, scanning electron micrograph of oxeads. C, tangential view of ectosomal skeleton. D, perpendicular section of choanosome (scale bars: A = 1.5 cm; B = 50 μm ; C = 250 μm ; D = 500 μm).

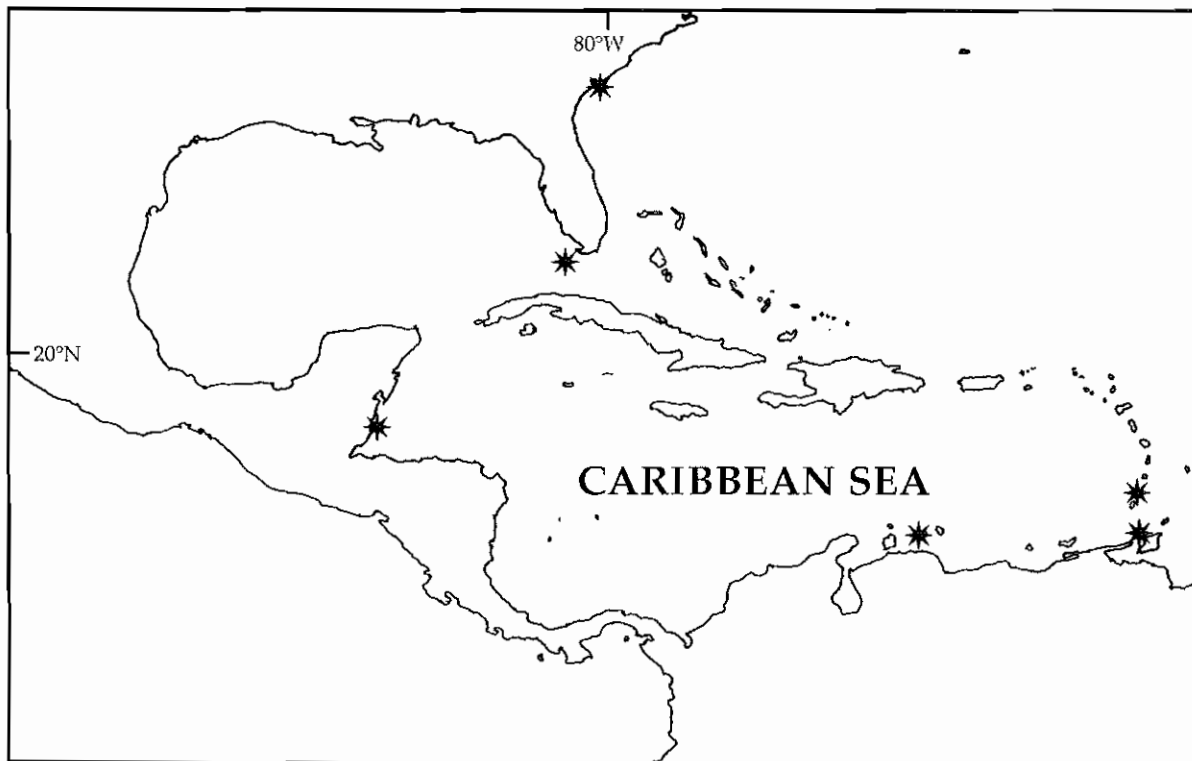


Fig. 41. Distribution of *Haliclona (Rhizoniera) curacaoensis*.

Soest (1996), described from Jamaica from 77.7 m depth (holotype, ZMA Por. 11338 examined). Because there are more members in the colder north-eastern part of the North Atlantic it is quite possible that the subgenus is mainly restricted to cold and temperate water temperatures, with submergence in the tropical belt.

SPECIES OF THE SUBGENUS *RHIZONIERA*

Haliclona (Rhizoniera) curacaoensis (Van Soest, 1980)

Figs. 3L, 40A-D

Reniera curacaoensis Van Soest, 1980: 12, fig. 3, Pl. I fig. 4.

Haliclona curacaoensis; De Weerd, Rützler & Smith, 1991: 199, figs. 3f, 5a, b, f.

MATERIAL

SOUTH CAROLINA: USNM 33601 (31°31'48"N, 79°44'36"W, 58 m, 5-VIII-1981, coll. S.C. Mar. Res. for MMS/BLM Sta. OS01, R/V Oregon; LMRS).

FLORIDA: USNM 41804 (Florida Keys, mangrove island 400 m E of Big Torch Key, 0.3 m, on mangrove roots, coll. W.H. de Weerd and S. Viada).

GRENADINES: ZMA Por. 13453 (Tobago Cays, N side Baradel Island, 12°38'20"N, 61°21'23"W, on mangrove root, 2-IV-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles March/April 1989, R/V Seward Johnson).

TRINIDAD: ZMA Por. 15876 (Port of Spain, on wreck, 1.5-2.5 m, coll. J. Vermeulen, Stat. 86-91-14).

CURACAO: ZMA Por. 3662 (holotype, Santa Martha Baai); ZMA Por. 3672 (paratype, Piscadera Baai); ZMA Por. 6421 (Fuikbaai, on mangrove root, 13-I-1987, coll. W.H. de Weerd).

BELIZE: several specimens in the USNM collection (cf. De Weerd et al., 1991); in addition: ZMA Por. 13470 (Twin Cays, Hidden Creek, on *Rhizophora*, 0.5 m, 10-XII-1988, coll. W.H. de Weerd); ZMA Por. 13471 (Manatee Key, Pelican Cays, on *Madracis*, 3 m, July 1997, coll. R.W.M. van Soest).

DESCRIPTION. - Shape and size: rather close-packed oscular mounds of 2-4 cm high, arising from a thickly encrusting common base; diameter of the mounds 2-3 cm at the basis, getting less towards the distal parts. Oscula 2-3 cm in diameter.

Consistency: soft, easily torn, sticky to the touch, mucous when rubbed.

Surface: smooth, rather strongly punctate.

Colour: bluish purple.

Ectosomal skeleton: absent or consisting of some vaguely strewn, tangentially orientated spicula.

Choanosomal skeleton: a rather irregular reticulation of paucispicular, somewhat sinuous primary lines, irregularly connected by unispicular secondary lines, with many choanosomal meshes.

Spongins: scarce, at the nodes of the spicula.

Spicula: oxeas, slender, with acerate to conical points, slightly to rather strongly curved, 78-146.2 (112.5 ± 16.3) × 2.8-5.7 (3.9 ± 0.8) μm.

Ecology: Commonly occurring in shallow water, on mangrove roots and corals, only once found in deeper water (58 m, USNM 33601).

Distribution (Fig. 41): Curaçao (Van Soest, 1980), Belize (De Weerd et al., 1991), Florida, South Carolina, Grenadines.

REMARKS. - *Haliclona (Rhizoniera) curacaoensis* is well characterized by its shape of close-packed oscular mounds and sticky surface. The oxeas are somewhat similar to those of *Haliclona (Soestella) piscaderaensis*, but this species forms cushions with a strongly reticulate surface and it has sigmas and the skeleton characteristic of the subgenus *Soestella*. As already mentioned by Van Soest (1980) it does not seem to have close relatives in the Caribbean.

Like the subgenera *Haliclona* and *Gellius*, the subgenus *Rhizoniera* is poorly represented in the shallow part of the Caribbean, as compared to the relatively high number of species occurring in the north-eastern part of the North Atlantic. The three subgenera may have a preference for cold and temperate water temperatures, showing tropical submergence in the tropical belt. This needs to be further investigated by study of tropical deep-water sponges and species occurring in cold water.

SPECIES OF THE GENUS *CHALINULA*

Chalinula molitba (De Laubenfels, 1949)

Figs. 2E, F, 3S, W, 42A-F

Haliclona molitba De Laubenfels, 1949: 9; 1950: 40, fig. 17; Wiedenmayer, 1977: 81, pl. 11 figs. 4-5, as *H. (Haliclona)*; Van Soest, 1980: 9, fig. 2, pl. I fig. 3; Rützler, 1986: 118.

Haliclona crassiloba; De Laubenfels, 1950a: 45, fig.

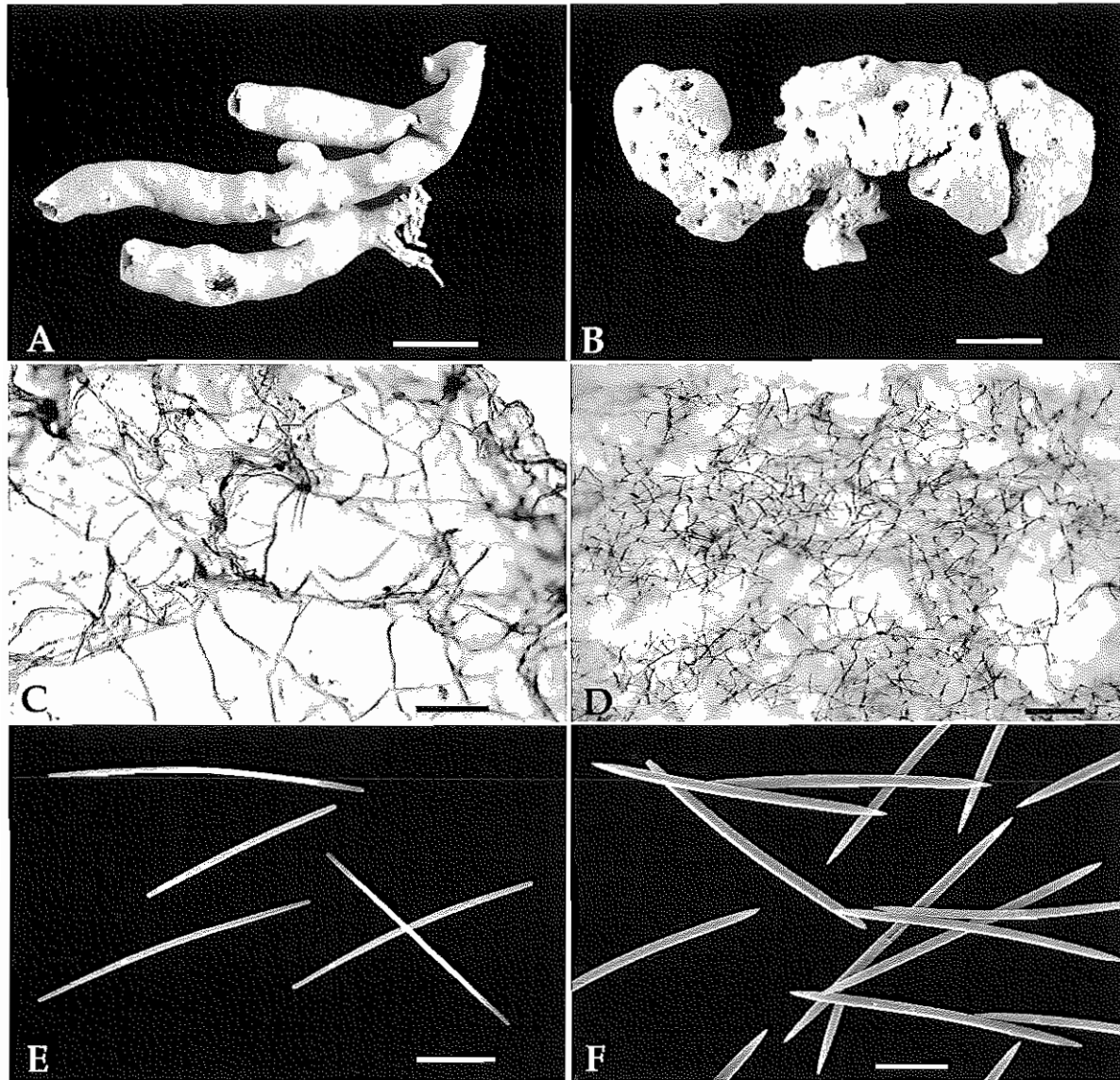


Fig. 42. *Chalinula molitba*. A, preserved specimen with tubular shape, ZMA Por. 11496. B, cushion-shaped specimen, ZMA Por. 11499. C, perpendicular section of choanosome of spongin-dominated skeleton, ZMA Por. 11496. D, perpendicular section of choanosome of spicula-dominated skeleton, USNM 41503. E, scanning electron micrograph of oxeads in spongin-dominated skeleton, ZMA Por. 11496. F, scanning electron micrograph of oxeads in spicula-dominated skeleton, USNM 41504 (scale bars: A = 3 cm; B = 1.5 cm; C = 150 μ m; D = 300 μ m; E, F = 25 μ m).

19 [Non: *Spongia crassiloba* Lamarck, 1814: 374 = *Amphimedon* sp., cf. Van Soest, 1980: 33].

Liosina monticulosa; De Laubenfels, 1950a: 54, fig. 24 [Non: *Pachychalina monticulosa* Verrill, 1907; cf. Van Soest, 1980: 9].

Haliclona (Reniera) aquaeductus forma *permollis*; Wiedenmayer, 1977: 89.

Reniera carmabi Van Soest, 1980: 14, fig. 4, pl. II fig. 1.

Haliclona pseudomolitba De Weerd et al., 1991:

197, figs. 3d, 4g, 5a, b, d.

MATERIAL

BERMUDA: BMNH 1948.8.6.15 (holotype *Haliclona molitba*); BMNH 1948.8.6.24 (specimen of De Laubenfels, 1950, *Liosina monticulosa*, Harrington Sound); BMNH 1948.8.6.17 (specimen of De Laubenfels, 1950, *Haliclona crassiloba*); USNM 31677 (Harrington Sound, 1946, coll. Bergman, identified by De Laubenfels as *Haliclona molitba*); USNM 31901 (Wreck Hill, 1-12 ft., June 1981, coll. J. H. Cardellina, id. by K. Rützler as *Haliclona molitba*); USNM 32845

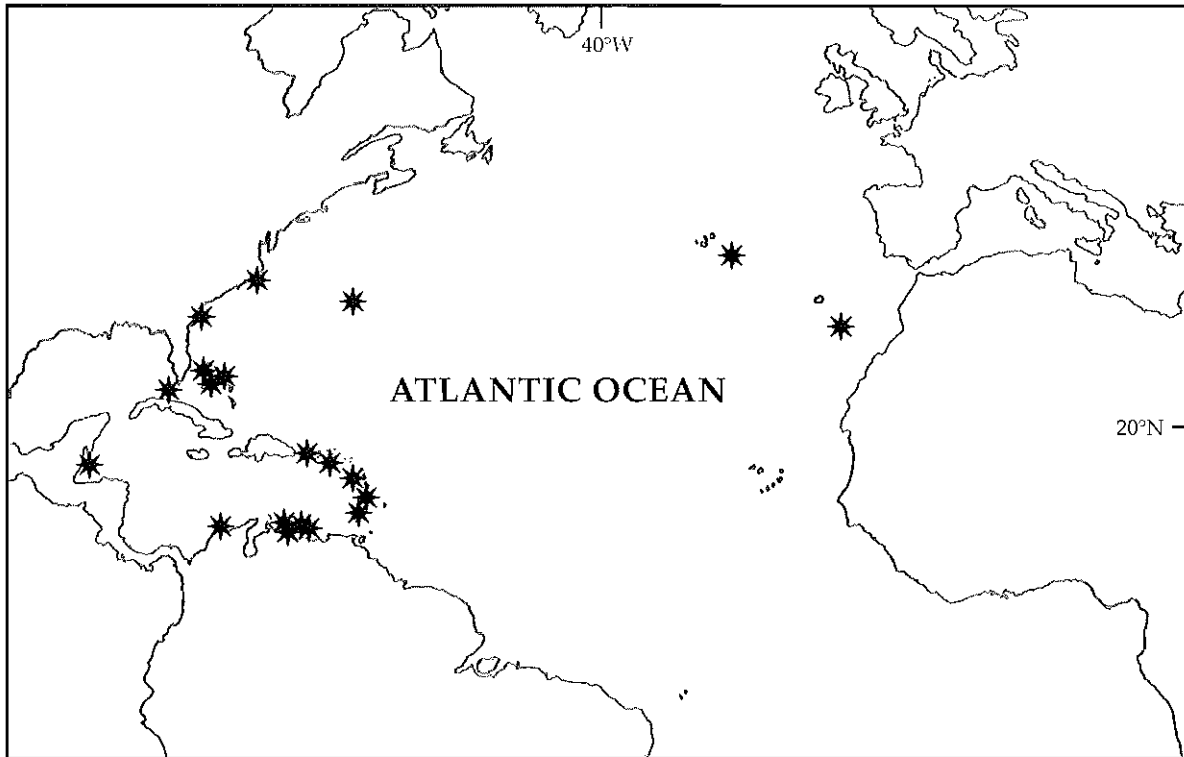


Fig. 43. Distribution of *Chalimula molitba*.

(Harrington Sound, Green Bay, 4 ft., under coral overhangs, August 1983, coll. J.H. Cardellina, Id. by K. Rützler as *Haliclona molitba*); ZMA Por. 5872 (Harrington Sound, 3-4 m, 25-XI-1985, coll. R.W.M. van Soest); ZMA Por. 5876 (Ferry Reach, 3-4 m, 24-XI-1985, coll. R.W.M. van Soest).

NORTH CAROLINA: USNM 33432 (33°31'42"N, 77°26'06"W, Sta. MIS04, 31 m, 30-XI-1981, coll. Duke U. for MMS/BLM, LMRS, id. by E. Nicholson as *Haliclona* sp. c).

GEORGIA: USNM 33433, ZMA Por. 11502 (fragm.) (31°36'12"N, 80°47'36"W, 24 ms, 7-VI-1983, coll. Geo. Mar. Res. for MMS/BLM Sta. DH02, R/V Bagby, LMRS).

FLORIDA: ZMA Por. 11488 (Florida Keys, mangrove island 400 m E of Big Torch Key, in peat undercuts, 1 m, coll. W.H. de Weerd and S. Viada).

BAHAMAS: USNM 30132 (Bimini, specimen of Wiedenmayer, 1977); USNM 30325 (Bimini, specimen of Wiedenmayer, 1977 pl. 11 fig. 5, "B 924"); USNM 30329 (Bimini, specimen of Wiedenmayer, 1977: 89, B 844); USNM 33571 (Andros Island, marine cave, entrance, 7 m, 1982, coll. British Cave Diving Exp., id. K. Rützler as *H. molitba*); USNM 41820 (Joulter Cays, 25°16'03"N, 78°07'75"W, 1 ft., mangroves, coll. HBOI/BMR Exp. Bahamas 1986, HBOI # 9-VI-86-2-6).

PUERTO RICO: USNM 41839, 42374, 42376, 42377, 42381 (Parguera, W side Monkey Island, on mangrove roots and muddy bottom, 1 m, 14-II-1990, coll. W.H. de Weerd and K. Smith); USNM 42375, 42379, 42380 (Parguera, W side Monkey Island, peat mud, 1 m, 18-II-1990, coll. W.H. de Weerd and K. Smith); USNM 42378 (Parguera, NE side

Isla Magueyes, peat mud, 1 m, 15-II-1990, coll. W.H. de Weerd and K. Smith).

ST. CROIX: ZMA Por. 9419 (coll. & don. W. Gladfelter, # T-3); ZMA Por. 9422 (coll. & don. W. Gladfelter, # Lx9).

GUADELOUPE: USNM 41826, 42364 (Basse-Terre, central W side, S side of southern Ilets à Goyaves (Pigcon), 16°10'25"N, 61°47'75"W, 6-10 m, underside coral rubble, 21-VI-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson).

MARTINIQUE: USNM 41797 (paratype *Haliclona pseudomolitba*, cf. De Weerd et al., 1991: 197; complete site data: Diamond Rock, 14°26'40"N, 61°02'52"W, S side, bottom of shallow cave, 60 ft., 3-VII-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson); ZMA Por. 11497 (schizoparatype, same data as USNM 41797); ZMA Por. 11494 (Baie du Marin, N side Pt. du Marin, 14°27'00"N, 60°53'18"W, seagrass fields, 1.5 m, 1-VII-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson).

ST. LUCIA: USNM 41827 (Vieux Fort Bay, Mathurin Pt., W side, 13°42'96"N, 60°58'10"W, under coral rubble, 5 m, 28-VI-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles June/July 1989, R/V Seward Johnson).

VENEZUELA: USNM 41506, 41508, 41721, 41722 (Los Roques, W side of Dos Mosquitos Sur, 11°48'00"N, 66°54'00"W, under coral rubble, 3-5 m, 23-IV-1989, coll. W.H. de Weerd); USNM 41723 (Los Roques, N side Cayo de Agua, under coral rubble, 3 m, 22-IV-1989, coll. W.H. de

Weerd); USNM 41822 (Los Roques, W side Dos Mosquitos Sur, under coral rubble, 3 m, 21-IV-1989, coll. W.H. de Weerd); USNM 42395 (Front of Pescadores Cay, Morrocoy National Park, mangroves, 1-V-1989, coll. M.C. Diaz); ZMA Por. 7589 (Los Roques, NW side Dos Mosquitos Sur, underside conch shell, 0.1 m, 21-IV-1989, coll. W.H. de Weerd); ZMA Por. 7590 (same data as USNM 41822); ZMA Por. 11495 (same data as USNM 41506); ZMA Por. 11496 (Los Roques, N side Cayo Nube Verde, Boca Grande, *Thalassia* fields, 0.5-1.5 m, 19-IV-1989, coll. W.H. de Weerd); ZMA Por. 11499 (Los Roques, inside bay S side Espenqui, on mangrove root, 0.5 m, 20-IV-1989, coll. W.H. de Weerd).

BOINAIRE: ZMA Por. 4259 (cf. Van Soest, 1980: 10, as *Haliclona molitba*); ZMA Por. 6402 (Lac, Cay, on mangrove root, 0.5 m, 29-XII-1986, coll. W.H. de Weerd); ZMA Por. 6406 (Lac, Cay, *Thalassia* field, 1 m, 29-XII-1986, coll. W.H. de Weerd); ZMA Por. 6407 (Lac, Cay, *Thalassia* and *Halimeda* fields, on sandy bottom, 1 m, 2-I-1987, coll. W.H. de Weerd); ZMA Por. 6408 (Lac, Cay, *Thalassia* and *Halimeda* fields, on sandy bottom, 1 m, 29-XII-1986, coll. W.H. de Weerd).

CURAÇAO: ZMA Por. 4027, 4268 (cf. Van Soest, 1980: 9, as *Haliclona molitba*); ZMA Por. 4341 (holotype *Reniera carmabi*, cf. Van Soest, 1980: 14); ZMA Por. 4343 (cf. Van Soest, 1980: 14, as *R. carmabi*); ZMA Por. 4468 (Piscadera Bay, central part, 3rd buoy, on shell agglomerate, 31-X-1963, coll. P. Wagenaar Hummelinck, # 1477); ZMA Por. 5380 (Barbara Beach, 1-3 m, 3-VI-1984, coll. J.H. Stock and J. Vermeulen); ZMA Por. 6399, 6413 (Fuikbaai, 1-2 m, 13-I-1987, coll. W.H. de Weerd); ZMA Por. 7596 (near Carmabi, under coral rubble, 0.5-1.5 m, 25-XII-1980, coll. R.W.M. van Soest, id. as *Dendroxea carmabi*).

COLOMBIA: USNM 41830 (Bahia de Santa Marta, El Morro, 24 m, 25-IV-1988, coll. S. Zeca, # ASC-2).

BELIZE: USNM 41743 (holotype *Haliclona pseudomolitba*, cf. De Weerd et al., 1991: 197); USNM 41503, ZMA POR. 7595 (paratypes *H. pseudomolitba*, cf. De Weerd et al., 1991: 197); USNM 41504 (Twin Cays, Hidden Creek, peat undercuts, 1 m, 12-XII-1988, coll. W.H. de Weerd); USNM 41738 (Twin Cays, Hidden Creek, mangrove roots, 9-V-1985, coll. K. Rützler and K. Smith); USNM 41742 (cf. De Weerd et al., 1991: 197, as *H. pseudomolitba*); USNM 41742 (De Weerd et al., 1991: 197, as *H. pseudomolitba*).

AZORES: ZMA. Por. 11501 (Sao Miguel, S coast, Ponto Delgada Harbor, 37°44'5"N 25°39'72"W, flat sand, 35 ft., 10-VIII-1990, HBOI/BMR Eastern Atlantic Exped., R/V Sea Diver, fragm. of HBOI 10-VIII-90-1-5).

CANARY ISLANDS: ZMA Por. 5765 (Lanzarote, in tidal pool, 20-VIII-1984, coll. R.G. Moolenbeek).

DESCRIPTION. - Shape and size: very variable, varying from dense clusters of partly coalescent, hollow tubes to fingershaped, the fingers/branches solid with several oscula, flush with the surface, at all sides of the branches, but it may also form laterally spreading thick cushions or remain thinly encrusting. Diameter of the clusters of tubes to

about 20 cm, thickness of the tubes/fingers 0.3-2 cm, height to about 15 cm. Oscula in tube-shaped specimens 0.1-0.6 cm in diameter, with a strong tendency to narrow upon preservation in alcohol. Oscula in finger-shaped specimens 0.1-0.3 cm, in the cushion-shaped forms 0.1-0.5 cm, in the thinly encrusting forms less than 0.1 cm.

Consistency: very soft and limp, highly compressible, fragile.

Surface: even, slightly hispid.

Colour: bright to dark pink, sometimes with yellowish cream tinges, occasionally light brown.

Ectosomal skeleton: absent.

Choanosomal skeleton: extremely variable, varying from spongin-dominated skeletons of spongin fibres without clearly distinguishable primary and secondary fibres, 6-122 µm thick, cored by 0-6 oxeas (often strongyloxeas) of reduced size, through a reticulation of more pronounced primary and secondary lines which are often crooked, with secondary lines 1-3 oxeas in length, with an intermediate amount of spongin, to spicula-dominated skeletons forming an isotropic, largely unispicular reticulation with larger oxeas and scarce spongin.

Spongin: in spongin-dominated skeletons it is the main structural component, with a fibre thickness of 4-122 µm. In intermediate skeletons the fibre thickness varies from 2.5 to 42.5 µm. In spicula-dominated skeletons the spongin is scarce and confined to the nodes of the spicula.

Spicula: varying from vestigial strongyloxeas with truncated, cleaved ends of 45.4-99.2 x 0.5-2.6 µm in spongin-dominated skeletons to much more robust, sharply pointed oxeas of 65.9-144 x 1.3-7 µm in spicula-dominated skeletons.

Ecology: *Thalassia*-fields, on shallow sandy bottom, stilt roots of mangroves, peat undercuts and banks, shallow caves, undersides coral rubble; not found below 18 m.

Distribution (Fig. 43): Bermuda (e.g., De Laubenfels, 1949), North Carolina, Georgia, Florida, Bahamas, Puerto Rico, St. Croix, Guadeloupe, Martinique, St. Lucia, Venezuela, Colombia, Bonaire, Curaçao, Belize, Azores, Canary Islands.

REMARKS. - 'The extreme variation in *Chalinula molitba* misled De Weerd et al. (1991) when they described a new species *Haliclona pseudomolitba*

from Belize and Martinique, based on finger-shaped specimens with spicula-dominated skeletons. The species was considered different from *Haliclona molitba* De Laubenfels, because both the holotype of *H. molitba* and material identified by others as *H. molitba* were all sponges with spongin-dominated skeletons. Since then a series of intermediate forms has been found with all possible intergrades between the two extreme skeletal architectures. An ANOVA-test, conducted on 64 specimens did not show bimodal differences in growth form and skeletal architecture ($p = 0.1$). This suggests that there is no correlation between growth form and skeletal architecture, i.e., branching forms may have both spongin- and spicula-dominated skeletons, and the same applies to the cushion-shaped and thinly encrusting forms. Nor could a correlation be found between these characters and geographic locality.

De Laubenfels' (1950a) specimen of *Liosina monticulosa* (Verrill, 1907; see also Van Soest, 1980) from Bermuda (BMNH 1948.8.6.24) is a spongin-dominated form of *C. molitba*, with oxeas of $69.3-130.9 \times 0.8-1.9 \mu\text{m}$.

Haliclona crassiloba sensu De Laubenfels, 1950a (BMNH 1948.8.6.17) is *C. molitba* with an intermediate skeleton and oxeas of $87.6-99 \times 3-3.6 \mu\text{m}$. It is not a new species, as suggested by Van Soest (1980).

Finally, Van Soest's (1980) *Reniera carmabi* is considered a synonym of *C. molitba*. The specimens are thinly encrusting with an intermediate skeleton and oxeas of $57-90.5 \times 0.3-2.4 \mu\text{m}$. The distinctive blue life colour, as mentioned by Van Soest (l.c.), is enigmatic, but may have been caused by local or other conditions.

In some cases *C. molitba* may become very similar in skeletal architecture to the North Atlantic *C. limbata* (Montagu, 1818) and *C. loosanoffi* (Hartman, 1958) (cf. Van Soest, 1976; De Weerd, 1986). These species, especially *C. loosanoffi*, also show a considerable variation in the size of the oxeas and amount of spongin; *C. loosanoffi* also in growth form. *C. limbata* has a much tougher consistency than *C. molitba*, is consistently cushion-shaped and brown, and has generally smaller oxeas ($55-90$ by $0.5-1.5 \mu\text{m}$). *C. loosanoffi* has oxeas in the same size category as *C. molitba* ($70-120$ by $2-4.5 \mu\text{m}$), but they are much more fusiform with a conspicuously high number

of centrotylote forms intermixed, and the species has gemmulae, which do not occur in *C. molitba*.

C. molitba was found once in the Azores (ZMA Por. 11501), with a tubular form and spicula-dominated skeleton, entirely similar to specimens like USNM 41503, 41504, 41738 and 41797. The record of the Canary Islands is also from a single specimen, cushion-shaped, with an intermediate amount of spongin and vestigial strongyloxeas. There are no other records of the species from other eastern Atlantic (including Mediterranean) localities, which could indicate that *C. molitba* is, outside the Caribbean, probably restricted to the Azores and the Canary Islands.

Chalinula renieroides Schmidt, 1868

Figs. 3U, 44A-C

Chalinula renieroides Schmidt, 1868: 7; Topsent, 1938: 1-2

Haliclona renieroides; Pulitzer-Finali, 1978: 84.

Chalinula fertilis Keller, 1879: 318, pls. 18-20; Topsent, 1925a: 17; Gricssinger, 1971: 163, fig. 13a.

Acervochalina fertilis; De Weerd & Van Soest, 1986: 27, figs. 19, 20.

REMARK. - For the synonymy of *C. renieroides* with *C. fertilis* see above.

MATERIAL

GRENADA: ZMA Por. 12733 (off St. George Harbour, 0.5 mi W of St. John River, $12^{\circ}03'52''\text{N}$, $61^{\circ}45'58''\text{W}$, under stone, 1 m, 3-IV-1989, coll. W.H. de Weerd, HBOI/BMR Exped. Lesser Antilles March/April 1989, R/V Seward Johnson).
CURAÇAO: ZMA Por. 4034 (Piscadera Bay, Boca, E, sandy bottom, 1.5-2 m, 5-I-1964, coll. Wagenaar Hummelinck, # 1457)

DESCRIPTION. - Shape and size: thin crusts to laterally spreading cushions of equal thickness, $4 \times 3.5 \times 0.3-0.4$ cm in ZMA Por. 4034, with numerous (approx. 25) circular oscula on slightly raised, small mounds, and flush with the surface, 0.8-1.5 mm in diameter.

Consistency: soft, somewhat resilient, compressible.

Surface: even, slightly hispid.

Colour: light brown.

Ectosomal skeleton: absent.

Choanosomal skeleton: regular reticulation of

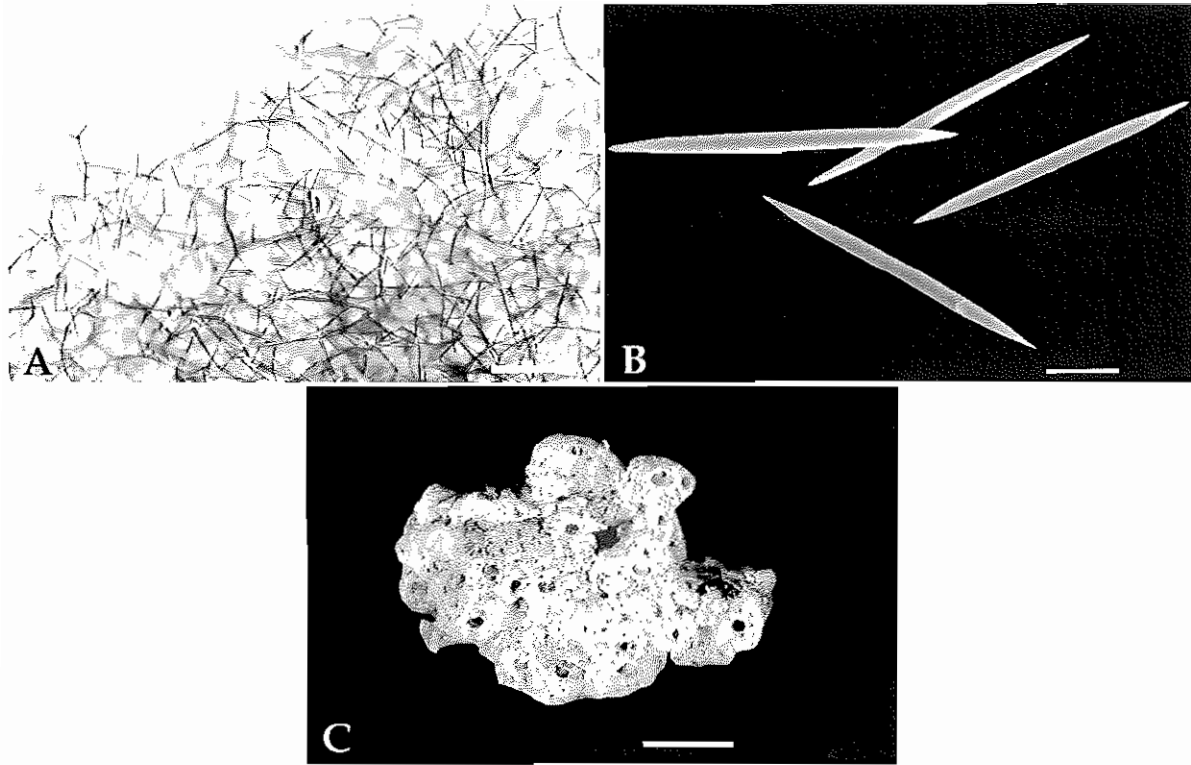


Fig. 41. *Chalimula renieroides*. A, perpendicular section of choanosome, from slide MNHN D.T.748. B, scanning electron micrograph of oxeas. C, preserved specimen, ZMA Por. 3043 (scale bars: A = 200 μ m; B = 20 μ m; C = 0.5 cm).

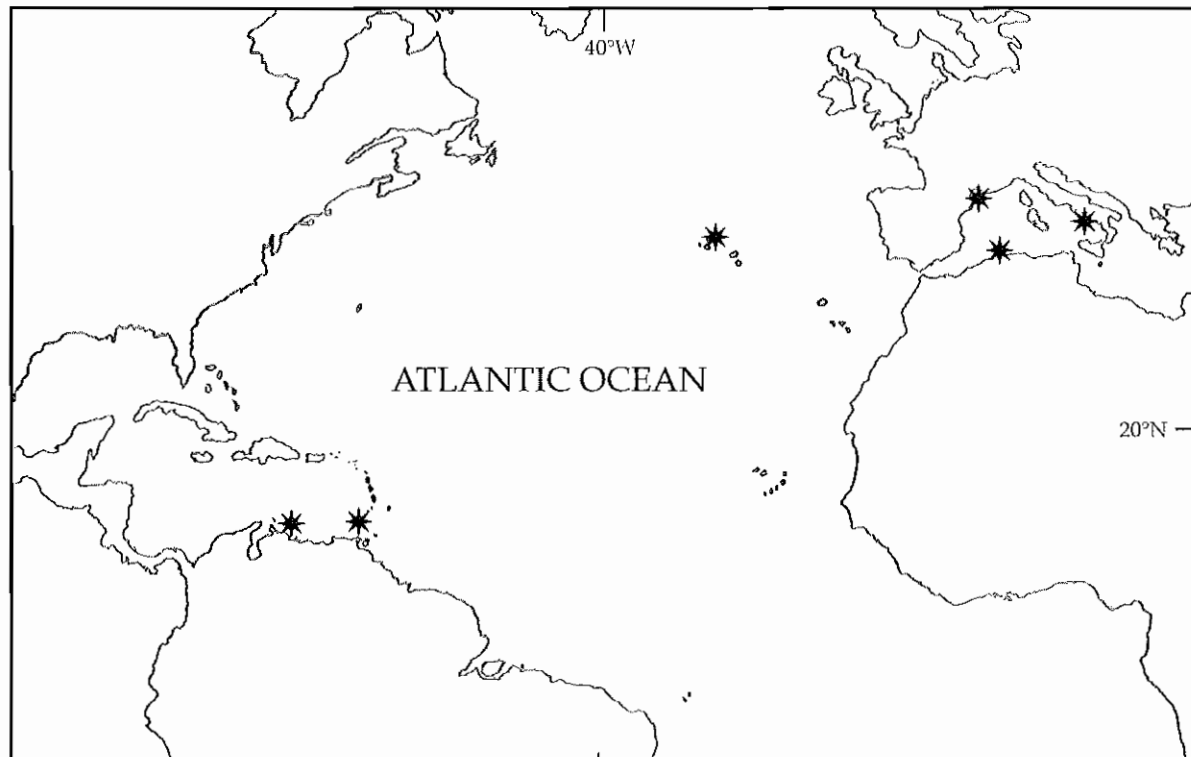


Fig. 45. Distribution of *Chalimula renieroides*.

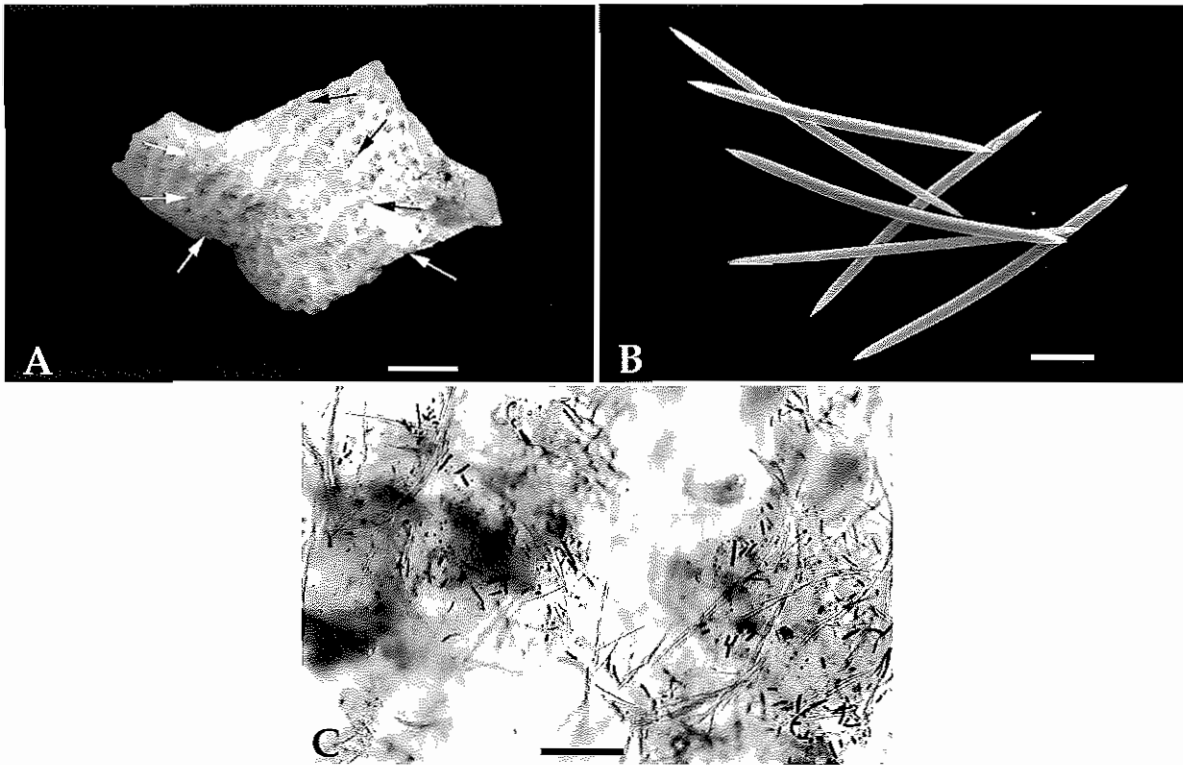


Fig. 46. *Chalinula zae* n.sp. A, holotype, USNM 41829, growing on *Agaricia* sp. (arrows indicate area covered by the sponge). B, scanning electron micrograph of oxeas. C, perpendicular section of choanosome (scale bars: A = 1 cm; B = 25 μ m; C = 200 μ m).

unispicular (occasionally paucispicular) primary lines which are, at unequal distances but regularly, connected by secondary lines of 1 spiculum thick and 2-4 spicula in length. Most meshes between the lines are rectangular, 133-295 μ m in diameter.

Spongine: moderate, completely enveloping the skeletal lines.

Spicula: short, straight or only very slightly curved oxeas with a pronounced fusiform shape and sharp points, 81-105 ($93.9 \pm 51.$) \times 3.6-6.6 (5.1 ± 0.7) μ m.

Ecology: on and under stones in shallow sandy bottom.

Distribution (Fig. 45): Mediterranean (Algeria, Schmidt, 1868; Naples, Topsent, 1925a, Pulitzer-Finali, 1978; L'étang de Thau, Topsent, 1938, Griessinger, 1971), Azores (De Weerd & Van Grenada, Curaçao).

REMARKS. - *Chalinula renieroides* occurs, like *C. molitba*, at both sides of the North Atlantic Ocean, and also in the Mediterranean. This dis-

tribution pattern is unusual for sponges and may be due to the absence of morphological divergence when the earlier continuous Tethyan population of the species became fragmented by the widening of the North Atlantic Ocean during the Cretaceous. This would mean that the species is of a very old age, but it is also possible that sub-recent transatlantic colonization has taken place.

***Chalinula zae* n.sp.**

Figs. 2A, 3O, 46A-C

Haliclona sp.; Lehnert & Van Soest, 1998: 90.

MATERIAL

COLOMBIA: Holotype: USNM 41829 (Islas del Rosario, SE of Isla Grande, on dead parts of *Agaricia tenuifolia*, 4 m, 28-I-1983, coll. S. Zea, #C-Por 176).

ST. CROIX: Paratype: ZMA Por. 9420 (on coral rubble, coll. & don. W. Gladfelter, # 0-19, other data lacking).

Additional material: JAMAICA: ZMA Por. 12963 (reefs in front of mouth Rio Bueno, on agglomerate of shells and calcareous worm tubes, 20 m, 13-VII-1993, coll. & don. H. Lehnert, # J314).



Fig. 47. Distribution of *Chalinula zae* n.sp.

DESCRIPTION. - Shape and size: thinly encrusting. The holotype occupies 3 x 2.5 cm of the upper-side and 1 x 1.8 cm of the underside of a piece of *Agaricia*. The paratype covers the major upper-side of a piece of coral rubble of 1.8 x 2.7 cm. The oscula are in the living state small, flush with the surface and situated in the centre of a conspicuously star-shaped pattern of exhalant canals. Both this feature and the oscula disappear upon preservation.

Consistency: soft.

Surface: even, slightly hispid.

Colour: dark brown (holotype), orange (paratype), orange-yellow (ZMA Por. 12963).

Ectosomal skeleton: absent.

Choanosomal skeleton: delicate, somewhat irregular reticulation of uni- to paucispicular primary lines, connected by secondary lines of 1-2 spicula thick and 1-2 spicula long.

Spongin: mainly at the nodes of the spicula, occasionally forming a thin sheath around spicula.

Spicula: slightly curved oxeas, of equal thickness throughout, suddenly ending in very short, blunt, slightly telescoped points, 111-151.5 (130.7 ±

11.3) x 3-5.4 (4 ± 0.8) µm.

Ecology: on coral rubble; known depth range 4-20 m.

Distribution (Fig. 47): Jamaica, St. Croix, Colombia.

ETYMOLOGY. -Named after Dr Sven Zea, collector of the holotype, in recognition of his contributions to the knowledge of Caribbean sponges.

REMARKS. - Although *C. zae* n.sp. is known only from three specimens, it is sufficiently characteristic to describe it as a new species. Most remarkable are the star-shaped oscula, a character which is unusual for chalinids. The length of the oxeas exceeds both those of *C. molitba* and *C. renieroides*, and the shape of the oxeas, with the short points, is entirely different from these species.

KEY TO THE SPECIES OF THE GENUS *CHALINULA*

- 1a. Sponges forming laterally spreading cushions with several circular oscula on low elevations, consistency spongy, elastic, oxeas with a pronounced fusiform

- shape, very constant in shape and size, 80-105 x 3.5-6.5 μm *Chalinula renieroides*
- b. Sponges thinly encrusting, thickly encrusting, tube- or finger-shaped, oxeas of variable size and shape, but not pronounced fusiform 2
- 2a. Thinly encrusting, with conspicuous star-shaped patterns of the exhalant canals around the oscula (this feature becomes less visible in preserved specimens), colour varying from dark brown to orange-yellow, oxeas with short, blunt, slightly telescoped ends, 110-150 x 3-5.5 μm *Chalinula zcae* n.sp.
- b. Tube- or finger-shaped, also thickly encrusting, finger-shaped specimens with several oscula alongside all parts of the branches, flush with the surface, cushion-shaped specimens with numerous oscula at the upper side, consistency limp, compressible, fragile, colour bright to dark pink, sometimes with yellowish cream tinges, skeleton varying from a spongin-dominated reticulation with small, vestigial, blunt-tipped oxeas of 45-100 x 0.5 - 2.6 to a spicula-dominated reticulation with sharply pointed oxeas of 65-145 x 1.3-7 μm *Chalinula molitba*

ADDITIONAL RECORDS OF CARIBBEAN CHALINIDAE

The following species are either deep-water species, or they are ill-known or have a dubious taxonomic status. Deep-water species are *Reniera ascidia* Schmidt (1870), *Reniera hebes* Schmidt (1870), *Haliclona calcinea* Burton (1954), *Haliclona strongylophora* Lehnert & Van Soest (1996) and *Haliclona megasclera* Lehnert & Van Soest (1996).

Reniera ascidia Schmidt (1870: 40) was described from Florida, from a depth of 108 m, as a massive sponge with tube-like outgrowths, with oxeas of about 200 μm . Material of this species is present in BMNH (Desqueyroux-Faúndez & Stone, 1992).

Reniera hebes Schmidt (1870: 40) was also described from Florida, from 90 m depth. Schmidt does not give a description, he only mentions the presence of strongyles ("Nadeln an beiden Enden stumpf"). Material of this species is also present in the BMNH (Desqueyroux-Faúndez & Stone, 1992).

Haliclona calcinea was described from Grenada from 720-800 m depth (holotype, BMNH 1938.6.30.31 examined). It is a characteristic species with a massive form, oxeas of ca. 440-555 x 13.8-1.8 μm , sharply bent toxas of 35-63 x 1.9-2.8 μm and centrangulated sigmas of 16-32.5 x

0.7-1.9 μm . A slide made from the holotype shows a somewhat irregular, paucispicular, tangential reticulation, but not a dermal crust as in *Oceanapia*, as was suggested by Van Soest (1980). It has the subhalichondroid skeletal architecture typical for the subgenus *Gellius*, to which it is here assigned.

Haliclona strongylophora Lehnert & Van Soest (1996: 73) (holotype, ZMA Por. 11336 examined), was found in Jamaica at depths of 76.2 and 77.7 m. It is a soft, encrusting sponge with strongyles of 150-200 x 40-10 μm , with an isotropic reticulation, making it a member of the subgenus *Reniera*, in agreement with Lehnert & Van Soest's assignment of the species to the 'aqueductus' group.

Haliclona megasclera Lehnert & Van Soest (1996: 73) (holotype, ZMA Por. 11338 examined) was also described from Jamaica, from 77.7 m depth, as a leather-like massive sponge with oxeas of 282-370 x 9-12 μm . It was assigned by the authors to the 'angulata' group, here replaced by the subgenus *Gellius*. The oxeas, considered of a unique large size for Caribbean *Haliclona* species by Lehnert & Van Soest, are of similar size as those of *Haliclona (Halichoelona) stoneae* n.sp., in which they measure about 285-360 x 7.5-12.8 μm . The two species are definitely not conspecific: *H. (Halich.) stoneae* n.sp. consists of thick, brittle cushions with conspicuously large oscula and has sigmas.

Species of dubious taxonomic status are *Chalina finitima* Schmidt, 1870, *Reniera fortior* Schmidt, 1870, and *Adocia perforata* Pulitzer-Finali, 1986.

Chalina finitima Schmidt (1870: 33) was described from Florida, without record of depth, as a thick crust, with radiar and connecting fibres. The only known material is a microscope slide in the BMNH (1870.5.3.133), showing a skeleton quite similar to the spongin-dominated skeleton as found in *Chalinula molitba* (De Laubenfels, 1949), with oxeas of 78-132 x 1.5-3 μm and spongin fibres of 6.2-21.6 μm . If the two species would turn out to be conspecific, Schmidt's name should have priority. The poor description and scarce material do not justify such a decision, and I consider *Chalina finitima* as a species incertae sedis. *Acervochalina finitima* sensu Ridley, 1884 is *Callyspongia diffusa* (Ridley, 1884)

(cf. e.g., Bergquist & Warne, 1980, and Wiedenmayer, 1989).

Reniera fortior Schmidt (1870: 40) was described from the Antilles, without record of depth, as a turnip-shaped sponge, with oxeas of 138 μm , and much spongin. A slide, made by Rob van Soest from Schmidt's specimen in the Zoological Museum, University of Copenhagen (ZMUC), shows a skeleton (without visible spongin) close to the subgenus *Halichoelona*, but because it is denser it also approaches *Xestospongia*. It is considered as a species incertae sedis.

Adocia perforata Pulitzer-Finali (1986: 160) was described from Puerto Rico, 0.5-1 m depth, as a massive, firm, compressible but friable sponge, with oxeas of 100-115 x 3.5-4.5 μm . A fragment of the holotype in the Museum of Natural History of Genoa (MSNG 47706) is present in the ZMA collection, but it is difficult to assess the taxonomic status of the species. It has a skeleton not unlike the subgenus *Halichoelona*, i.e. subisotropic, but it is denser, approaching *Xestospongia*. With the scarce material available and the absence of characters which clearly set the species apart it is not included in the identification key of the species of *Halichoelona*.

Finally, BMNH holds an unpublished specimen (BMNH 1937.11.26.16a) labeled "*Haliclona flagellifer* (R&D), Turneffe, Brit. Honduras, T 26, Presd. J.H. Borley", of unknown depth (cf. also Van Soest, 1980). A slide made from this specimen shows a choanosomal skeleton typical of the subgenus *Gellius*, with slender oxeas with slightly telescoped ends of ca. 130-170 x 1.5-3 μm and sigmas of very variable shape and size, some of them flagelliform, 10-53 x 0.6-1.7 μm . It is different from *Gellius flagellifer* Ridley and Dendy, 1886 and remains of dubious status.

ACKNOWLEDGEMENTS

The author is most grateful to Dr Klaus Rützler (Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.) who enabled me to receive several Postdoctoral Fellowships and grants from the Smithsonian Institution during 1988-1991. These formed the onset for the present monograph. I am also grateful to Dr Shirley Pomponi (Harbor Branch Oceanographic

Institution, Florida) for inviting me to participate in cruises to the Lesser Antilles and the Azores with R/V Seward Johnston, and for providing logistical support during my visit to the Florida Keys.

Field work in the gulf of Chiriquí was made possible by an invitation of Dr Peter W. Glynn (Rosenstiel School of Marine and Atmospheric Sciences, Florida) to participate in his research on eastern Pacific species of the hydrocoral *Millepora*. This enabled me to collect sponges in this remote area as well.

For the loan of type specimens and other material, or for their help during my visits to museums I thank Shirley M. Stone (now retired) and Clare Valentine (Natural History Museum, London), Dr Nicole Boury-Esnault (Museum National d'Histoire Naturelle, Paris, and Station Marine d'Endoume, Marseille), Kate Smith (National Museum of Natural History, Smithsonian Institution), Eric Lazo-Wasem (Yale Peabody Museum, New Haven) and Cléa Lerner (Fundação Zoobotânica do Rio Grande do Sul, Museu de Ciências Naturais, Porto Alegre, Brazil).

I thank Sven Zea (Universidad Nacional de Colombia, Departamento de Biología, INVE-MAR, Colombia) and Helmut Lehnert (Institute for Organic Chemistry, Germany) for the donation of specimens of new species to the ZMA, and Eduardo Hajdu (Universidade Federal do Rio de Janeiro, Instituto de Biologia, Brazil) for a specimen of *Haliclona (Soestella) melana* from Brazil.

Thanks are due to Mike Carpenter, Troy Clark, Henk de Haas, Paul Hoetjes, John Reed, Kate Smith, Steve Viada, Pim van Vliet, Jan Vermeulen and Chad Walter for help in the field and technical assistance.

REFERENCES

- ALCOLADO, P.M., 1984. Nuevas especies de esponjas encontradas en Cuba. *Poeyana* **271**: 1-22.
- BERGQUIST, P.R. & K.P. WARNE, 1980. The marine fauna of New Zealand: Porifera, Demospongiae, Part 3 (Haplosclerida and Nepheliospongia). *New Zealand Oceanogr. Inst. Mem.* **87**: 1-78.
- BOURY-ESNAULT, N. & T. LOPES, 1985. Les Démosponges littorales de l'Archipel des Açores. *Ann. Inst. océanogr.* **61** (2): 149-225.

- BOWERBANK, J. S., 1864. A monograph of the British Spongiadae. Vol. 1. London, Ray Society: 1-290.
- BOWERBANK, J. S., 1866. A monograph of the British Spongiadae. Vol. 2. London, Ray Society: 1-388.
- BOWERBANK, J. S., 1874. A monograph of the British Spongiadae. Vol. 3. London, Ray Society: 1-367.
- BRIGGS, J.C., 1974. Marine Zoogeography. Mc Graw-Hill Book Company, New York: 1-461.
- BURTON, M., 1934. Sponges. Scient. Repts. Great Barrier Reef Exp., 1928-29, **4** (14): 513-621.
- BURTON, M., 1954. The "Rosaura" Expedition, 1937-1938. 5. Sponges. Bull. Brit. Mus. (Nat. Hist.), Zool. **2** (6): 215-239.
- DESQUEYROUX-FAÚNDEZ, R., 1976. Demospongiae from the region of Canales of Chile. Cah. Biol. mar. **17** (1): 93-109.
- DESQUEYROUX-FAÚNDEZ, R. & S.M. STONE, 1992. O. Schmidt sponge catalogue. An illustrated guide to the Graz Museum collection, with notes on additional material. Muséum d'Histoire naturelle, Geneva: 1-190.
- DEVIJVER, C., M. SALMOUN, D. DALOZE, J.C. BRAEKMAN, W.H. DE WEERDT, M.J. DE KLUJVER. & R. GOMEZ, 2000. (2*R*, 3*R*, 7*Z*)-2-aminotetradec-7-ene-1, 3-diol, a new amino alcohol from the Caribbean sponge *Haliclona vansoesti*. J. Nat. Prod. **63** (7): 978-980.
- EKMAN, S., 1953. Zoogeography of the sea. Sidgwick & Jackson, London: 1-417
- FLEMING, J., 1828. A history of British animals. Edinburgh, London: 1-565.
- FROMONT, J., 1993. Descriptions of species of the Haplosclerida (Porifera: Demospongiae) occurring in tropical waters of the Great Barrier Reef. The Beagle **10** (1): 7-40.
- FROMONT, J., 1995. Haplosclerida and Petrosida (Porifera: Demospongiae) from the New Caledonia Lagoon. Invertebr. Taxon. **9**: 149-180.
- GEORGE, W.C. & H.V. WILSON, 1919. Sponges of Beaufort (N.C.) Harbor and vicinity. Bull. Bur. Fish. **36**: 130-179.
- GRANT, R.E., 1826. Notice of two new species of British sponges. Edinb. new Phil. J. **2**: 203-204.
- GRANT, R. E., 1835. Animal kingdom. In: Todd, R.B. (ed.). The encyclopedia of anatomy and physiology, 1. Sherwood, Gilber & Piper, London: 107-118.
- GRANT, R.E., 1861. Tabular view of the primary divisions of the Animal Kingdom. Walton, London: 1-91 [sponges: 73-76].
- GRAY, J. E., 1867. Notes on the arrangement of sponges, with description of some new genera. Proc. Zool. Soc. London **1867**: 492-558.
- GRAY, J. E., 1872: Notes on the classification of sponges. Ann. Mag. nat. Hist., (4) **9**: 442-461.
- GRIESSINGER, J.-M., 1971. Étude des Réniérides de Méditerranée (Demosponges Haplosclérides). Bull. Mus. nation. Hist. nat., (3) **3** (Zoologie 3): 97-182.
- HARTMAN, W.D., 1958. Natural history of the marine sponges of southern New England. Bull. Peabody Mus. nat. Hist. **12**: 1-155.
- HECHTEL, G. J., 1965. A systematic study of the Demospongiae of Port Royal, Jamaica. Bull. Peabody Mus. nat. Hist. **20**: 1-103.
- HENTSCHEL, E., 1912. Kiesel- und Hornschwämme der Aru und Kei-Inseln. Abhandl. d. Senckenb. Naturf. Gesellsch. **34**: 295-448
- HENTSCHEL, E., 1914. Monaxone Kieselchwämme und Hornschwämme der deutschen Südpolar-Expedition, 1901-3. Deutsch. Südpol.-Exped., XV, Zoology 7: 35-141.
- HOOPER, J.N.A. & F. WIEDENMAYER, 1994. Porifera. In: Wells, A. (ed.). Zoological Catalogue of Australia, 12. Melbourne, CSIRO, Australia: 1-624.
- HUMPHRIES, C.J. & L.R. PARENTI, 1999. Cladistic biogeography: Second edition: Interpreting patterns of plant and animal distributions. Oxford University Press, Oxford: 1-187.
- JOHNSTON, G., 1842. A history of British sponges and Lithophytes. Lizars, Edinburgh: 1-264.
- KELLER, 1879. Studien über Organisation und Entwicklung der Chalcineen. Z. wiss. Zool. **33** (1): 317-349.
- KNOWLTON, N., L.A. WEIGT, L.A. SOLÓRZANO, D.K. MILLS & E. BERMINGHAM, 1993. Divergence in proteins, mitochondrial DNA, and reproductive compatibility across the Isthmus of Panama. Science **260**: 1629-1632.
- LABOREL, J., 1970 [1969]. Les peuplements de Madréporaires des côtes tropicales du Brazil. Ann. Univ. Abidjan, Ser. E, **2** (3): 1-260.
- LAMARCK, J. B., 1814. Sur les polypiers empâtés. Ann. Mus. Hist. nat. Paris **20**: 370-386, 432-458.
- LAUBENFELS, M. W. DE, 1932. The marine and fresh water sponges of California. Proc. U.S. nation. Mus., **81** (4): 1-140.
- LAUBENFELS, M. W. DE, 1936a. A discussion of the sponge fauna of the dry Tortugas in particular; and the West Indies in general, with material for a revision of the families and orders of the Porifera. Carnegie Inst. Washington Publ., No. 467 (Papers Tortugas Lab., vol. 30): 1-225.
- LAUBENFELS, M. W. DE, 1936b. A comparison of the shallow-water sponges near the Pacific end of the Panama Canal with those at the Caribbean end. Proc. U.S. nation. Mus. **83**: 441-466.
- LAUBENFELS, M.W. DE, 1947. Ecology of the sponges of a brackish water environment at Beaufort, N.C. Ecol. Monogr. **17**: 31-46.
- LAUBENFELS, M.W. DE, 1949. Sponges of the western Bahamas. Amer. Mus. Novitates **1431**: 1-25.
- LAUBENFELS, M.W. DE, 1950a. The Porifera of the Bermuda Archipelago. Trans. zool. Soc. London **27**: 1-154.
- LAUBENFELS, M.W. DE, 1950b. The sponges of Kanoho Bay, Oahu. Pacif. Sci. **4** (1): 3-36.
- LAUBENFELS, M.W. DE, 1951. The sponges of the Island of Hawaii. Pacif. Sci. **5** (3): 256-271.
- LAUBENFELS, M.W. DE, 1953. A guide to the sponges of eastern North America. A special publication of the

- Marine Laboratory, University of Miami. University of Miami Press: 1-32.
- LAUBENFELS, M. W., DE, 1954. The sponges of the West Central Pacific. Oregon State Monogr. **7**: 1-306.
- LEHNERT, H. & R. W. M. VAN SOEST, 1996. North Jamaican deep fore-reef sponges. *Beaufortia* **46** (4): 53-81.
- LEHNERT, H. & R. W. M. VAN SOEST, 1998. Shallow water sponges of Jamaica. *Beaufortia* **48** (5): 71-103.
- LENDENFELD, R. L., VON, 1887. Die Chalincen des Australischen Gebietes. *Zool. Jb.* **2**: 723-828.
- LENTI, F. VAN & W.H. DE WEERDT, 1987. The haplosclerid sponge fauna (Porifera, Demospongiae) from Banyuls-sur-Mer (Mediterranean), with the description of a new species. In: Vacelet, J. & N. Boury-Esnault (eds). Taxonomy of Porifera from the North East Atlantic and Mediterranean Sea. NATO-ASI-Serie G: Ecological Sciences, 13. Springer Verlag, Berlin: 125-148.
- LERNER, C.B., 1996. Esponjas da Ilha da Galé, reserva marinha biológica do Arvoredo, Santa Catarina, Brasil (Porifera: Demospongiae). *Biosciências* **4** (2): 101-129.
- LESSIOS, H.A. & C.W. CUNNINGHAM, 1990. Gametic incompatibility between species of the sea urchin *Echinometra* on the two sides of the Isthmus of Panama. *Evolution* **44** (4): 933-941.
- LÉVI, C., 1959. Campagne de la 'Calypso': Golf de Guinée. 5. Spongiaires. *Ann. Inst. océanogr.* **37**: 115-141.
- LIEBERKÜHN, N., 1859. Neue Beiträge zur Anatomie der Spongien. *Arch. Anat. Physiol.* **30** (3): 353-382.
- LITTLE, F.J., 1963. The sponge fauna of the St. George's Sound, Apalachee Bay, and Panama City Regions of the Florida Gulf coast. *Tulane Stud. Zool.* **11**: 31-71.
- LUNDBECK, W., 1902. Porifera. Part I. Homorrhaphidae and Heterorrhaphidae. Danish Ingolf Exped. **6**: 1-108.
- MIKLUCHO-MACLAY, N., 1870. Über einige Schwämme des Nördlichen Stillen Oceans und des Eismeeres, welche im Zoologischen Museum der Kaiserlichen Akademie der Wissenschaften in St. Petersburg aufgestellt sind. *Mém. Acad. Sci. St. Petersburg* **7** (15) 3: 1-24.
- MONTAGU, G., 1818. An essay on sponges, with descriptions of all the species that have been discovered on the coast of Great Britain. *Mem. Wern. nat. Hist. Soc.* **2** (1): 67-122.
- MOTHES, B. & C. B. LERNER, 1994. Esponjas marinhas do infralitoral de Bombinas (Santa Catarina, Brasil) com descrição de três espécies novas (Porifera: Calcarea e Demospongiae). *Biosciências* **2** (1): 47-62.
- MÜLLER, O.F., 1806. *Zoologica Danica*. Havniae (3rd Edition) **4**: 1-46.
- MURICY, G. & S.M. RIBEIRO, 1999. Shallow-water Haplosclerida (Porifera, Demospongiae) from Rio de Janeiro State, Brazil (south-western Atlantic). *Beaufortia* **49** (9): 83-108.
- PALLAS, P. S., 1766. *Elenchus zoophytorum sistens generum adumbrationes generaliores et specierum cognitarum succinctas descriptiones cum selectis auctorum synonymis*. P. van Cleef, The Hague: 1-451.
- PULITZER-FINALI, G., 1969-1970. *Reniera sarai*, new name for *Haliclona viscosa* Sarà. *Boll. Mus. Ist. biol. Univ. Genova* **37** (256): 97-101.
- PULITZER-FINALI, G., 1978. Report on a collection of sponges from the Bay of Naples. III. Hadromerida, Axinellida, Poecilosclerida, Halichondrida, Haplosclerida. *Boll. Mus. Ist. biol. Univ. Genova* **45**: 7-89.
- PULITZER-FINALI, G., 1982. Some new or little-known sponges from the Great Barrier Reef of Australia. *Boll. Mus. Ist. biol. Univ. Genova* **48-49** (1980-1982): 87-141.
- PULITZER-FINALI, G., 1986. A collection of West Indian Demospongiae (Porifera). In appendix a list of Demospongiae hitherto recorded from the West Indies. *Ann. Mus. Civ. Storia Nat. Genova* **86**: 65-216.
- RIDLEY, S. O., 1884. Spongiida. In: Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H.M.S. 'Alert', 1881-2. British Museum (Natural History), London: 366-482, 582-630.
- RIDLEY, S.O. & A. DENDY, 1886. Preliminary report on the Monaxonida collected by H.M.S. 'Challenger'. Parts I and II. *Ann. Mag. nat. Hist.* (5) **18**: 325-351, 470-493.
- ROSEN, D.E., 1976. A vicariance model of Caribbean biogeography. *Syst. Zool.* **24** (4): 431-464.
- RÜTZLER, K., 1986. Phylum Porifera. In: Sterrer, W. (ed.). Marine fauna and flora of Bermuda. John Wiley & Sons, Inc: 111-127.
- SARÀ, M., 1958. Studio sui porifera di una grotta di marca del Golfo di Napoli. *Arch. zool. Ital.* **43**: 203-286.
- SARÀ, M., 1960. Poriferi del litorale dell'isola d'Ischia e loro ripartizione per ambiente. *Pubbl. Staz. zool. Napoli* **31**: 421-472.
- SCHMIDT, O., 1862. Die Spongien des Adriatischen Meeres. Engelmann, Leipzig: 1-88.
- SCHMIDT, O., 1864. Supplement der Spongien des Adriatischen Meeres. Engelmann, Leipzig: 1-48.
- SCHMIDT, O., 1868. Die Spongien der Küste von Algier. Mit Nachträgen zu den Spongien des Adriatischen Meeres (drittes Supplement). Engelmann, Leipzig: 1-44.
- SCHMIDT, O., 1870. Grundzüge einer Spongien-Fauna des Atlantischen Gebietes. Engelmann, Leipzig: 1-88.
- SOEST, R.W.M. VAN, 1976. First European record of *Haliclona loosanoffi* Hartman, 1958 (Porifera, Haplosclerida), a species hitherto known only from the New England coast (U.S.A.). *Beaufortia* **24**: 177-188.
- SOEST, R.W.M. VAN, 1980. Marine sponges from Curaçao and other Caribbean localities. Part 2. Haplosclerida. *Stud. Fauna Curaçao Carib. Isl.* **62** (191): 1-173.
- SOEST, R. W. M. VAN, 1981. A checklist of the Curaçao sponges (Porifera, Demospongiae) including a pictorial key to the more common reef-forms. *Versl. Techn. Geg. Inst. Tax. Zool. Univ. Amsterdam*, **31**: 1-39.
- SOEST, R. W. M. VAN, 1990. Toward a phylogenetic classification of sponges. In: Rützler, K. (ed.). New perspectives in sponge biology. Smithsonian Institution Press, Washington, D.C.: 344-348.
- SOEST, R.W.M. VAN, 1994. Demosponge distribution patterns. In: Soest, R.W.M. van, Th.M.G. van Kempen & J.-C. Braekman (eds). Sponges in time and space. Balkema, Rotterdam: 213-223.

- SOEST, R.W.M. VAN & D.B. SASS, 1981. Marine sponges from an island cave on San Salvador Island, Bahamas. *Bijdr. Dierk.* **51** (2): 332-344.
- STEPHENS, J., 1912. Marine Porifera of the Clare Island Survey. *Proc. r. Irish Acad.* **31** (59): 1-41.
- TOPSENT, E., 1888. Contribution à l'étude des Clionides. *Arch. Zool. exp. gén.* **2** (5): 1-166.
- TOPSENT, E., 1892a. Contribution à l'étude spongiaires de l'Atlantique Nord. *Rés. Camp. sci. Albert I Monaco* **2**: 1-165.
- TOPSENT, E., 1892b. Diagnoses d'éponges nouvelles de la Méditerranée et plus particulièrement de Banyuls. *Arch. Zool. exp. gén.* **2** (10), Notes & Revue: xvii-xxviii.
- TOPSENT, E., 1893. Nouvelle série de diagnoses d'éponges de Roscoff et de Banyuls. *Arch. zool. exp. gén.* (3) **1**, Notes & Revue: xxxiii-xliii.
- TOPSENT, E., 1908. Spongiaires. *Expéd. antarct. Franç.* (1903-05), Paris **4**: 1-37.
- TOPSENT, E., 1918. Éponges de San Thomé, essai sur les genres *Spirastrella*, *Donatia* et *Chondrilla*. *Arch. Zool. exp. gén.* **57**: 535-618.
- TOPSENT, E., 1925a. Éponges de l'Étang de Thau. *Bull. Inst. océanogr. Monaco* **542**: 1-19.
- TOPSENT, E., 1925b. Étude de spongiaires du golfe de Naples. *Arch. Zool. exp. gén.* **63**: 623-725.
- TOPSENT, E., 1927. Diagnoses d'éponges nouvelles recueillies par le Prince Albert 1er de Monaco. *Bull. Inst. océanogr. Monaco* **502**: 1-19.
- TOPSENT, E., 1938. Commentaires sur quelques genres d'éponges marines. *Bull. Inst. Océanogr. Monaco* **744**: 1-23.
- VACELET, J., 1969. Éponges de la roche du large et de l'étagage bathyal de Méditerranée (récoltes de la soucoupe plongeante Cousteau et dragages). *Mém. Mus. nation. Hist. nat. (A, Zoologie)* **59** (2): 145-219.
- VERRILL, A. E., 1907. The Bermuda Islands. Part IV. Geology and paleontology, and part V. An account of the coral reefs. *Trans. Connecticut Acad. Arts Sci.* **12**: 45-438.
- WEERDT, W.H. DE, 1986. A systematic revision of the north-eastern Atlantic shallow-water Haplosclerida (Porifera, Demospongiae), part II: Chalinidae. *Beaufortia* **36** (6): 81-165.
- WEERDT, W.H. DE, 1987. The shallow-water Haplosclerida (Porifera, Demospongiae) of the North East Atlantic Ocean: taxonomy, phylogeny and historical biogeography: 1-243. (PhD thesis).
- WEERDT, W.H. DE, 1989. Phylogeny and vicariance biogeography of North Atlantic Chalinidae (Haplosclerida, Demospongiae). *Beaufortia* **39** (3): 55-88.
- WEERDT, W.H. DE, 1990. Discontinuous distribution of the tropical West Atlantic hydrocoral *Millepora squarrosa*. *Beaufortia* **41** (27): 195-203.
- WEERDT, W.H. DE, 1991. Vicariance biogeography using North Atlantic Chalinidae (Demospongiae). In: Reitner, J. & H. Keupp (eds): *Fossil and Recent sponges*. Springer-Verlag, Berlin: 421-431.
- WEERDT, W.H. DE, M.J. DE KLUIJVER & R. GOMEZ, 1999. *Haliclona (Halichoelona) vansoesti* n.sp., a new chalinid sponge species (Porifera, Demospongiae, Haplosclerida) from the Caribbean. *Beaufortia* **49** (6): 47-54.
- WEERDT, W.H. DE, K. RÜTZLER & K.P. SMITH, 1991. The Chalinidae (Porifera) of Twin Cays, Belize, and adjacent waters. *Proc. biol. Soc. Wash.* **104** (1): 189-205.
- WEERDT, W.H. DE & R.W.M. VAN SOEST, 1986. Marine shallow-water Haplosclerida (Porifera) from the south-eastern part of the North Atlantic Ocean. *Zool. Verh. Leiden* **225**: 1-49.
- WELLS, H.W., M.J. WELLS & I.E. GRAY, 1960. Marine sponges of North Carolina. *J. Elisha Mitchell sci. Soc.* **76**: 200-245.
- WIEDENMAYER, F., 1977. Shallow-water sponges of the Western Bahamas. *Experientia, Suppl.* **28**: 1-287.
- WIEDENMAYER, F., 1989. Demospongiae (Porifera) from northern Bass Strait, southern Australia. *Mem. Mus. Victoria* **50** (1): 1-242.
- WULFF, J.L., 1996. Do the same sponge species live on both the Caribbean and eastern Pacific sides of the Isthmus of Panama? In: Willenz, Ph. (ed.). *Recent advances in sponge biodiversity inventory and documentation*. *Inst. r. sci. nat. Belg.* **66** (suppl.): 165-173.
- ZEA, S., 1987. Esponjas del Caribe colombiano: Dictyoceratida, Dendroceratida, Verongida, Haplosclerida, Poecilosclerida, Halichondrida, Axinellida, Desmophorida y Homosclerophorida. *Catálogo Científico, Colombia*: 1-286.
- ZEA, S., 1993. Cover of sponges and other sessile organisms in rocky and coral reef habitats of Santa Marta, Colombian Caribbean Sea. *Caribb. J. Sci.* **29** (1-2): 75-88.
- ZEA, S. & W.H. DE WEERDT, 1999. *Haliclona (Haliclona) epiphytica* n.sp. (Porifera, Demospongiae, Haplosclerida), a seaweed-dwelling sponge from the Colombian Caribbean. *Beaufortia* **49** (13): 171-176.

Received: July 14, 2000