Microcionid sponges from Northwest Africa and the Macaronesian Islands (Porifera, Demospongiae, Poecilosclerida)

R.W.M. van Soest, E.J. Beglinger & N.J. de Voogd

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R.W.M. van Soest, E.J. Beglinger & N.J. de Voogd, Naturalis Biodiversity Center, Darwinweg 2, 2333 CR, Leiden, The Netherlands (rob.vansoest@naturalis.nl).

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A monographic treatment is presented of sponges belonging to the family Microcionidae occurring in Northwest African waters and around the offshore oceanic islands (Cape Verde Islands, Canary Islands, Madeira Archipelago, Azores, and Ascension Island). The material examined was obtained by Dutch expeditions to these waters during the period 1976-1988, complemented with a few additional samples, all of which are incorporated in the sponge collection of the Naturalis Biodiversity Center. In these collections we identified 29 microcionid species, including 17 species new to science, which are all extensively described and illustrated with SEM photos of the spicules, light microscopy photos of the skeletal structure, and photos of the habit of – usually preserved – specimens. The research was supported by re-examined type and other original specimens obtained on loan from major museum collections, and many additional illustrations of these specimens are added for comparison. We also reviewed published descriptions of sponge specimens from the study area, which we were unable to obtain for reexamination, and attempted to draw conclusions about their identity. We conclude that the microcionid fauna of the region comprises approximately 45-48 species (several of the unverified published records remain of uncertain identification), belonging to the genera *Clathria* (subfamily Micorocioninae), *Antho*, *Artemisina* and *Ophlitaspongia* (subfamily Ophlitaspongiinae). Based on the review of this fauna, we propose to revive two previously synonymized subgenera, *Clathria (Paresperia)* Burton, and *Antho (Plocamia)* Schmidt. We provide a key for the identification of microcionid species of the region. We discuss the morphological characters used to distinguish microcionid sponges and comment on distribution patterns.

Contents

Introduction

The sponge fauna of the Macaronesian islands is relatively well known with several monographic reports by Topsent (1892, 1904a, 1928), Boury-Esnault & Lopes (1985) and Cruz (2002). In contrast, sponges of the adjacent continental Northwest African coasts are poorly documented, with few recent publications and older papers usually based on wide-ranging expeditions with often only summary descriptions (Lendenfeld, 1907; Topsent, 1918, 1928; Arnesen, 1923; Lévi, 1952, 1956, 1959, 1960a; Burton, 1956; Van Soest, 1993a). Preliminary analysis (van Soest, 1993b) suggests that – next to some endemic taxa – the main affinity of the sponge fauna of Northwest Africa lies with the Lusitanian and Western Mediterranean faunas, with a minor affinity with the Tropical Western Atlantic.

Dutch expeditions in the 1980's (CANCAP 1-7 and Mauritania II expeditions, see Van der Land, 1987, 1988) yielded ample materials from the Cape Verde Islands, the Canary Islands, the Madeira Archipelagoes, the Azores (collectively called the Macaronesian islands), and the coasts of Mauritania. Sponges were collected by various methods from shallow water down to >1000 m. This material is supplemented by older specimens collected by F.P. Vermeulen in Mauritanian and Senegalese waters and several samples from Ascension Island collected by R. Irving during the Oxford University Expedition to Ascension Island, 'Operation Origin', 1986. The combined collections contain sponges new to science and many interesting new finds of ill-known sponges. An ongoing series of reports on these sponges has the aim to bring our knowledge to a level comparable to that of the European regions; for details of already published contributions see Van Soest et al. (2012).

The present paper addresses the taxonomy of Northwest African species of the poecilosclerid family Microcionidae, including those of the Macaronesian islands. Until now, a total of 22 microcionid species considered valid have been reported from this area (see Van Soest et al. 2013). The collection treated here is dominated by species of the genera *Clathria* Schmidt, 1862 and *Antho* Gray, 1867, but including also a few species of *Artemisina* Vosmaer, 1885. Together the present collection comprises 29 species, but we will also briefly review species not found in the collection but reported from the region previously. For comparison, we studied Mediterranean and Caribbean specimens of microcionid species presumed conspecific with or closely related to Northwest African species, based largely on the examination of type and other original specimens.

Material and methods

Specimens were collected by wading, snorkeling, SCUBA, Van Veen grab, 1.2, 2.4 and 3.5 m Agassiz trawl and rectangular dredge during the CANCAP 1 (March 1976, Madeira), 3 (October 1978, Madeira and Mauritania), 4 (May-June 1980, Canary Islands and Madeira), 5 (June 1981, Azores), 6 (June 1982, Cape Verde Islands and Senegal) and 7 Expeditions (August 1986, Cape Verde Islands), on board of H.M.S. 'Onversaagd' and 'Tydemann', and Mauritania II Expedition (June 1988), on board of RV 'Tyro'. See for details of stations Van der Land (1987, 1988). We also included material from the Gulf of Cadiz collected by boxcore during the Moundforce 2004 Expedition (organized

Fig. 1. Map of the North East Atlantic showing the Marine Ecoregions (blue-green) (from Spalding et al. 2007) in which studied sponge samples were obtained by various expeditions. Details of each collected sample are provided in the Material Examined section preceding each species description.

by the Royal Netherlands Institute for Sea Research at Texel) and the Belgian CADI-POR III Program. Marine Ecoregions (Spalding et al. 2006) in which the collecting activities of all treated samples were located are presented in fig. 1. All material was provisionally identified on board and subsequently preserved in 96% ethanol. Until recently, most of the material was incorporated in the collections of the Zoölogisch Museum of the University of Amsterdam (ZMA), but at present the ZMA collection is housed in the Naturalis Biodiversity Center at Leiden. A minor part of the studied specimens was incorporated in the collections of the Rijksmuseum van Natuurlijke

Historie at Leiden (RMNH), now also housed in the Naturalis Biodiversity Center. Precise collection data are provided with each treatment of the species below. To study the skeletal structure, thick sections were made by hand, air-dried on a hotplate and mounted in Canada Balsam. Stacked (automontage) light microscopy images of these thick sections were made using a Leica DM5500 microscope. For measurements of the spicules and SEM examination dissoluted spicule suspensions were made with concentrated sodium hypochlorite (NaClO), washed five times in distilled water and mounted on light microscopic slides and SEM stubs. Spicule measurements (minimum-*mean*-maximum) are based on 25 spicules of each category or type for each individual specimen, unless otherwise indicated. SEM photos of spicules were combined in plates, aligned, and cleaned using Photoshop CS3 licensed to R.W.M. van Soest.

Terminology.— Choanosomal skeletons in the family Microcionidae may be distinguished by descriptive terms partially derived from Lévi (1960a) and Hooper (1996: Fig. 1) as being 'hymedesmioid', 'microcionid', 'renieroid' or 'plumo-reticulate'. These terms are not exact, and intermediate skeletal conditions are frequent, both among different species and within specimens belonging to the same species. Megascleres in Microcionidae usually consist of (1) ectosomal subtylostyles, (2) structural or principal styles, (3) echinating (acantho-)styles, and we will employ these terms in that order in most of the descriptions below. Occasionally distinctive variations of these may be described as a separate spicule type, e.g. derivates of subtylostyles with tylote or spined-mucronate endings where in normal condition the endings are gradually tapering to a point, which are here called quasitylotes following Hooper (1996). In *Antho* species the basal reticulation is usually made up of short (acantho-)styles or (acantho-)strongyles, but several species have 'dumbbell' shaped spicules (thick acanthotylotes) which take the position of (and are probably derived from) acanthostrongyles. Microscleres usually consist of toxas, in one or more distinct shapes, which were named by Hooper (1996: Fig. 6) 'oxhorn', 'wing-shaped', 'accolada', 'oxeote' and '(sinuous) raphidiform' toxas, and palmate isochelae named 'typical' and 'contorted' (where the upper and lower alae are not arranged in one plane). In addition to these toxa terms and chelae terms proposed by Hooper (1996), we will employ the term 'strepsitoxas' for long thin toxas with a spiral twist in the curvature, and the term 'cleistochelae' (cf. Topsent, 1925) for chelae in which the free alae from opposite sides (almost) touch and the shaft has a plate-like ridge (almost) filling the space between the alae.

Museum abbreviations.— BMNH = Natural History Museum, London, LMJG = Landesmuseum Johanneum, Graz, Austria, MNHN = National Natural History Museum, Paris, RMNH = (State Museum of Natural History) Naturalis Biodiversity Center, Leiden, ZMA = (Zoological Museum of Amsterdam) Naturalis Biodiversity Center, Leiden, ZMUB = Zoological Museum University Bergen, Norway, ZMUC = Zoological Museum University of Copenhagen, Denmark, MZUS = Zoology Museum Strasbourg.

Higher taxa classification (subfamilies, genera, subgenera) follows the Systema Porifera (Hooper, 2002 in Hooper & Van Soest, 2002). Definitions of subfamilies and (sub-) genera are to be taken as conforming to those in the Systema Porifera, and are not repeated here unless they are proposed to be changed or revived, in which case an emended definition is provided. The order in which the species are treated is alphabetical within the respective (sub-)genera.

Results
Systematic descriptions

Phylum Porifera
Class Demospongiae
Order Poecilosclerida
Suborder Microcionina
Family Microcionidae

The family Microcionidae was extensively reviewed by Hooper (1996, 2002). The genus *Clathria* Schmidt, 1862 is relatively well-studied in the Mediterranean and along the North East Atlantic coasts of Europe (see e.g. Topsent, 1925; Sarà, 1958, 1959; Sarà & Siribelli, 1960; Lévi, 1960a; Pulitzer-Finali, 1983; Ackers et al. 1992; Van Soest et al. 2000), but not well-known from Northwest Africa. For instance, in a preliminary overview Van Soest (1993b: table 4) lists 14 unidentified *Clathria* species from the Cape Verde islands alone. Many species are encrusting, small, and their descriptions appear to show considerable overlap or uncertain differences with Mediterranean and northern species. The taxonomy of some species groups, e.g. those with long thin toxas, appears confused and may need extensive revision, which unfortunately exceeds the limits of the present study. The genus is subdivided into eight subgenera in the Systema Porifera, one of which, encrusting *Clathria (Microciona)* Bowerbank, 1862, is dominating in the region. Subgenera *Clathria (Clathria), Clathria (Thalysias)* Duchassaing & Michelotti, 1864, and *Clathria (Axosuberites)* Topsent, 1893 have only few species in the region. Below, we report the occurrence in the study area of *Clathria* (*Cornulotrocha)* Topsent, 1927, known so far from a seamount off the coast of Portugal. The remaining subgenera (*Wilsonella* Carter, 1885, *Dendrocia* Hallmann, 1920, *Isociella* Hallmann, 1920) are not represented in our material. We propose here to revive a ninth subgenus, *Paresperia* Burton, 1930, erected for type species *P. intermedia* Burton, 1930, a junior synonym of *Clathria anchorata* Carter, 1874, which is reported from the present region. This was assigned with hesitation to the synonymy of *Clathria (Clathria)* by Hooper (2002), but its characters deviate considerably from that group necessitating recognition as a separate subgenus. Several species were found to be morphologically close or virtually indistinguishable from Caribbean species. These are described as separate species on very small differences based on the assumption that further non-morphological differences likely exist between populations separated by the depths of the Atlantic Ocean. An important substratum of *Clathria (Microciona)* species in Mauritanian waters are living or recently dead gastropods (see also Van Soest, 1993a), with at least four species occurring on these. In Cape Verdian waters limestone conglomerates such as living or dead coralline algae are the main substratum for such thin *Clathria* species.

The genus *Antho* Gray, 1867 is also well-known in adjacent areas of the North East Atlantic and Mediterranean, and so far three subgenera are distinguished (Hooper, 2002), two of which are common in the region: *Antho (Antho)* comprises species with (acantho-)styles and/or -strongyles making up a basal renieroid reticulation but they lack a category of echinating acanthostyles. *Antho* (*Acarnia)* Gray, 1867 has similar structure but its species possess echinating acanthostyles. The third subgenus, *Antho (Isopenectya)* Hallmann, 1920 with axial compressed skeleton without microscleres, has not

been found in the region so far. The distinction between *Acarnia* and *Antho* is practical, but the possession or lack of echinating acanthostyles is probably of little phylogenetic significance. Both subgenera contain species possessing dumbbell-shaped diactinal spicules, formerly assigned to the genus *Plocamia* Schmidt, 1870 (with type species the West Indian *P. gymnazusa* Schmidt, 1870). Northwest African waters were found to contain several of such species and this opportunity is taken to erect a separate fourth infrageneric taxon, *Antho (Plocamia)* for them.

Finally, we report the presence of species of the genus *Artemisina* Vosmaer, 1885, known from several Western European and Arctic records, but so far not described from West African waters. The genus is recognizable by a reduction of megasclere diversity and lack of echinating styles.

Subfamily Microcioninae

Genus *Clathria* Schmidt, 1862
Subgenus *Clathria* Schmidt, 1862

***Clathria (Clathria) hjorti* (Arnesen, 1932) comb. nov.**
(figs 2, 3A-D, 4A-J)

Echinoclathria hjorti Arnesen, 1932: 21, pl. II fig. 5; pl. V fig. 3; Hooper, 1996: 482 (holotype deposition cited incorrectly as Uppsala Museum, Sweden).
Axociella hjorti; De Laubenfels, 1936: 119.
Dictyoclathria morisca; Lévi, 1959: 134, pl. 5 fig. 1, text-fig. 27 (not: Schmidt, 1868)
Clathria coralloides sensu Van Soest, 1993b: table 2 (not: Scopoli, 1772: 412, pl. 64 fig. 1455); nec Boury-Esnault & Lopes, 1985: 194, fig. 43 (see below).
Not: *Ophlitaspongia hjorti*; Burton, 1959a: 43.

Material.— Holotype (ZMUB 25643), Morocco, off Cape Bojeador (Boujdour), 26.1°N 14.55°W, 39 m, trawl, Michael Sars Expedition stat. 37, 20.v.1910; (ZMA Por. 05050), Mauritania, off Cap Blanc, 20.7°N 17.1667°W, 11-35 m, F.P. Vermeulen, 1906; (ZMA Por. 06605), Mauritania, S of Cap Timiris, 18.8333°N 16.3667°W, 26 m, sandy bottom with shells, 1.2 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 18/02, 8.vi.1988; (ZMA Por. 06741), Mauritania, off Banc d'Arguin, 20.0°N 17.15°W, 20 m, sandy bottom, 1.2 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 63/05, 8.vi.1988; (ZMA Por. 06778), Mauritania, off Banc d'Arguin, 20.0°N 17.4°W, 48-52 m, muddy sand bottom, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 72/17, 13.vi.1988; (ZMA Por. 09958), Mauritania, off Cap Blanc, 20.7°N 17.1667°W, 11-35 m, F.P. Vermeulen, 1906; (ZMA Por. 09964), Senegal, J.J. Vermeulen, Plancius Expedition 1986; (ZMA Por. 09965), Mauritania, off Cap Blanc, 20.7°N 17.1667°W, 11-35 m, F.P. Vermeulen, 1906; (ZMA Por. 09967), Mauritania, off Cap Blanc, 20.7°N 17.1667°W, 11-35 m, F.P. Vermeulen, 1906; (ZMA Por. 17561), 'Gulf of Guinea', old collection.
Examined for comparison.— (LMJG 15236), Schmidt fragments of *Clathria coralloides* (see Desqueyroux-Faúndez & Stone, 1992: 9, pl. 25 figs 145-149); (MNHN LBIM D.T. 331 and 332) *Clathria coralloides*, Naples, 1920, Topsent collections, 3 slides; (RMNH 266) Triest, Italy, North Adriatic Sea; type and fragment (RMNH Por. 274 and 275), *Clathria coralloides* var. *mollissima* Vosmaer, 1880, Gulf of Genoa, Italy; type and fragments (RMNH Por. 271, 272, and 273), *Clathria coralloides* var. *ceratodes* Vosmaer, 1880, Gulf of Genoa, Italy; (ZMA Por. 09944), *Clathria (Clathria) coralloides*, Adriatic, Croatia, Dalmatia, Splitski Canal, 43.45°N 16.7167°E, 50-60 m, trawl, Excursion Yugoslavia 1954, 7.v.1954; holotype (MNHN LBIM D.T. 764), *Desmacidon arciferum* Schmidt, 1868, Exploration scientifique de l'Algérie, 1868.

Fig. 2. Holotype (ZMUB 25643) of *Echinoclathria hjorti* Arnesen, 1932, reassigned to *Clathria (Clathria) hjorti* comb. nov. (scale bar = 1 cm).

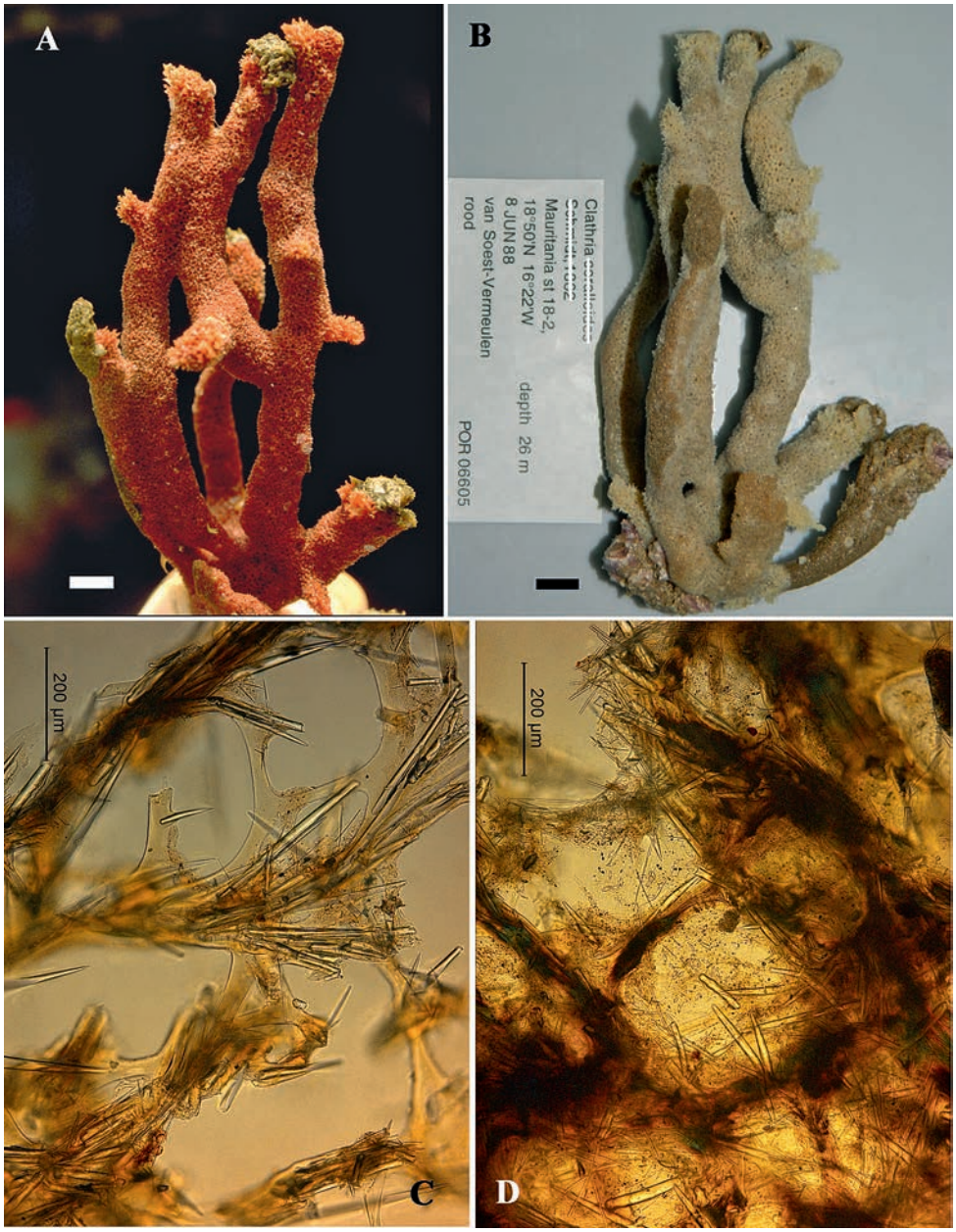


Fig. 3. *Clathria (Clathria) hjorti* comb. nov. (ZMA Por. 06605), A, on deck photo of specimen trawled from 26 m depth off Cape Timiris during the 1988 Mauritania II Expedition, photographed immediately after collection by W. Kolvoort (scale bar = 1 cm), B, the same after preservation (scale bar = 1 cm), C, light microscopy photo of choanosomal skeleton (scale bar = 200 µm), D, ditto of peripheral skeleton.

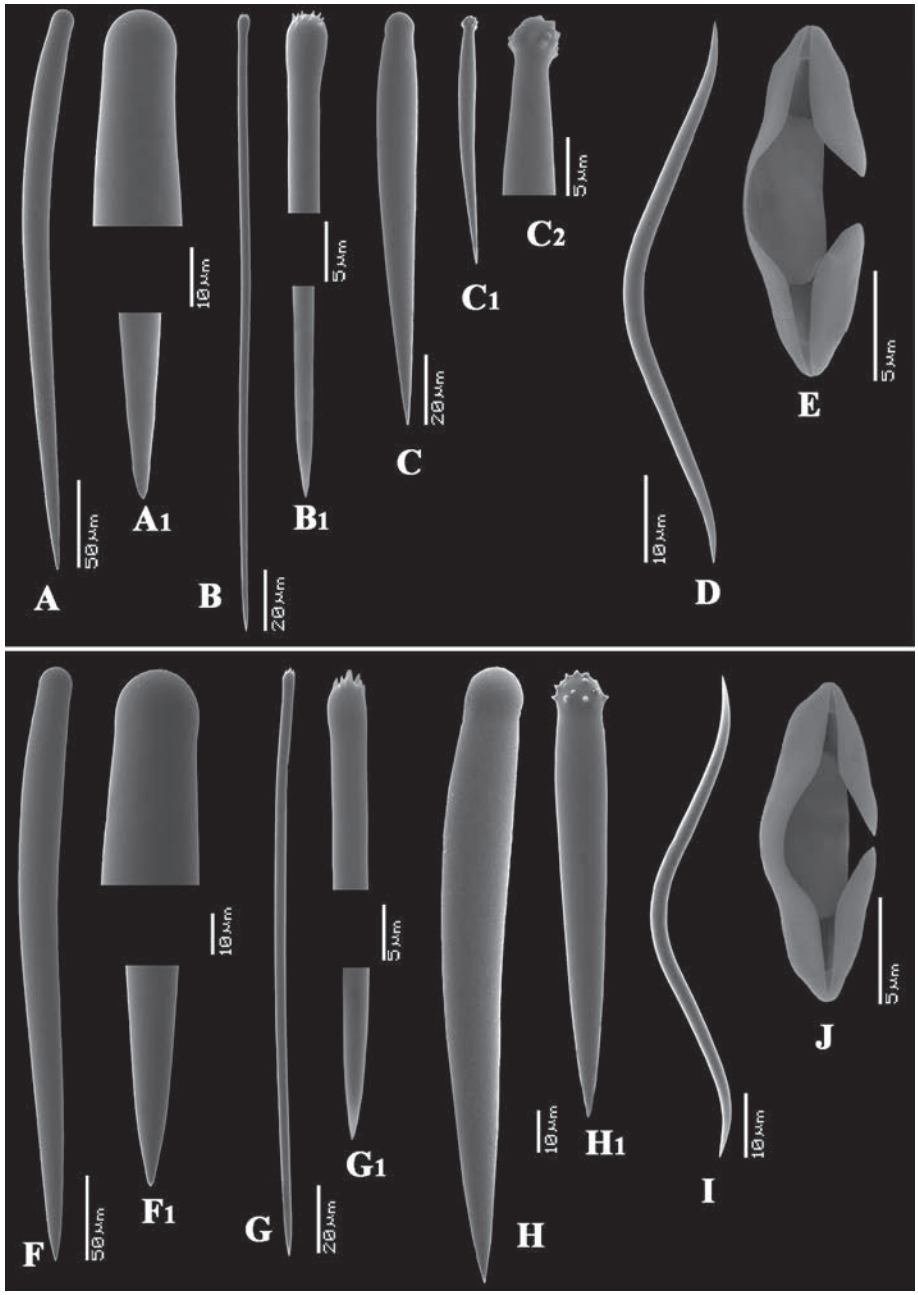


Fig. 4. *Clathria (Clathria) hjorti* comb. nov., A-E, SEM images of the spicules of holotype (ZMUB 25643), A, structural style, A1, details of head and pointed end, B, subtylostyle, B1, detail of head and pointed end, C-C1, larger and smaller echinating styles, C2, detail of head of C1, D, tox, E, cleistochela, F-G, SEM images of the spicules of Mauritania specimen (ZMA Por. 06605), F, structural style, F1, details of head and pointed end, G, subtylostyle, G1, detail of head and pointed end, H-H1, larger and smaller echinating styles, I, tox, J, cleistochela.

Description.— Bright red bushes made up of thick branches with irregular outline, dividing, anastomosing and coalescing from a thick stem. The holotype (fig. 2) is 24 cm high and 18 cm wide, consisting of five partly flattened anastomosing branches dividing into one plane. Additional specimens, including ZMA Por. 06605 which was examined and photographed freshly collected on-deck (fig. 3A), may vary from 5 up to 30 cm high and 6 up to 40 cm wide, and may be dividing three-dimensionally. Individual branches in the upper part approximately 1 cm in diameter, usually blunt-ending, occasionally tapering to a thinner apex, near the substratum up to 2 cm or more in diameter, forming flattened basal masses by anastomosis of several individual branches. Stem of holotype 4 cm diameter, but almost absent in other specimens. Branches occasionally with short stubby side branches. No apparent oscules but surface distinctly punctate (fig. 3B), uneven, hispid. Consistency firm, corky.

Skeleton.— Anisotropic rectangular- to plumose reticulation of spongin fibers cored and echinated by fusiform thick styles (fig. 3C). Meshes of the skeleton variable, 600 × 250 μm to 200 × 300 μm, ascending fibers 60-120 μm in thickness cored by three or more spicules in cross section; connecting fibers 20-90 μm in thickness mostly uncored. Both ascending and connecting fibers echinated sparingly by short fusiform (acantho-)styles (fig. 3D).

Spicules.— (figs 4A-J) Subtylostyles, coring styles, echinating (acantho)styles, toxas, palmate cleistochelae.

Subtylostyles (figs 4B, G), straight, with elongate microspined, heads, quite variable in size, 122-*238.0*-324 × 2-*3.1*-7 μm.

Principal coring styles (figs 4A, F), smooth, thick, fusiform, curved, subterminal constriction common, quite variable in size within a single specimen, overall size 136-*336.8*-726 × 16-*21.1*-36 μm.

Echinating styles (figs 4C, H), thick, fusiform, subterminally constricted, not clearly morphologically distinct from coring styles, but the ornamentation of the heads is variable: occasionally spined or warty (figs 4C1-2, H1), occasionally only rugose or entirely smooth, shaft smooth or rarely with a few spines, 72-*123.8*-204 × 6-*10.2*-22 μm.

Toxas (figs 4D, I), wing-shaped, with shallow angular curvature and upturned apices, in a large size variation (smaller-thinner to larger-thicker), but not readily divisible into distinct categories, 18-*68.9*-135 μm.

Palmate isochelae (figs 4E, J), invariably cleistochelate, alae almost touching, with space between the alae filled in with a blade-like extension of the shaft, 14-*16.6*-21 μm.

Ecology.— On sandy bottom, at 10-52 m depth.

Distribution.— Morocco, Western Sahara, Mauritania, Senegal; "Gulf of Guinea" (old collection); possibly Northern Spain (Solórzano, 1991 as *C. coralloides*, but no description provided).

Remarks.— Arnesen (1932: 22, left hand column) describes and pictures (his pl. 5 fig. 3) strongylote forms of the structural styles, but these were not observed by us, and most likely constitute a rare deviation of the styles. Arnesen failed to notice the cleistochelate condition of the chelae, which is indeed not easy to observe under light microscopy. Lévi's (1959) record of *Dictyoclathria morisca* from Rio de Oro (depth 43-45 m, between approximately 21° and 26°N, Western Sahara, near the type locality of *C. (C.) hjorti* comb. nov.), conforms in all aspects to the present species, with long thick branches (up to 25 cm high and 1.5 cm in diameter), subtylostyles up to 275 × 4 μm, long

smooth styles up to 650 × 30 μm, smaller smooth echinating styles of 120 × 12 μm, shallow-angled wing-shaped toxas of 40-120 μm, and palmate isochelae, with alae drawn as nearing each other closely, 14-18 μm. Burton (1959a: 43) reported the present species (as *Ophlitaspongia* Bowerbank, 1866) from the deep sea (down to 913 m) W of Iceland without sufficient description ('the skeleton varies in the usual way'). It is unlikely that this record is correct, but this needs to be verified.

Initially the Mauritanian material was assigned to the Mediterranean species *Clathria (Clathria) coralloides* (Scopoli, 1772) (see Van Soest, 1993b: table 2) because of its similarity to it. Both species consist of anastomosed red branches with rectangular spongin skeletons, and they lack a separate category of echinating acanthostyles, instead of which shorter versions of the structural styles take up that position. The present holotype and the ZMA West African material possess wing-shaped toxas with a shallow curvature, with upturned smooth apices, and in a large size range. In the fragments from Schmidt's collection of *C. coralloides* from the Adriatic (figs 5C, 6A-E), and in type specimens of *C. coralloides* var. *mollis* Vosmaer, 1880 (fig. 5A) and *C. coralloides* var. *ceratodes* Vosmaer, 1880 from Naples and Genoa, toxas are absent. Still older records of *C. (C.) coralloides* (*Spongia coralloides* Scopoli, 1772: 412, and Olivi, 1792: 264; *Spongia clathrus* Esper, 1794: 200, pl. 9 figs 1-2; *Grantia coralloides* Nardo, 1833: 522; *Halichondria corona* Lieberkühn, 1859: 521, pl. XI fig. 3) do not provide sufficient spicular information (if any at all). Pansini (1987: 48, figs 5-6) also remarked that toxas were absent in his specimens from the Adriatic. Finally, a specimen from the Splitski Canal kept in ZMA (Por. 09944, figs 5B, 6F-I) also did not contain any toxas. However, Babiç (1922, as *Clathria seriata*) described a *C. (C.) coralloides*-like sponge with toxas, and Topsent (1925) also described under the name *C. coralloides* from Naples a ramose specimen(s) with branches 1-2 mm in diameter possessing toxas. Later, Topsent (1938: 15) redescribed the holotype of *Desmacidon arciferum* Schmidt, 1868 as junior synonym of *Clathria coralloides*, likewise with toxas. We borrowed the type of *Desmacidon arciferum* (see fig. 7A) and made sections (fig. 7B) and SEM images of the spicules (figs 7C-G), and this has abundant toxas. Pulitzer-Finali (1983: 569) also found abundant toxas in encrusting Mediterranean specimens assigned by him to *Clathria coralloides*. Possibly all the records with toxas belong to *C. (C.) arcifera* comb. nov. and/or *C. (C.) hjorti* comb. nov. rather than to *C. (C.) coralloides*, and ultimately this could mean that *C. (C.) arcifera* comb. nov. is a senior synonym of *C. hjorti* comb. nov.

Since no neotype designation of *C. coralloides* has been made so far and the descriptions of *C. (C.) coralloides* differ among authors (and may well include misapplied identifications), it is not easy to pinpoint absolute differences with *C. (C.) hjorti* comb. nov. We provide images and SEMs of the spicules of selected Mediterranean *C. (C.) coralloides* specimens (see figs 5-6), which all lack toxas, and the holotype of *Desmacidon arciferum* (fig. 7) as a representative for *C. (C.) coralloides*-like specimens possessing toxas, to facilitate comparison with the *C. (C.) hjorti* comb. nov. We examined three MNHN slides, (LBIM nrs. D.T. 331 (2 slides) and 332), labeled 'Clathria coralloides O. Schmidt, Naples 1920', presumably these are from the specimen(s?) described by Topsent (1925: 645), but remarkably no toxas were found in these slides, while Topsent gives measurements and a drawing of toxas, stating that these were rare in certain individuals but rather abundant in others. Spicule size data of all examined specimens and additional literature data are presented in Table 1. The major difference between the *C. (C.) hjorti*

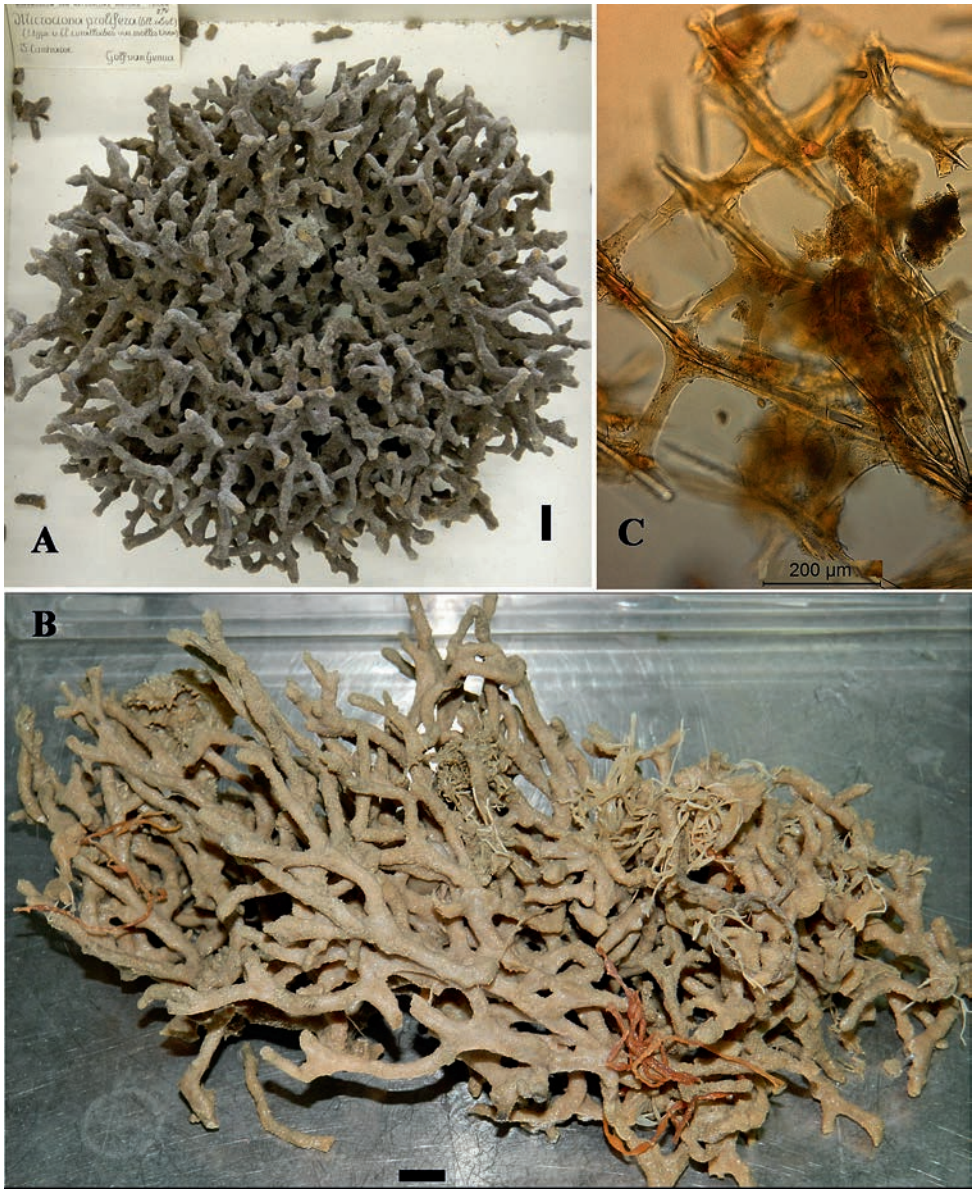


Fig. 5. *Clathria (Clathria) coralloides* from the Adriatic Sea, A, dry holotype (RMNH 274) of *Clathria coralloides var. mollis* Vosmaer, 1880 (scale bar = 1 cm), B, wet specimen (ZMA Por. 09944) (scale bar = 1 cm), C, cross section of skeleton of one of Schmidt's, 1862 specimens (LMJG 15336).

comb. nov. specimens and the *C. (C.) coralloides* s.l. specimens is a matter of grade: the size and thickness of the branches, which in typical *C. (C.) coralloides* usually are only a few mm in diameter (up to 6 mm), whereas they are up to 2 cm thick in the present material. The bushes of *C. (C.) coralloides* are much more crowded and denser anasto-

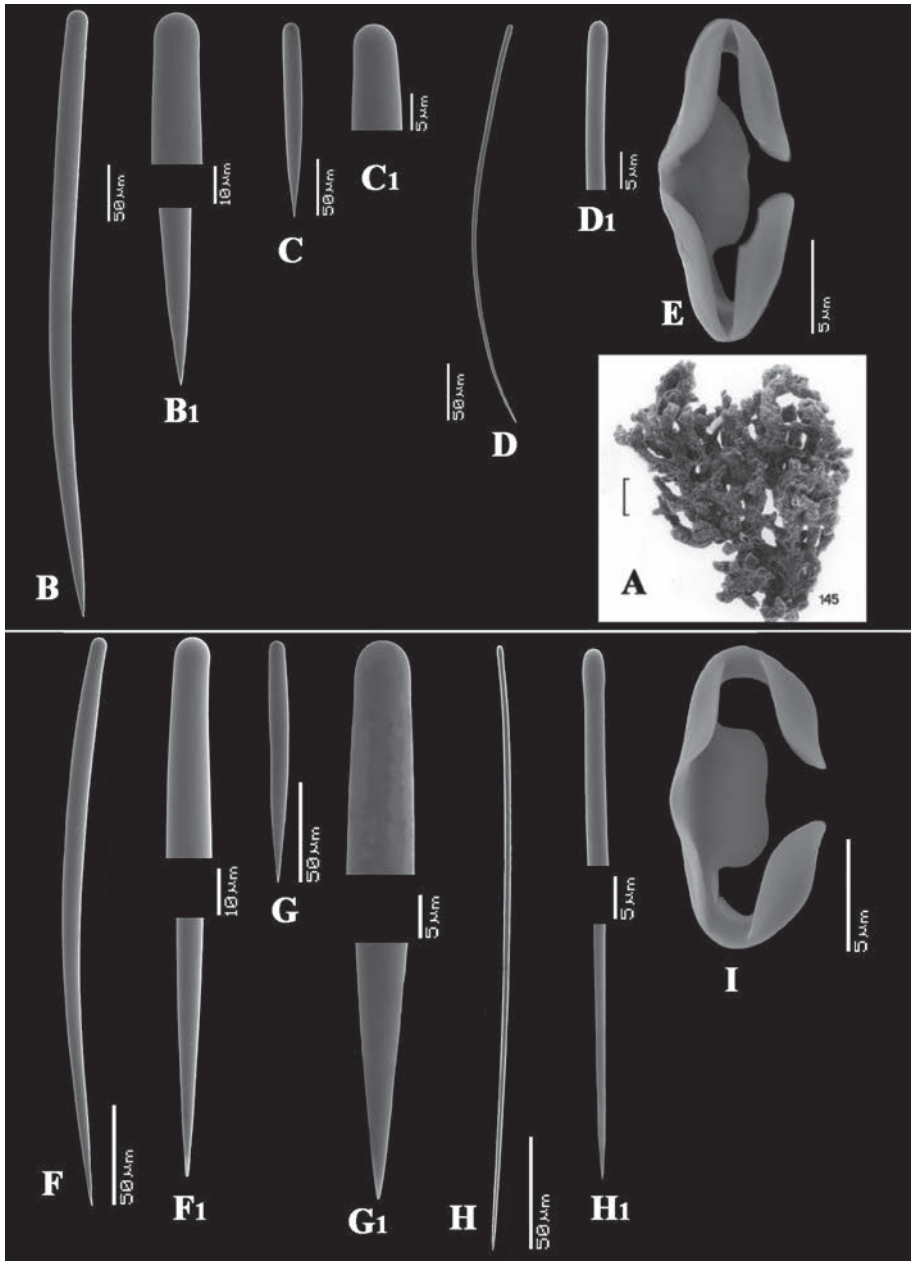


Fig. 6. *Clathria (Clathria) coralloides* from the Adriatic Sea, A, one of Schmidt's 1862 specimens (LMJG 15336), reproduced from Desqueyroux-Faúndez & Stone, 1992, figure 145 (scale bar = 1 cm), B-E, SEM images of the spicules from LMJG 15336, B-B1, structural style and detail of head and pointed end, C-C1, echinating style and detail of head, D-D1, ectosomal subtylostyle and detail of head, E, cleistochela, F-I, SEM images of the spicules of (ZMA Por. 09944), F-F1, structural style and detail of head and pointed end, G-G1, echinating style and detail of head and pointed end, H-H1, ectosomal subtylostyle and detail of head, I, cleistochela.

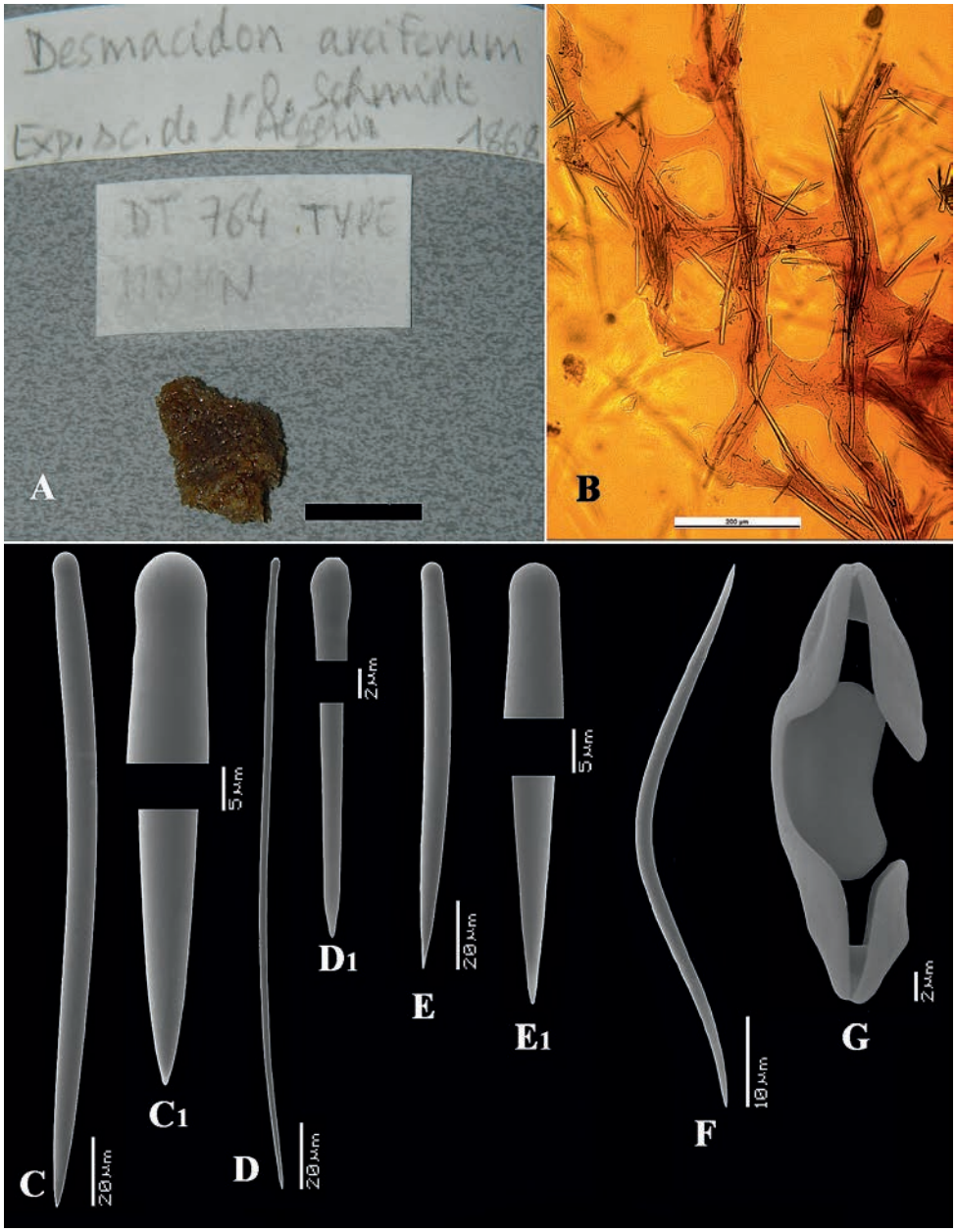


Fig. 7. *Clathria (Clathria) arcifera* (Schmidt, 1868 as *Desmacidon*) comb. nov. from Algeria, A, habitus of remaining fragment of holotype (MNHN D.T.764) and labels (scale bar = 1 cm), B, cross section of peripheral skeleton (scale bar = 200 µm), C-G, SEM images of spicules, C-C1, structural style and detail of head and pointed end, D-D1, ectosomal subtylostyle and detail of head and pointed end, E-E1, echinating style and detail of head and pointed end, F, tox, G, cleistochela.

Table 1. Data on morphology and spicule sizes of studied specimens of the '*Clathria (Clathria) coralloides* complex' (including *Clathria hjorti, Clathria coralloides and Clathria arcifera*). Abbreviations.— msp = microspined heads, sm = smooth, sp = spined.

specimen	proposed name	subtylostyles (μm)	coring styles (μm)	echinating styles (μm)	to×as (μm)	cleistochelae (μm)	habit	locality
ZMUC unnumbered	*hjorti*	122–324 × 2–3.5 (msp)	246–372 × 16–24 (sm)	72–204 × 6–15 (sm+sp)	51–108	13–16	arborescent-anastomosing	Western Sahara
ZMA Por 05050	*hjorti*	192–276 × 2.5–4 (msp)	360–600 × 26–32 (sm)	78–186 × 9–22 (sm)	41–91	17–20	arborescent-anastomosing	Mauritania
ZMA Por.06605	*hjorti*	156–271 × 2.5–3 (msp)	292–496 × 21–31 (sm)	142–187 × 12–20 (sm)	25–102	17–21	arborescent-anastomosing	Mauritania
ZMA Por.06741	*hjorti*	129–299 × 2–5 (msp)	231–414 × 18–26 (sm)	108–135 × 7–11 (sm+sp)	18–118	15–17	arborescent-flabellate	Mauritania
ZMA Por.06778	*hjorti*	186–315 × 2–7 (msp)	231–558 × 22–27 (sm)	84–168 × 8–14 (sm+sp)	16–96	16–18	arborescent	Mauritania
ZMA Por.09958	*hjorti*	159–306 × 2–6 (msp)	211–468 × 18–25 (sm)	84–156 × 6–12 (sm+sp)	51–69	14–17	arborescent	Mauritania
ZMA Por.09964	*hjorti*	159–306 × 2–6 (msp)	211–468 18–25 (sm)	87–156 6–12 (sm+sp)	51–61	14–17	arborescent	Senegal
ZMA Por.09965	*hjorti*	241–322 × 3–4 (msp)	181–726 × 18–32 (sm)	74–181 × 9–15 (sm+sp)	18–135	17–19	arborescent	Mauritania
ZMA Por.09967	*hjorti*	162–309 × 2–5 (msp)	197–573 × 18–36 (sm)	90–149 × 7–11 (sm+sp)	18–114	18–21	arborescent	Mauritania
ZMA Por.17561	*hjorti*	153–318 × 2.5–4 (msp)	136–456 × 20–26 (sm)	93–126 × 7–12 (sm+sp)	33–89	19–20	arborescent	Gulf of Guinea
morisca Lévi, 1959*	*hjorti*	up to 275 × 4	up to 650 × 30 (sm)	120 × 12 (sm)	40–120	14–18	thick branches	Western Sahara
LMJG 15236	*coralloides*	194–391 × 1–4 (sm)	198-558 × 14-21 (sm)	105-174 × 8-16 (sm)	not found	18–22	arborescent bush	Adriatic
ZMA Por.09942	*coralloides*	183–426 × 1.5–4 (sm)	198–462 × 13–20 (sm)	93–138 × 6–14 (sm)	not found	17–18	arborescent bush	Adriatic
ZMA Por.09944	*coralloides*	153–402 × 1.5–3.5 (sm)	213–474 × 15–21 (sm)	93–144 × 7–13.5 (sm)	not found	16–19	arborescent bush	Adriatic
MNHN D.T. 331 & 332	*coralloides*	171–360 × 1.5–3 (sm)	216–422 × 5–17(sm)	89–135 × 4.5–15 (sm)	not found	15–19	thin branches	Naples
coralloides sensu Pansini,1987*	*coralloides*	245-460 × 1.5-6	115-450 × 7-18 (sm)	present	not found	10–15	lobes and branches	Adriatic

arcifera MNHN D.T.764	*arcifera*	155-165 × 3 (sm)	175-215 × 7-12 (sm)	80-135 × 4-9 (sm)	60–75	15	massive	Algeria
coralloides sensu Topsent, 1925*	*arcifera?*	200-550 × 2-5 (msp)	sm 400-500	80-120 × 12-15 (sm)	80–140	16–20	thin-branched bush	Naples
seriata sensu Babiç, 1922*	*arcifera?*	present	266-680 × 4-22 (sm)	80-260 × 5-20 (sm)	32–160	9–18	forked thin branch	Adriatic
coralloides sensu Pulitzer-Finali, 1983*	*arcifera?*	260-510 × 2-4	400-750 × 13-21 (sm)	190-300 × 8-18 (sm)	33–150	12–14.5	digitations, cushion	Ionian Sea
coralloides sensu B.E. & Lopes,1985*	*arcifera?*	200–380 × 1.5–4	224–414 × 8–15 (sm)	64–181 × 2–14 (sm)	27–156	16	encrusting	Azores

mosed than those of *C. C.) hjorti* comb. no*v.* A further definite difference is the spined condition of some of the echinating styles, usually only on the head, but not infrequently also on the shaft. Finally, the chelae of the present species are always mature cleistochelae with the alae touching or nearing closely and the shaft provided with a blade-like ridge almost entirely filling the inter-alae space, whereas those of *C. (C.) coralloides* s.l. may be 'ctenichelate' or incipient cleistochelate (a condition not previously mentioned in the literature, but observed in Schmidt's Adriatic specimen and Vosmaer's types of varieties *mollis* and *ceratodes*), but they have the alae clearly separate and the blade-like ridge less developed. On average, the ectosomal subtylostyles are smaller in *C. (C.) hjorti* comb. nov., and they invariably have microspined heads, whereas is this is less frequent in *C. (C.) coralloides* s.l. Possibly, the absence of toxas in many *C. (C.) coralloides* specimens is a further difference, but this needs more study. It may be relevant to separate densely ramose, 'genuine' *C. (C.) coralloide*s specimens, all apparently lacking toxas, from massively encrusting to lobate or digitate specimens possessing toxas, such as *Desmacidon arciferum* Schmidt (1868), *Clathria seriata* sensu Babiç, 1922, and *C. (C.) coralloides* sensu Topsent, 1925 and Pulitzer-Finali,1983, which could then be named *C. (C.) arcifera* (Schmidt, 1868) comb. nov. However, the spicule size data (Table 1) do not appear very similar among the various toxa-bearing specimens, so it may be premature to make such a decision. It falls outside the scope of the present study, and we will have to await further studies.

We reexamined the specimen of *Clathria coralloides* sensu Schmidt, 1868 from Algeria (MNHN, Expédition scientifique de l'Algérie, 1842, 93/V) and found this to be a *Phorbas fictitius* (Bowerbank, 1866). It is not known whether this is Schmidt's error or a matter of mislaid labels.

Clathria (C.) coralloides was recorded not only from the Mediterranean, but also from Atlantic localities: Boury-Esnault & Lopes (1985: 194, fig. 43) hesitatingly assigned a thinly encrusting Azorean specimen with toxas to *C. coralloides*, and Solórzano et al. (1991: 37) mentioned a record from Galicia (NW Spain) without giving a description. Both records must be considered dubious and need reexamination in the light of information provided above. Possibly, in the future they could be assigned to *C. (C.) arcifera* comb. nov. as outlined above.

Southward along the coasts of Namibia and South Africa there are also several ramose *Clathria (Clathria)* species (see descriptions in Lévi, 1963 and Uriz, 1988), *C. (C.) parva* Lévi, 1963, *C. (C.) axociona* Lévi, 1963, and *C. (C.) tortuosa* Uriz, 1988. All three have thinner branches (3 mm), and the palmate isochelae

are 'typical' in the first two. *C. (C.) axociona* is similar to *C. (C.) hjorti* comb. nov. in the spicule morphologies and sizes, but palmate isochelae are large (22-26 μm), not overlapping in size with those of the present species. *C. (C.) parva* is dissimilar in spicule characters, e.g. by having spined endings on the toxas and very small echinating acanthostyles. Perhaps the most similar species is Namibian *C. (C.) tortuosa*, because it has cleistochelae, and skeletal structure and spiculation generally similar to that of the present species. Points of difference are the larger and thicker styles with spined or rugose heads, longer subtylostyles with apparently smooth heads, and two distinct size classes of toxas. Finally, considerable similarity is also found in *Ophlitaspongia dichotoma* Lévi, 1963 (assigned to *Echinoclathria* by Hooper, 1996), which shares the habit and smooth fusiform styles with *C. (C.) hjorti* comb. nov.; however, it has no chelae and the toxas are up to 7 μm thick.

The present species is transferred to the genus *Clathria* subgenus *Clathria*, because the skeleton is plumoreticulate, not renieroid. Hooper (1996) kept the species in *Echinoclathria*, because the original description in Arnesen (1932) is ambiguous with respect to the skeletal structure. The skeleton of the species is virtually indistinguishable from that of *C. (C.) coralloides*, kept in *Clathria (Clathria)* by Hooper (1996). Lévi (1963) suggested that this species along with *C. (C.) axociona* and several other species (*Clathria transiens* Hallmann, 1912 and *Ophlitaspongia minor* Burton, 1959) are part of a group of species intermediate between *Clathria* and *Ophlitaspongia* by their lack of a special category of spined acanthostyles.

The cleistochelate condition of the palmate isochelae is shared with encrusting *C. (Microciona) cleistochela* Topsent (1925), originally described from Naples and other localities in the Mediterranean, but subsequently recorded from the Azores (Boury-Esnault & Lopes, 1985) and the Canary Islands (Cruz, 2002). The species is so far only known as thin crusts, and the echinating spicules are a clearly separate category of acanthostyles, not modified or shorter versions of the coring styles. The same arguments are valid for *Clathria (Microciona) tunisiae* Hooper, 1996 (= *chelifera* sensu Lévi, 1960a), which is very similar to *C. (M.) cleistochela*, differing only in spicule sizes. Skagerrak species *C. (M.) elliptichela* Alander, 1942 also has cleistochelae. Below, we describe two additional encrusting species with cleistochelae. The similarity in chela micromorphology between all the mentioned species is striking and indicates the existence of a possibly related group of species in the Atlantic region transgressing the subgenus boundaries.

Subgenus *Microciona* Bowerbank, 1862

Clathria (Microciona) armata (Bowerbank, 1862)

(figs 8A-C, 9A-E)

Microciona armata Bowerbank, 1862: 779; 1866: 130; 1874: 60, pl. XXIII figs 17-24; Lévi, 1956: 399, fig. 6; Lévi, 1960a: 73, figs 16-17; Pulitzer-Finali, 1983: 573, fig. 69; Van Soest et al. 2000: http://species-identification.org/species.php?species_group=sponges&menuentry=soorten&id=155&tab=beschrijving (with additional synonyms).

Clathria atrasanguinea; Van Soest, 1993a: 103, plate 1 fig. E, Table 1 (not: *Microciona atrasanguinea* Bowerbank, 1862).

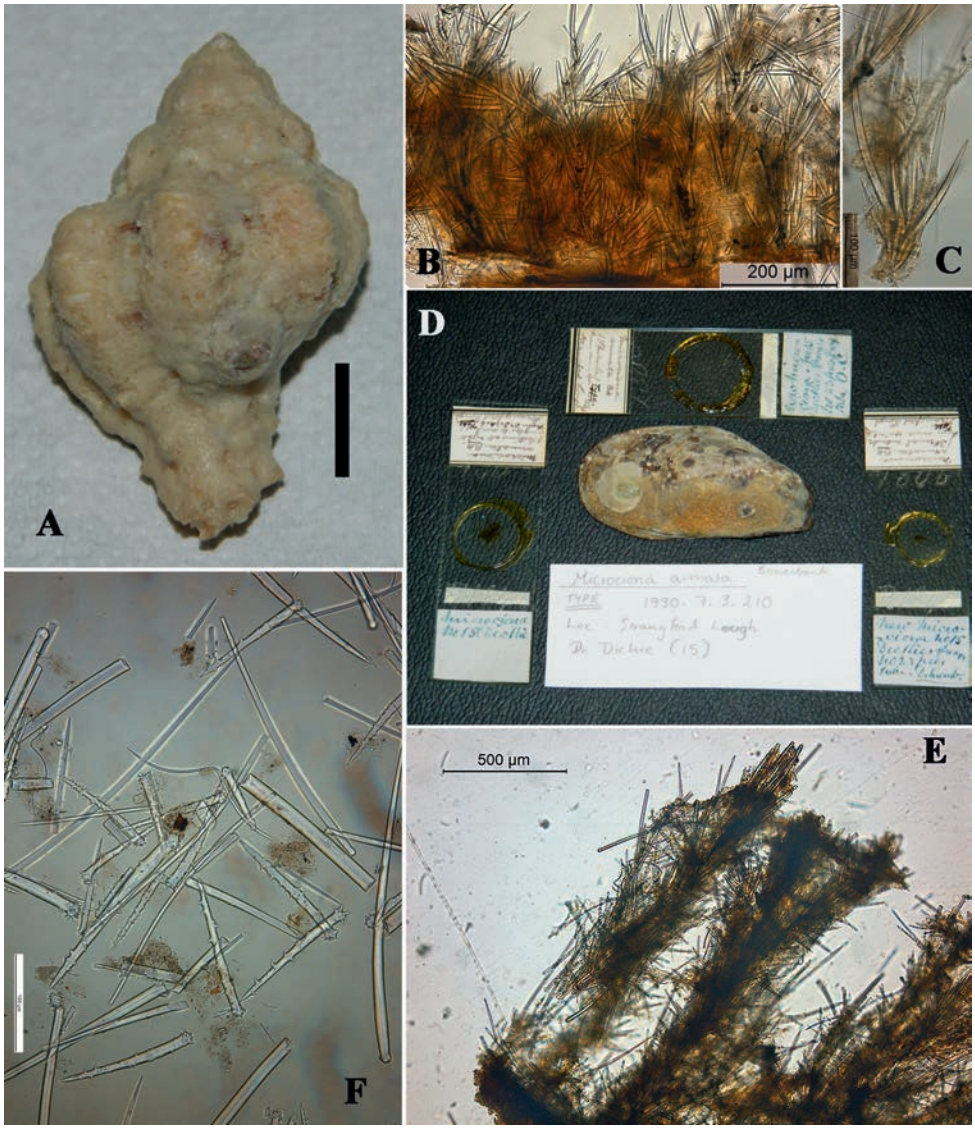


Fig. 8. *Clathria (Microciona) armata* (Bowerbank, 1862), A-C, Mauritanian specimen (ZMA Por. 06555), A, habit encrusting a gastropod (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C, detail of skeleton to show microcionid arrangement (scale bar = 100 µm), D-F, holotype of *Microciona armata* (BMNH 1930.7.3.210), D, holotype and slides from Strangford Lough, Northern Ireland, E, cross section of a skeleton (scale bar = 500 µm), F, overview of spicules (scale bar = 100 µm).

Material.— (ZMA Por. 06555, photo Fig. 8A), Mauritania, Baie de Cansado, on shipwreck, 20.9°N 17.0333°W, 0-6 m, snorkeling, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 03/03, 6.vi.1988; (ZMA Por. 06559), Mauritania, Baie de Cansado, on shipwreck, 20.9°N 17.0333°W, 0-6 m, snorkeling, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 03/08, 6.vi.1988; (ZMA Por. 06571), Mauritania, E coast of Cap Blanc, 20.7833°N 17.05°W, 0-2 m, snorkeling, R.W.M. van Soest & J.J.

Vermeulen, Mauritania II Expedition stat. 008/03, 6.vi.1988; (ZMA Por. 06572), Mauritania, E coast of Cap Blanc, 20.7833°N 17.05°W, 0-2 m, snorkeling, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 08/04, 7.vi.1988; (ZMA Por. 06573), Mauritania, E coast of Cap Blanc, 20.7833°N 17.05°W, 0-2 m, snorkeling, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 08/05, 7.vi.1988; (ZMA Por. 06576), Mauritania, E coast of Cap Blanc, 20.7833°N 17.05°W, 0-1 m, snorkeling, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 07/04, 7.vi.1988; (ZMA Por. 06596), Mauritania, 18.8333°N 16.3667°W, 26 m, sandy bottom with shells, hermitcrabs, bryozoans, flatfish and gastropods, 1.2 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 018/03, 8.vi.1988; (ZMA Por. 06602), Mauritania, off Banc d'Arguin, 18.8333°N 16.3333°W, 21 m, 1.2 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 016/03, 8.vi.1988; (ZMA Por. 06677), Mauritania, 19.0667°N 16.4167°W, 18 m, muddy fine grey sand, some shell gravel, red algae, gastropods, and tube worms, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 044/02, 11.vi.1988; (ZMA Por. 06680), Mauritania, off Banc d'Arguin, 19.0667°N 16.4333°W, 18 m, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 045/01, 11.vi.1988; (ZMA Por. 06681), Mauritania, off Banc d'Arguin, 19.0667°N 16.45°W, 25 m, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 046/01, 11.vi.1988; (ZMA Por. 06682), Mauritania, off Banc d'Arguin, 19.0667°N 16.45°W, 25 m, bottom fauna hermitcrabs, and gastropods, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 047/01, 11.vi.1988; (ZMA Por. 06755), Mauritania, 20.0°N 17.2833°W, 32 m, muddy sand with diverse bottom fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 069/01, 13.vi.1988; (ZMA Por. 06759), Mauritania, off Banc d'Arguin, 20.0°N 17.3°W, 38-41 m, bottom muddy sand with diverse fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 070/02, 13.vi.1988; (ZMA Por. 06782), Mauritania, off Banc d'Arguin, 19 m, 20.0°N 17.4°W, hard calcareous bottom, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 072/21, 13.vi.1988; (ZMA Por. 06790), Mauritania, off Banc d'Arguin, 19 m, 20.05°N 17.15°W, hard calcareous bottom, 1.2 Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 73/08, 13.vi.1988; (ZMA Por. 06794), Mauritania, off Banc d'Arguin, 20.0333°N 17.4333°W, 60-70 m, bottom with diverse fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 080/04, 14.vi.1988; (ZMA Por. 06824), Mauritania, off Banc d'Arguin, 20.5°N 17.0833°W, 22 m, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 110/02, 18.vi.1988; (ZMA Por. 06838), Mauritania, off Banc d'Arguin, 20.4333°N 17.35°W, 37 m, muddy sand with diverse bottom fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 124/02, 19.vi.1988; (ZMA Por. 15288, 15347, 15348 and 15372), all from Mauritania, off Banc d'Arguin, 19.0833°N 16.4167°W, 12-18 m, bottom sand and shells on sandstone ridges, rectangular dredge, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 49, 11.vi.1988.

Examined for comparison.— Holotype (BMNH 1930.7.3.210), *Microciona armata* Bowerbank, 1862, dry red-brown encrustation on mussel shell, labeled TYPE, Loc: Strangford Lough, Dr Dickie (15), and three slides made from the type, #R1844 labeled Microciona Dickie no. 15, section at right angles to surface, TYPE Strangford Lough', #R1845 labeled 'New Microciona species No. 15, Dickie's specimen no. 23, dermal membrane, Strangford Lough', and #R1846, labeled ditto, with 'spicules' in stead of 'dermal membrane' (see photos Figs 8D-F); (RMNH Por. 265), O. Schmidt fragment presumably obtained by Vosmaer and labeled 'Microciona prolifera (Ell. & Sol.) (?type v Scopalina toxotes O.S.), Mus. Graz, coll. G.C.J. Vosmaer R94, Adria'; (ZMA Por. 14133), *Clathria (Microciona) armata*, France, Roscoff, Ar Tourtu, 46.688°N 3.884°W, 20 m, M.J. de Kluijver, SYMBIOSPONGE 98/FR/SEP15/MK049, 15.ix.1998; holotype spicule slide (MNHN LBIM D.T.328, #56a=71bis), *Clathria gradalis* Topsent, 1925, Naples.

Description.— Encrusting dead and live gastropods (fig. 8A), bivalves (mussels), dead shells and limestone ridges in shallow water. Size depending on substratum, up to 5 cm in lateral expansion, thickness approximately 1 mm. Colour various shades of orange and red. Surface finely hispid.

Skeleton.— (figs 8B-C) Microcionid, with plumose spongin-enforced spiculofibers cored by choanosomal styles with warty heads, echinated by relative robust acantho-

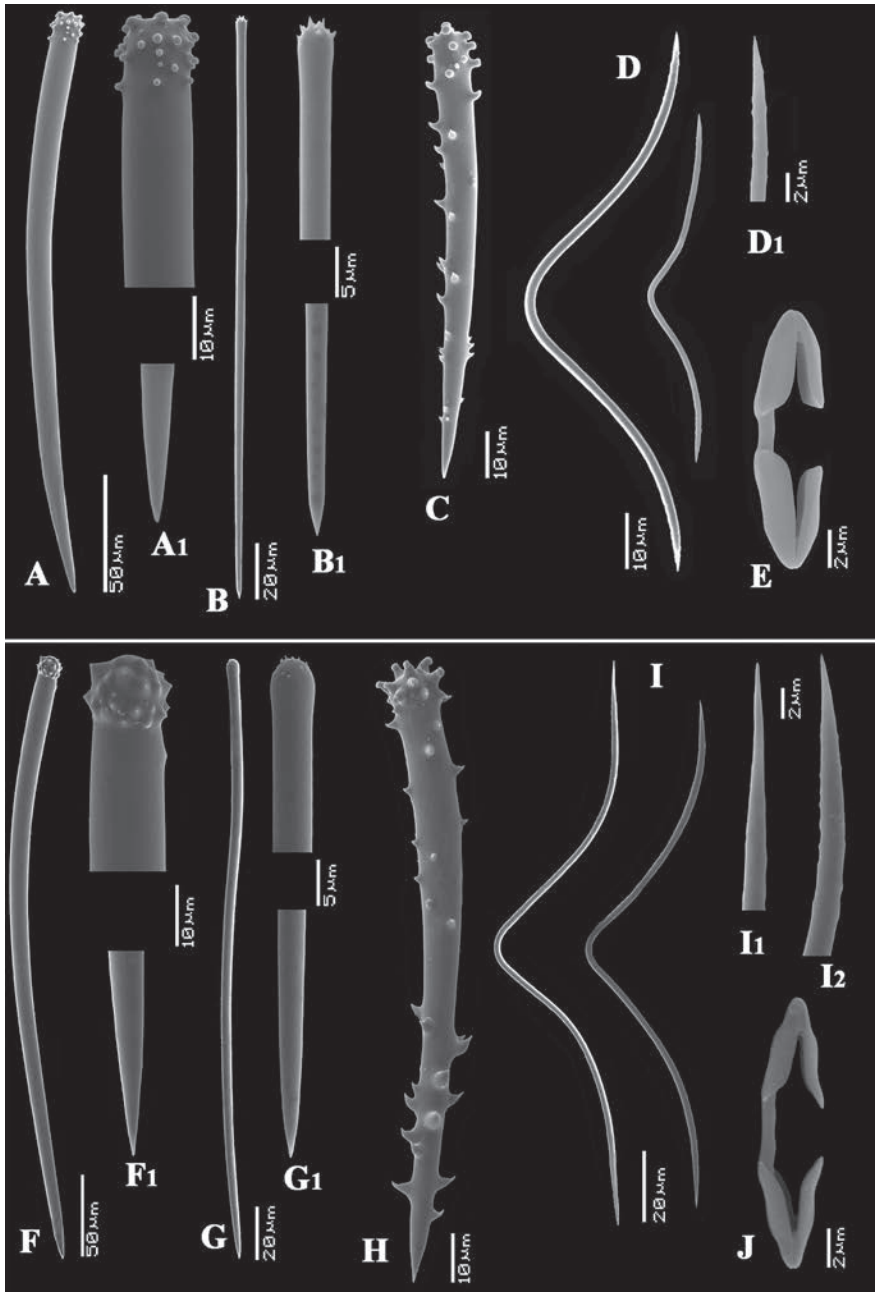


Fig. 9. *Clathria (Microciona) armata* (Bowerbank, 1862), SEM images of spicules, A-E, Mauritanian specimen (ZMA Por. 15347), A-A1, structural style and detail of head and pointed end, B-B1, ectosomal subtylostyle and detail of head and pointed end, C, echinating acanthostyle, D-D1, toxas and detail of ending, E, chela, F-J, holotype (BMNH 1930.7.3.210), F-F1, structural style and detail of head and pointed end, G-G1, ectosomal subtylostyle and detail of head and pointed end, H, echinating acanthostyle, I-I1,2, toxas with details of endings of a more or less smooth and a spined ending, J, chela.

styles. Ectosomal skeleton a partially tangential mass and alternated by bouquets of smaller ectosomal subtylostyles carried by bundles of longer subtylostyles erected on the ends of the fibers.

Spicules.— (Figs 9A-J) Subtylostyles, coring styles, echinating acanthostyles, toxas, palmate isochelae.

Subtylostyles (Figs 9B, G), with slightly swollen microspined heads, in two overlapping size categories, the smaller (102-144 μm) somewhat flexuous and often with blunt or mucronate pointed end, the larger (225-350 μm) straight, sharply pointed; overall size 102-*217.0*-359 × 1.5-*2.8*-4.5 μm.

Styles (Figs 9A, F), straight or slightly curved, with warty/spined heads, occasionally smooth, shaft smooth or with a few spines in the region underneath the head, with sharply pointed end, 172-*296.9*-438 × 8-*11.6*-15 μm.

Echinating acanthostyles (Figs 9C, H), relatively robust, entirely heavily spined, many with recurved spines, also in the lower half of the shaft, 72-*117.1*-153 × 6-*7.5*-10 μm.

Toxas (Figs 9D, I), wing-shaped, deeply curved, with upturned, frequently bumpy or wobbly apices, larger may have thickness up to 1.5 μm, length 45-*92.1*-144 μm.

Palmate isochelae (Figs 9E, J), typical shaped but relatively narrow, 12-*15.5*-18 μm.

Ecology.— Encrusting shells on nearshore sandstone ridges, depth down to 70 m.

Distribution.— Mauritania, Senegal, elsewhere reported from most coastal regions of Western Europe and the Mediterranean.

Remarks.— The specimens from Mauritania reported here show a strong resemblance to the holotype of *Microciona armata* from Northern Ireland (figs 8D-F), and to specimens described from the west coasts of Europe (ZMA Por. 14133) and from the Mediterranean (RMNH Por. 265), although it appears that the upper size of the styles is usually larger northwards (see also e.g. Van Soest et al. 2000). In SEM many toxas, espe-

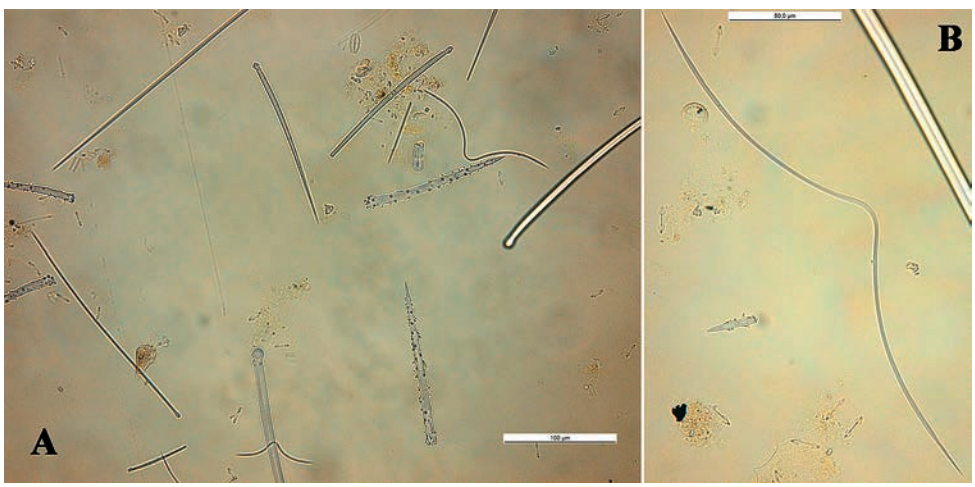


Fig. 10. *Clathria (Microciona) gradalis* Topsent, 1925, light microscopy images of spicules of holotype (MNHN LBIM D.T.328) from Naples, A, overview of spicules showing structural styles, ectosomal subtylostyles, echinating acanthostyles, toxas and palmate isochelae (scale bar = 100 μm), B, large tox with smooth apices (scale bar = 50 μm).

cially the larger thicker ones, show incipient spination in the form of bumpy or wobbly apices, which is barely visible in light microscopy. Lévi (1956) reported *Microciona armata* from Senegal, and his description bears considerable likeness to our specimens, including the toxas with spined apices. If these specimens turn out to be conspecific then the distribution of *C. (M.) armata* extends over a considerable area. The size variation in the subtylostyles is here considered to fall within the subgenus *Microciona*, as there is no continuous ectosomal skeleton of bouquets.

From the Celtic Seas species *C. (M.) atrasanguinea* (Bowerbank, 1862), to which this material was originally assigned, the present species differs in the shape and spination of the echinating acanthostyles, which are essentially similar to the structural styles, although a smaller version with a few more spines, whereas the echinating acanthostyles in *C. (M.) armata* are heavily spined proper acanthostyles, different from the structural styles.

The Mediterranean *Clathria (Microciona) gradalis* Topsent, 1925 is similar in spiculation (figs 10A-B). We examined a spicule slide of the holotype from Naples, MNHN D.T.328, with spicule size data: subtylostyles 203-*274.7*-401 × 1-*1.9*-3 μm, styles with subterminally constricted smooth or lightly spined heads 296-*605.9*-822 × 7-*8.6*-12μm, acanthostyles entirely spined, 93-*150.2*-202 × 7-*8.1*-10 μm, deeply curved toxas with smooth apices (fig. 10B), 30-*154.5*-252 μm, and typical shaped palmate isochelae, 12-*13.7*-16 mm. A distinct difference with our *C. (M.) armata* is the shape and sizes of the principal styles, which are clearly shorter and thicker, with warty heads, as opposed to the relatively long and thin, almost smooth styles of *C. (M.) gradalis*.

Another similar species, Mediterranean *C. (M.) duplex* Sarà, 1958 was reported from Roscoff and this has larger echinating acanthostyles and the toxas are always small (up to 58 μm); see for comparison Van Soest et al. 2000. There is also a resemblance with the Senegalese species *C. (M.) africana* (Lévi, 1956). That is described as a red sponge encrusting large gastropods just like our specimens and the overall spiculation is similar. However, all megascleres are smaller (subtylostyles up to 210 × 3 μm, styles up to 250 × 13-14 μm, not distinguished from echinating acanthostyles), and there are two distinct toxa categories, thin with considerable length variation and short thick toxas of 50-60 × 3 μm.

Clathria (Microciona) ascensionis **spec. nov.**

(figs 11A-G)

Material.— Holotype (ZMA Por. 20827), Ascension Island, North Point (site nr. 6), 7.8833°S 14.3833°W, 18 m, SCUBA, R. Irving, Operation Origin # 325, 29.xi.1985.

Description.— Very thin (less than 1 mm) red patches (fig. 11A), together occupying approximately 2 × 1 cm, on dead bivalve shell. Surface optically smooth, easily damaged.

Skeleton.— Hymedesmioid, with single long styles with head embedded in the basal spongin plate, surrounded by groups of heavily spined acanthostyles, with bouquets of ectosomal subtylostyles at the surface (fig. 11B).

Spicules.— (figs 11C-G) Subtylostyles, styles, echinating acanthostyles, rhaphidiform toxas, palmate isochelae.

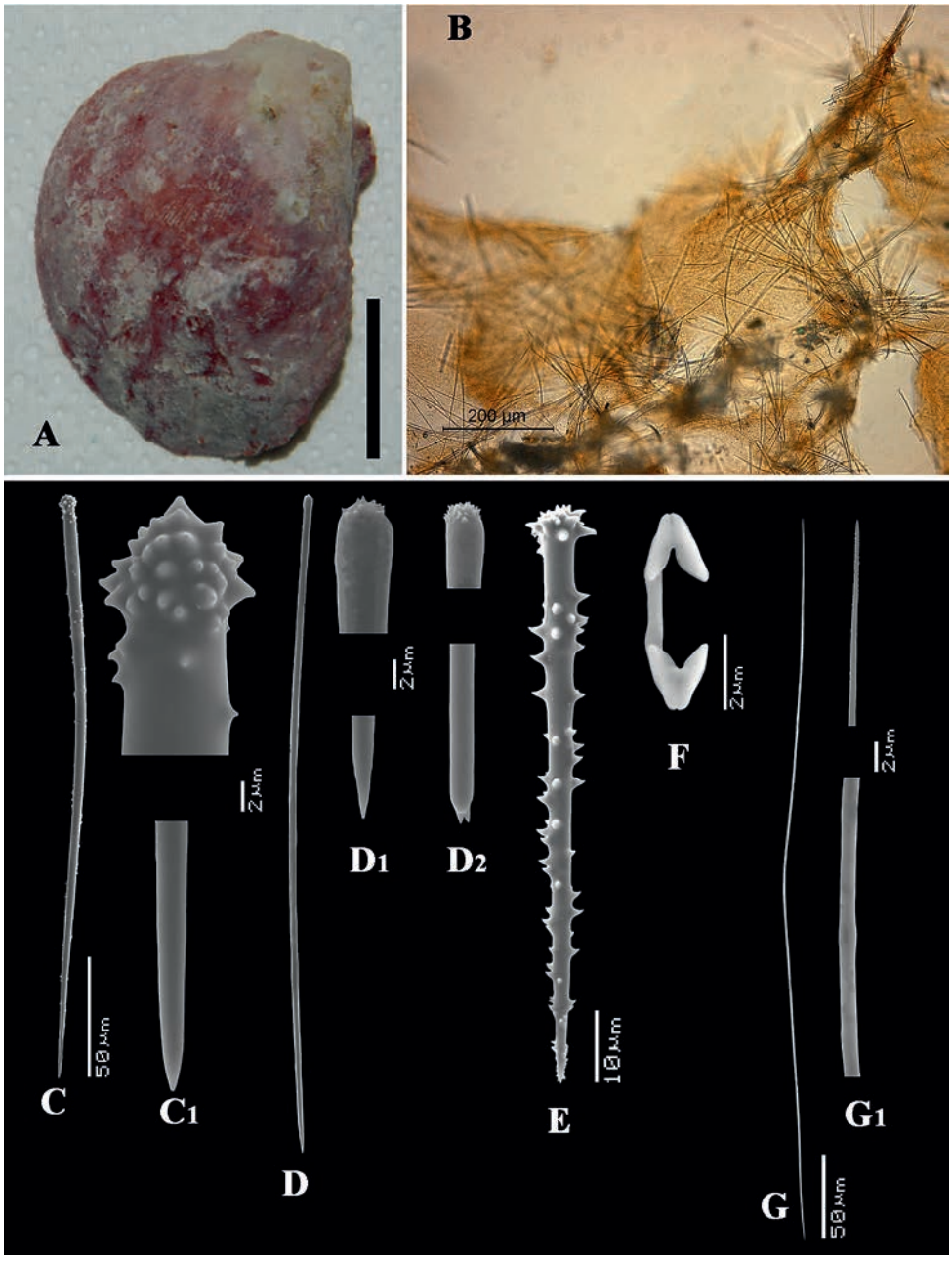


Fig. 11. *Clathria (Microciona) ascensionis* spec. nov., holotype (ZMA Por. 20287), from Ascension Island, A, habit encrusting a shell (scale bar = 1 cm), B, light microscopy image of cross section of skeleton (scale bar = 200 µm), C-G, SEM images of spicules, C-C1, structural style and detail of head and pointed end, D-D1,2, ectosomal subtylostyle, and details of head and pointed end of a larger and smaller one, E, echinating acanthostyle, F, palmate isochela, G-G1, rhaphidiform tox with details of centre and ending.

Ectosomal subtylostyles (figs 11D), with microspined elongate heads, shaft often somewhat curved, pointed end sharp, or occasionally bifid, size variable, 186-*244.5*-309 × 1.5-*2.3*-3 μm.

Styles (figs 11C), with spined-warty-rugose heads, rugosity extending some distance along the shaft, 254-*328.1*-388 × 7-*8.2*-9 μm.

Acanthostyles (fig. 11E), straight or somewhat curved, variable in length, densely spined all-over, 63-*77.6*-93 × 3-*4.2*-5 μm.

Raphidiform toxas (figs 11G), long, thin (less than 1 μm thick), with shallow or indistinct median curvature, and endings faintly and finely rugose, 334-*373.2*-444 μm.

Palmate isochelae (fig. 11F), typical shaped, numerous, tiny, 5-6 μm.

Etymology.— The name refers to the type locality, Ascension Island.

Ecology.— Sublittoral.

Distribution.— Known only from the type locality.

Remarks.— The new species is characterized by its extremely small palmate isochelae, the raphidiform toxas, and the presence of numerous pigment grains in the surface. The fact that the raphidiform toxas are faintly spined at the apices was unobserved with the light microscope and could only be detected by SEM. *Clathria (Microciona) gorgadensis* spec. nov. (see below) also has thin raphidiform toxas, but these are sinuously curved and do not have spined apices. Similar raphidiform toxas known from other *Clathria* species [e.g. West Indian *Clathria (Microciona) spinosa* Wilson, 1902, *Clathria (Thalysias) virgultosa* (Lamarck, 1814), *Clathria (Thalysias) curacaoensis* (Arndt, 1927), including its synonym *Clathria (Thalysias) raraechelae* (Van Soest, 1984), *Clathria (Thalysias) isodictyoides* (Van Soest, 1984), *Clathria (Thalysias) oxeota* (Van Soest, 1984), and further Indo-West Pacific species of various subgenera, see Hooper (1996)] need to be reexamined with magnifications higher than 10,000x to establish whether they could have spines as well. *Clathria (Microciona) capverdensis* spec. nov. (see below) also possesses small palmate isochelae, but that species has an additional larger normal sized category of palmate isochelae. It differs further by the microcionid skeletal structure, where *C. (M.) ascensionis* spec. nov. is hymedesmioid. Styles are more or less smooth in *C. (M.) capverdensis* spec. nov. and toxas are much shorter. None of the other regional species has such small isochelae, and the combination of further characters such as the present new species. Mediterranean *Clathria (Microciona) assimilis* Topsent, 1925 also possesses very small isochelae, but its toxas are deeply curved wing-shaped.

Clathria (Microciona) atoxa Topsent, 1928

(figs 12A-F)

Clathria gradalis var. atoxa Topsent, 1928: 299, pl. x fig. 14

Material.— (ZMA Por. 07499), Cape Verde Islands, São Nicolau, S of Branco, 16.6167°N 24.6333°W, 110-120 m, calcareous gravel and nodules, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Exped. stat. 150/04, 5.ix.1986; (ZMA Por. 22371b), Cape Verde Islands, Sal, W coast, Baia de Palmeira, 16.75°N 23.0°W, 5-15 m, volcanic stones at the base of vertical cliff down to 8 m and on slope down to 25 m, SCUBA diving, R.W.M. van Soest, CANCAP 7 Expedition stat. D09/10, 30.viii.1986.

Examined for comparison.— Holotype slide (MNHN LBIM D.T.1123), *Clathria gradalis var. atoxa* Topsent, 1928, Cape Verde Islands, 4 miles SW of Boa Vista, 15.9°N 22.9125°W, hard bottom, 91 m, Princesse-Alice 1901 Campagne stat. 1203.

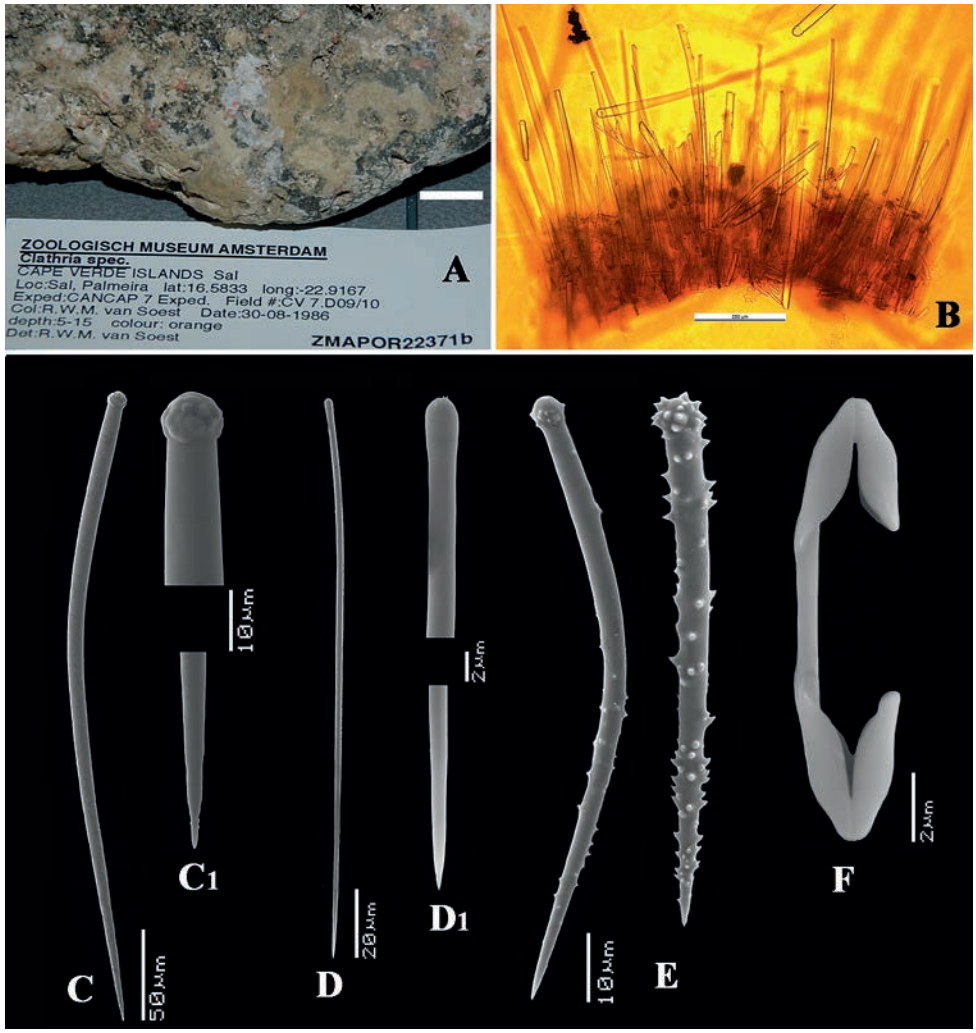


Fig. 12. *Clathria (Microciona) atoxa* Topsent, 1928, A, habit of Cape Verde specimen encrusting a stone (ZMA Por. 22371b) (scale bar = 1 cm), B, cross section of skeleton of holotype (MNHN LBIM D.T.1123) (scale bar = 200 µm), C-F, SEM images of spicules of Cape Verde specimen (ZMA Por. 22371b), C-C1, structural style and detail of head and pointed end, D-D1, ectosomal subtylostyle and detail of head and pointed end, E, echinating acanthostyles, F, palmate isochela.

Description.— Orange encrustation (fig. 12A) on dead bryozoan crust on volcanic stone. Size, up to 1.5 × 1 cm in largest expansion, 1 mm or less in thickness. Surface hispid.

Skeleton.— Hymedesmioid (fig. 12B), i.e. with all megascleres erect on the substratum, heads down in the basal spongin plate.

Spicules.— (figs 12C-F) Subtylostyles, structural styles, echinating acanthostyles, palmate isochelae (no toxas).

Subtylostyles (fig. 12D), straight with prominent microspined globular heads, gradually sharply pointed ends, 149-*190.3*-255 × 1.5-*1.9*-2 μm.

Styles (fig. 12C), robust, fusiform, with warty/spined heads, with pointed ends gradually tapering to sharp apices, 192-*396.9*-660 × 7-*17.8*-26 μm.

Echinating acanthostyles (fig. 12E), entirely densely and strongly spined, 66-*108.1*-209 × 5-*6.8*-10 μm.

Palmate isochelae (fig. 12F), 'typical' shaped, 13-*14.3*-16 μm.

Ecology.— Sandy gravel bottom, 5-120 m.

Distribution.— Cape Verde Islands: Boa Vista, Sal and São Nicolau.

Remarks.— The skeletal structure of our specimens matches Topsent's (1928) description. Subtylostyles measure 189-*214.5*-237 × 1.5-*2.1*-3 μm, styles with warty heads, occasionally smooth 273-*519.4*-710 × 7-*18.3*-25 μm, acanthostyles with entirely spined curved shaft, the smaller mostly straight, 90-*124.9*-183 × 4-*8.2*-11μm, and palmate isochelae, typical shaped, 13-*15.1*-18 μm. Apart from the styles, which are longer and more curved in Topsent's material, the spicules of the two specimens match reasonably closely. Our orange specimens encrusted a volcanic stone, whereas Topsent reported his specimen as rosy in alcohol and encrusting calcareous algae.

Records of *Clathria atoxa* from the Northeast Atlantic should be critically evaluated, as the lack of toxas is not necessarily sufficient for conspecificity.

Clathria (Microciona) aurea **spec. nov.**

(figs 13A-F)

Material.— Holotype (ZMA Por. 07420), Cape Verde Islands, W of Sal, off Palmeira, 16.7°N 23.0167°W, 224-248 m, calcareous nodules, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Expedition stat. 113/06, 31.viii.1986; paratype (ZMA Por. 07278), Cape Verde Islands, São Tiago, Ilheus Rombos, SE of Cima, 155-170 m, 14.95°N 24.65°W, hard calcareous bottom, Van Veen grab, R.W.M. van Soest, CANCAP 7 Expedition stat. 30/01, 23 August 1986.

Examined for comparison.— Holotype slides (MNHN LBIM D.T.327), *Clathria toxistricta* Topsent, 1925, Naples, 1920, '62', two slides; holotype slides (MNHN LBIM D.T.325), *Clathria toxitenuis* Topsent, 1925, Naples, 1920, '66', two slides; holotype slide (MNHN LBIM D.T.327), *Clathria toximajor* Topsent, 1925, Naples, 1902, '62", one slide; holotype (BMNH 1889.11.16.1), *Microciona strepsitoxa* Hope, 1889, Hastings, 45 m, on scallops, iii.1889; (RMNH unregistered), Banyuls, Vosmaer slide collection nr. 138, labeled *Microciona strepsitoxa*, det. E. Topsent.

Description.— Bright yellow patches encrusting limestone conglomerates and calcareous tubes (fig. 13A). Approximately 1 mm in thickness, lateral expansion 0.2-2 cm. Surface hispid, rather slimy, consistency soft.

Skeleton.— (fig. 13B) Hymedesmioid to microcionid, with choanosomal styles and echinating acanthostyles erect on the basal spongin plate.

Spicules.— (figs 13C-F) Subtylostyles, styles, echinating acanthostyles, toxas; no palmate isochelae.

Ectosomal subtylostyles (fig. 13D), relatively long and straight, with microspined heads, 162-*354.7*-520 × 2-*4.6*-5 μm.

Choanosomal styles (fig. 13C), relatively robust, with strongly warty heads and smooth shaft, subterminally abruptly curved, 418-*452.1*-660 × 18-*21.7*-25 μm.

Echinating acanthostyles (fig. 13E), relatively robust, the larger ones resembling the

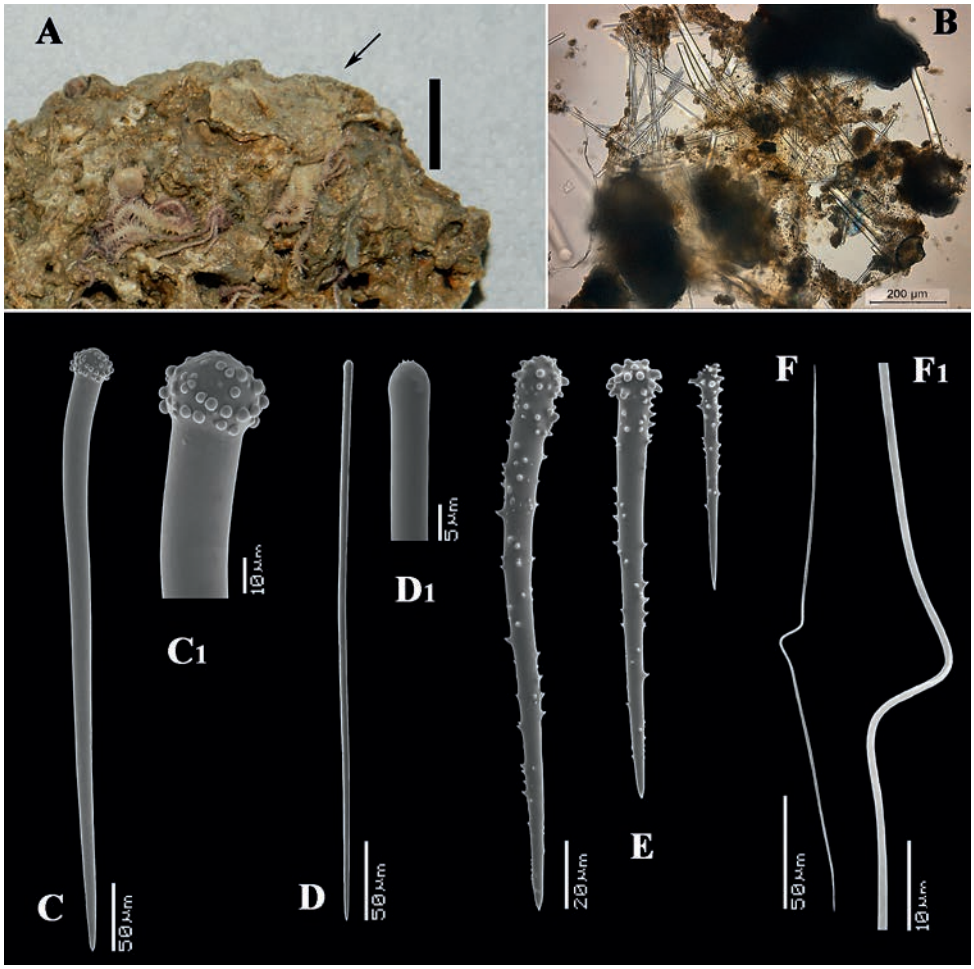


Fig. 13. *Clathria (Microciona) aurea* spec. nov., holotype (ZMA Por. 07420), A, habit (arrow) encrusting a calcareous nodule (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C-F, SEM images of spicules, C-C1, structural style and detail of head, D-D1, ectosomal subtylostyle and detail of head, E, echinating acanthostyles, F-F1, strepsitox and detail of central spiral curve.

choanosomal styles in being also subterminally curved, strongly spined all over, especially at the heads, the smaller ones are straight, 65-*149.9*-198 × 8-*11.5*-13 µm.

Strepsitoxas (fig. 13F), thin, long, accolada type, but with small characteristically twisted median curvature, 105-*263.2*-423 µm.

Etymology.— Aureus (L.) means golden, referring to the bright yellow colour of this species.

Ecology.— Deep water (155-248 m), on hard bottom.

Distribution.— Cape Verde Islands.

Remarks.— Four candidate species were considered to accommodate this characteristic species, Celtic Seas *Clathria (Microciona) strepsitoxa* (Hope, 1889), also reported

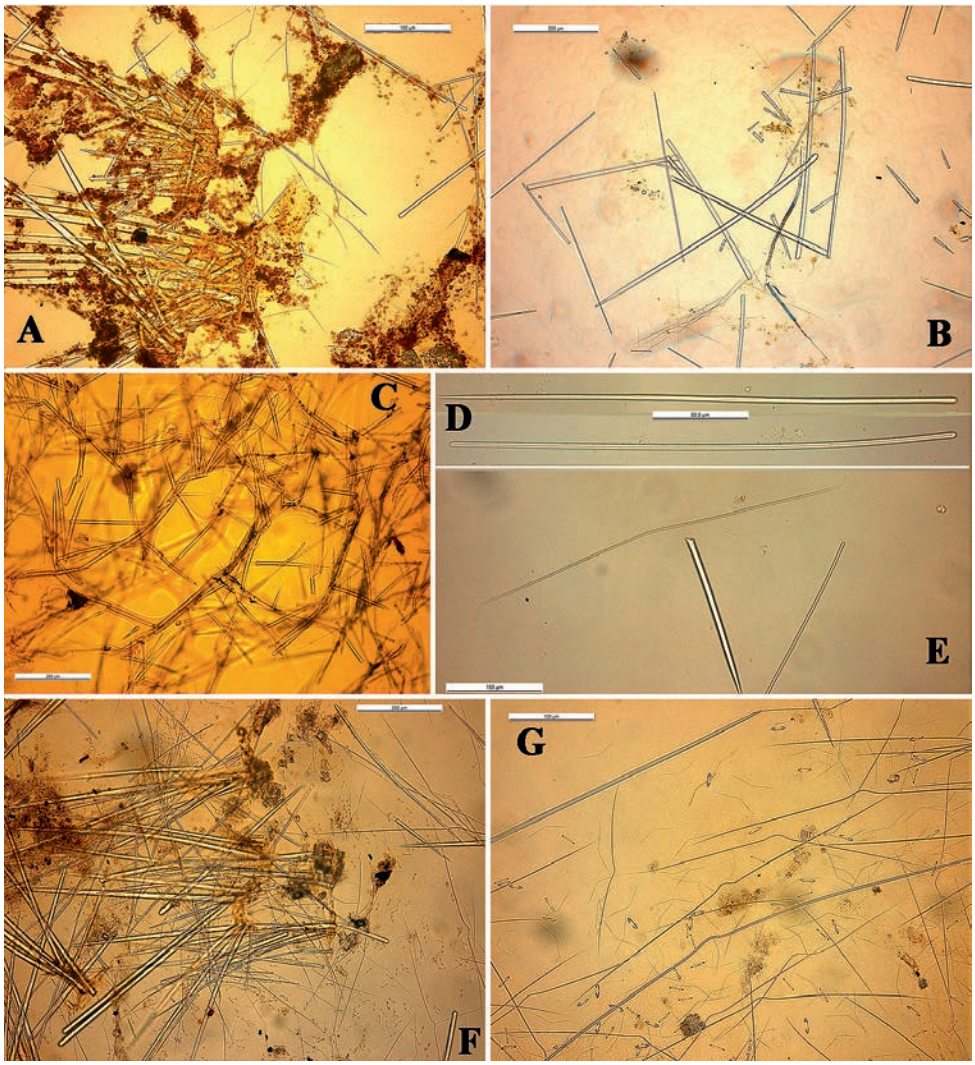


Fig. 14. Light microscopic images of MNHN holotype spicule slides of *Clathria* species described by Topsent (1925) from the Bay of Naples, A-B *Clathria toxitenuis*, A, cross section of skeleton showing hymedesmioid structure (scale bar = 100 μm), B, spicule complement (scale bar = 200 μm), C-E, *Clathria toxistricta*, C, cross section of choanosomal skeleton showing plumoreticulation (scale bar = 200 μm), D, 'normal' subtylostyle and strongylote 'subtylostyle' (scale bar = 50 μm) E, tox (scale bar = 100 μm), F-G, *Clathria toximajor*, F, cross section of skeleton showing hymedesmioid arrangement (scale bar = 200 μm), G, overview of various toxa categories and sizes (scale bar = 100 μm).

from the Mediterranean (Topsent, 1892b), Tenerife (Cruz, 2002), and the Azores (Boury-Esnault & Lopes, 1985), and the Naples species *Clathria toxitenuis* Topsent, 1925, *Clathria toxistricta* Topsent, 1925, and *Clathria toximajor* Topsent, 1925.

We examined two slides of the type of *Clathria toxitenuis* from Naples (figs 14A-B),

one skeletal slide and one spicule slide. The skeleton is hymedesmioid like our new species, and also the spicule measurements appear closely similar: subtylostyles 174-468 × 2-5 μm, structural styles 195-624 × 9-13 μm, acanthostyles, 99-123 × 7-9 μm, and accolada toxas 142-327 μm. There are nevertheless compelling differences with our new species in the shape of all spicules except the subtylostyles: many of the structural styles are entirely smooth and more or less straight, a minority has some spines or a few warts on the head, whereas the styles of the new species have strongly warty heads with rounded excrescenses. The acanthostyles of *C. toxitenuis* are straight and although entirely spined have a distinct smoother region in the upper half of the shaft, whereas those of our new species are more curved and more heavily spined-warty in the upper half of the shaft; the acanthostyles of *C. toxitenuis* also are more uniform in shape and size compared to the diversity of shapes and sizes in the new species. The toxas of *C. toxitenuis* have a shallow barely spirally curvature, whereas those of the new species have a strikingly deep spirally curvature. The colour of *C. toxitenuis* is given as orange, not golden-yellow like our new species. It has been reported from Marseille (Lévi, 1960), Banyuls (Boury-Esnault, 1971) and the Canary Islands (Cruz, 2002), but these records were of specimens possessing palmate isochelae, and possibly concern a different species, because the type slides did not contain a single chela, and Topsent also did not mention them in his description.

We examined two slides of the type of *C. toxistricta* from Naples (figs 14C-E) incorporated in the collections of the Paris Museum, one slide containing fragments showing the skeletal structure, the other the dissociated spicules. The skeleton is plumoreticulate with a more or less rectangular reticulation of spongin fibers, cored by structural styles and echinated sparingly by acanthostyles. The ectosomal spicules are modified subtylostyles, taking the form of strongyles or quasitylotes, rather uniform in size, 220-273 × 1.5-2 μm, the structural styles have a more or less straight smooth shaft and warty or smooth heads, strikingly uniform in size, 159-261 × 9-12 μm, acanthostyles resemble the structural styles but are smaller and entirely spined, 97-143 × 6.5-8 μm, toxas are of the accolada type with a shallow or vaguely spiral curvature, 135-444 μm; no chelae were observed in the slides (nor were they mentioned by Topsent). From *C. (C.) toxistricta* our specimens differ in the shape and size of the toxas, in the shape and greater length and thickness of the structural styles, in the shape and size of the ectosomal subtylostyles, and in the overall skeletal structure (hymedesmioid, not plumoreticulate). Live colour of *C. (C.) toxistricta* is given as red ('un beau rouge'), contrasting with our bright yellow specimens. Like our specimens, *C. (C.) toxistricta* lacks chelae, and in combination with the long thin accolada toxas, there is considerable resemblance, but insufficient for conspecificity.

We examined a slide of the type of *C. toximajor* from Naples (figs 14F-G), likewise from the MNHN collections. The skeletal structure is hymedesmioid like in our new species. The subtylostyles are predominantly 'normal' but occasionally they are strongylote, 231-441 × 2.5-6 μm; the structural styles are straight or slightly curved, most are smooth, but spines on the heads are not infrequent, 309-696 × 9.5-18 μm; acanthostyles are straight, entirely spined but with a relatively smooth upper shaft, 91-149 × 5-9 μm; toxas occur in two distinct categories, rhaphidiform with shallow curvature, 181-841 μm, and thin 'tricurvate', technically wing-shaped, smaller toxas, very uniform in shape and size, 51-66 μm; typical shaped palmate isochelae measure 16-21 μm. The presence

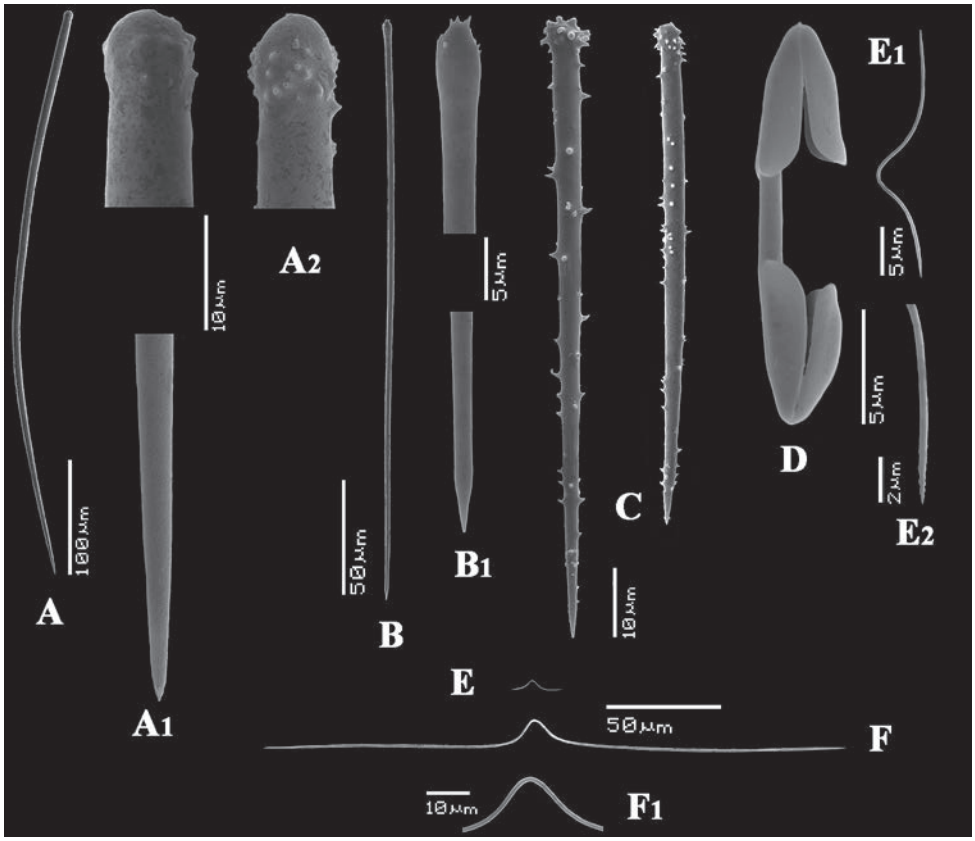


Fig. 15. *Clathria (Microciona) strepsitoxa* (Hope, 1889), SEM images of spicules of the holotype (BMNH 1889.11.16.1) from Hastings, England, A-A1,2, structural style and detail of variously ornamented heads, and pointed end, B-B1, ectosomal subtylostyle and detail of head and pointed end, C, echinating acanthostyles, D, palmate isochela, E-F, toxas, E-E1,2, small wingshaped tox, E, same magnification as F, E1, magnified, E2, detail of ending showing spines, F-F1, strepsitox and detail of central spiral curve.

of chelae, the two toxa categories, and the greater length of the rhaphidiform toxas are a clear difference with our new species. Details of the other spicules are also different.

We borrowed the type of *Microciona strepsitoxa* from the Natural History Museum (BMNH 1889.11.16.1) and also examined slides of Topsent's (1892b) record of the species from Banyuls present in the Vosmaer collection of slides in RMNH (both these specimens are closely similar and are very likely conspecific). For comparison purposes we present SEM images (figs 15A-F) and spicule measurements of the type of *Microciona strepsitoxa*: subtylostyles with microspined heads, 198-285 × 2.5-3 µm, styles with warty heads, 225-478 × 6-12 µm, acanthostyles straight, entirely spined, 78-136 × 5-8 µm, long thin strepsitoxas, 273-390 µm, numerous small wing-shaped toxas, 28-156 µm, and typical-shaped palmate isochelae 14-19 µm; the skeleton is typically hymedesmioid. Although skeletal structure, spicule sizes and the twisted condition of the long thin toxas resemble *C. (M.) strepsitoxa*, the choanosomal styles in our specimens are on aver-

age twice as thick as those of *strepsitoxa* and are characteristically curved subterminally, while also the echinating acanthostyles are thicker, and most importantly, no chelae and small oxhorn or wing shaped toxas were observed in any of the slides we made. We also noted, that in *C. (M.) strepsitoxa* the small toxas have a faint apical spination, which has not previously been reported for that species. Perhaps of lesser importance is the unusual live colour of our specimens, bright yellow, which is not reported for *C. (M.) strepsitoxa*.

C. (M.) aurea spec. nov. is a member of the species-rich group of *Clathria (Microciona)* possessing accolada toxas, long straight thin toxas with small median curve. Four species in the Northeast Atlantic are distinct by sharing two toxa types: next to the long straight thin toxas they have 'normal', smaller toxas with a deeper and more gradual median curve; these are *C. (M.) strepsitoxa* discussed above, *C. (M.) osismica* (Cabioch, 1968) described from Roscoff, with essentially the same spicule complement, but thinner and shorter megascleres, and the Irish bathyal species *C. (M.) ditoxa* (Stephens, 1916), which has the long thin toxas up to 800 μm and the shorter toxas are thick, up to 2.5 μm in thickness. *C. (M.) toximajor* Topsent, 1925 from Naples also has much longer toxas (up to 900 μm), and the small toxas have a shallow curve (fig. 14G), while those of *C. (M.) strepsitoxa* have a deep curve (fig. 15E). Perhaps *Clathria (Microciona) bitoxa* (Burton, 1930) should also be mentioned here, but this differs clearly by the lack of chelae and the possession of peculiar thick oxhorn toxas, next to the thin accolada toxas (see below).

The remaining members of the group, including the above discussed *C. (M.) toxitenuis* Topsent, 1925 and *C. (C.) toxistricta*, as well as *C. (M.) tenuissima* (Stephens, 1916), *C. (M.) levii* (Sarà & Siribelli, 1960), and *C. (M.) ascendens* (Cabioch, 1968), lack a second category of smaller normal toxas next to the long thin ones like our new species. None of these species is reported as having a bright yellow colour, and none of them have the curved highly warted styles and deeply spirally curved toxas like our new species.
The absence of chelae and the rather distinctly curved and heavily warted styles of this new species remind of *Clathria (Microciona) anancora* (Topsent, 1904a), described from deep water off the Azores. However, that species has abundant wing-shaped toxas of up to 120 μm in length, not strepsitoxas.

Clathria (Microciona) bicleistochelifera spec. nov.
(figs 16A-I)

Clathria cleistochela; Van Soest, 1993a: 210 (Table 2, in part).

Material.— Holotype (ZMA Por. 06986), Cape Verde Islands, Maio, SW coast off Punta Preta, sandy and rocky bottom, empty shells, 5-15 m, 15.1167°N 23 3°W, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/03, 26.viii.1986; paratype (ZMA Por. 07243), Cape Verde Islands, São Vicente, NE coast, Baia das Gatas, protected lagoon, 0-2 m, 16.8833°N 24.8833°W, snorkeling, R.W.M. van Soest, CANCAP 7 Exped. stat. K28/08, 6.ix.1986.

Description.— Blood-red or bright red crust on stones, shells, and wormtubes, surface conulose-hispid due to protruding fibers. Size of holotype 6 × 5 × 0.2 cm (detail shown in fig. 16A), paratype 1 × 4 × 0.1 cm. Consistency soft, but fibrous.

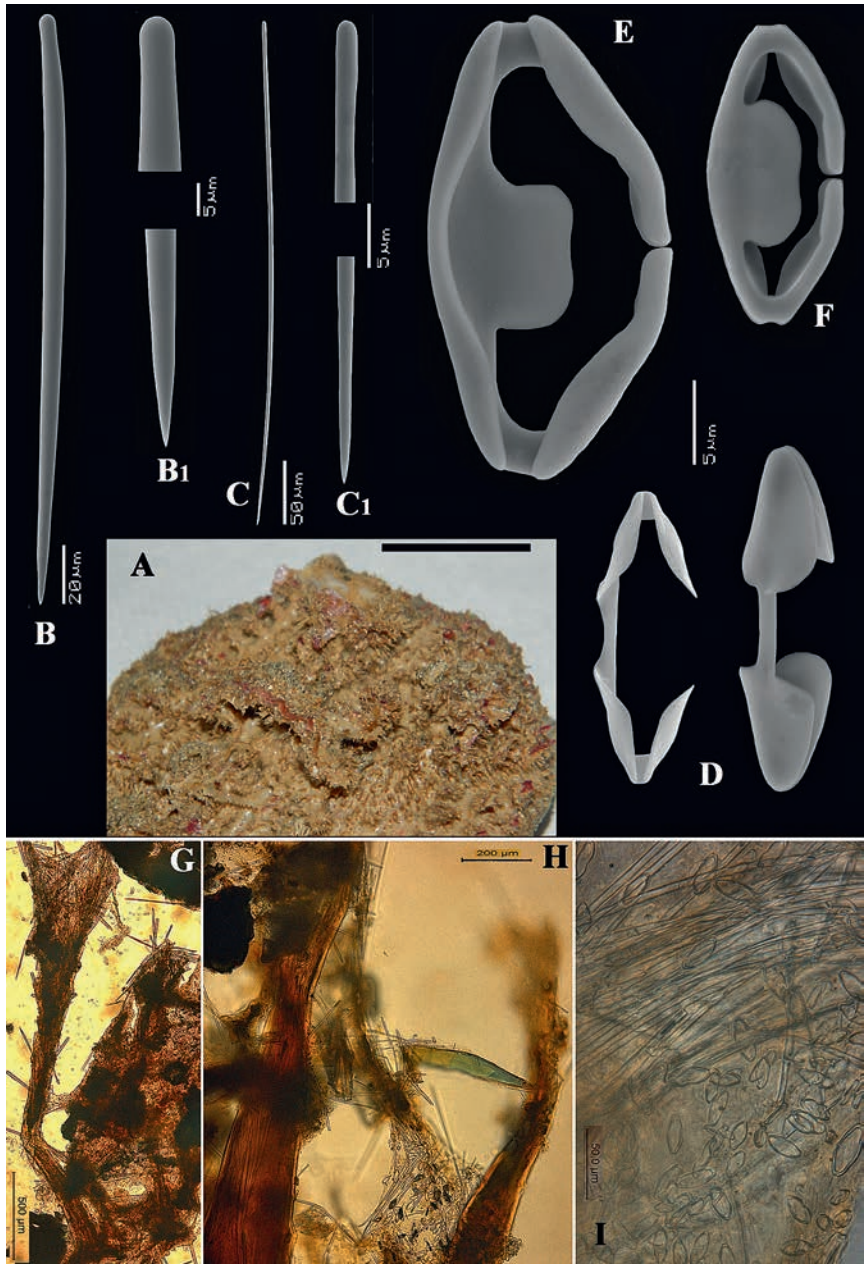


Fig. 16. *Clathria (Microciona) bicleistochelifera* spec. nov., holotype (ZMA Por. 06986), A, habit of holotype growing on an empty shell (scale bar = 1 cm), B-F, SEM images of the spicules, B-B1, structural style and detail of head and pointed end, C-C1, ectosomal subtylostyle and detail of head and pointed end, D, typical shaped palmate isochelae, E, large category of cleistochela, F, small category of cleistochela, G-F, light microscopy images of the skeleton, G, cross section showing plumoreticulate skeleton (scale bar = 500 µm), H, detail of skeleton showing cored main fibers (scale bar = 200 µm), I, surface membrane crowded with larger category of cleistochelae (scale bar = 50 µm).

Skeleton.— (figs 16G-H) Microcionid to plumo-reticulate. The basal spongin plate carries erect parallel spongin fibers, which branch outward near the surface, but are not anastomosed. Spongin columns up to 150 μm wide, peripheral branches have a diameter up to 45 μm. The columns are sparingly cored by 2-4 spicules (principal styles) in cross section and not echinated. Subtylostyles are scattered in the ectosomal region and crown the fiber endings.

Spicules.— (figs 16B-F) Subtylostyles, coring styles, palmate 'typical' isochelae and cleistochelae. No echinating acanthostyles, no toxas.

Subtylostyles (fig. 16C), thin and slightly flexuous, heads smooth, 204-*283.9*-363 × 1-*1.9*-2.5 μm.

Styles (fig. 16B), relatively long and thin, with smooth heads, in a large length range, 183-*370.2*-492 × 6-*8.2*-11 μm.

Palmate isochelae (fig. 16D) with typical shape, 16-*19.3*-22 μm.

Cleistochelae in two non-overlapping size categories, larger (fig. 16E) 22-*27.1*- 31 μm and smaller (fig. 16F) 13-*16.9*-20 μm.

Etymology.— The name refers to the two size categories of cleistochelae.

Ecology.— Intertidal and shallow-water, in bays.

Distribution.— So far only known from the islands of São Vicente and Maio, Cape Verde Islands.

Remarks.— The new species differs from the cleistocheliferous species *C. (M.) cancapseptima* spec. nov. described below in the possession of two distinct size categories of cleistochelae, the plumoreticulate skeletal structure, the lack of echinating acanthostyles and toxas. As described below in the discussion of *C. (M.) cancapseptima* spec. nov. these features distinguish the new species also from the other encrusting cleistocheliferous species of the region. From *C. (Clathria) hjorti* described above the present species differs clearly in the encrusting vs ramose habit. From *C. (M.) cleistochela* Topsent, 1925, recorded from the Azores (Boury-Esnault & Lopes, 1985) and the Canary Islands (Cruz, 2002), our new species differs in having two size categories of cleistochelae and in the lack of echinating acanthostyles and toxas.

Clathria (Microciona) bitoxa (Burton, 1930)

(figs 17A-H)

Hymantho bitoxa Burton, 1930: 503, text-fig. 2; Alander, 1942: 63.
Microciona bitoxa; Solórzano et al., 1991: 37.

Material.— (ZMA Por. 07276), Cape Verde Islands, S of São Tiago, 14.8667°N 23.55°W, 515 m, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Exped. stat. 026/03, 22.viii.1986.
Examined for comparison.— Holotype (BMNH 1910.1.1.787) of *Hymantho bitoxa*, Norway, coll. A.M. Norman.

Description.— Thin hispid red crust on a shell, becoming transparent in preserved state (fig. 17A); size approximately 1 × 0.5 cm in lateral expansion, thickness less than 1 mm.

Skeleton.— (fig. 17B) Hymedesmioid, with long styles erect on the substratum, with pointed ends protruding beyond the surface. Heads embedded in a basal spongin plate,

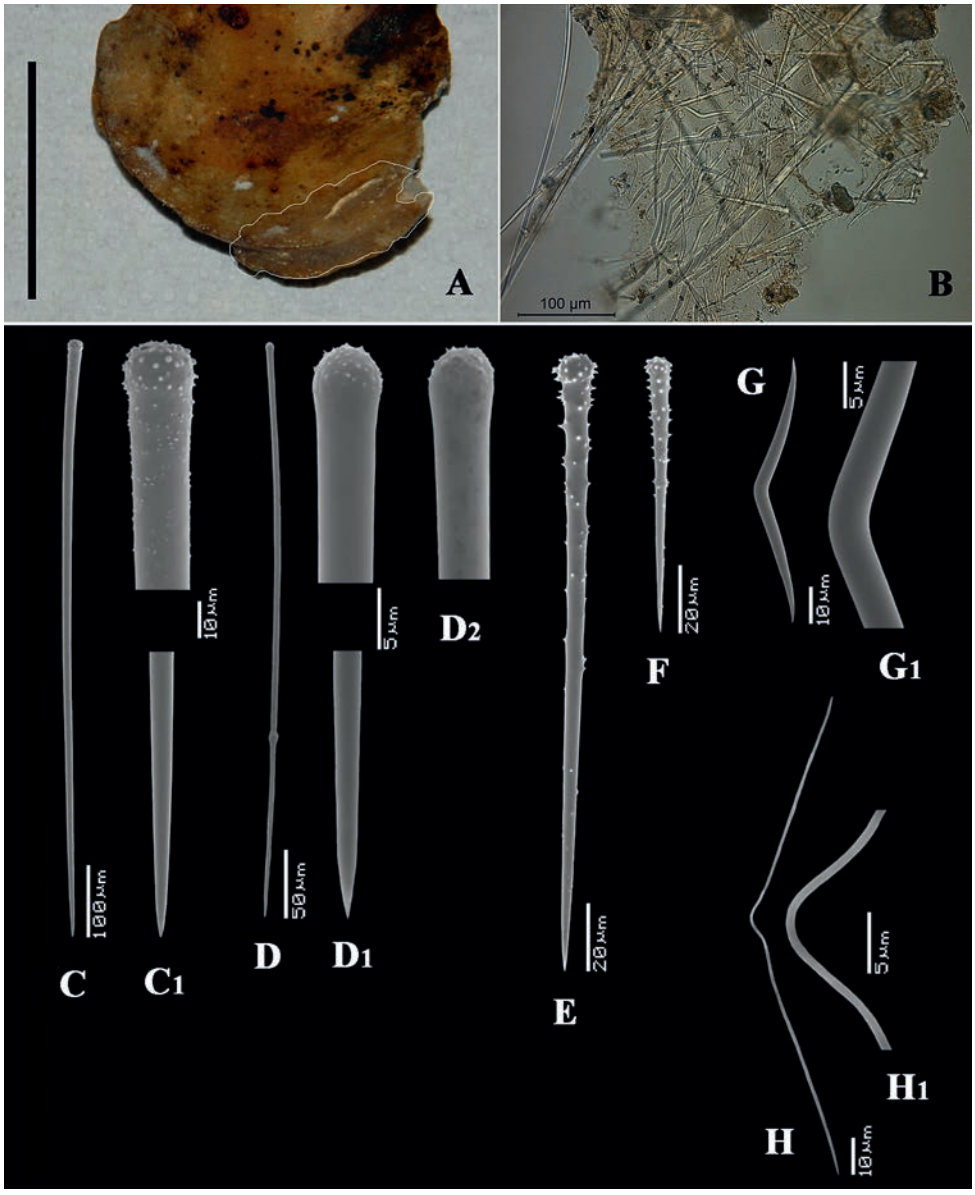


Fig. 17. *Clathria (Microciona) bitoxa* (Burton, 1930), Cape Verde Islands specimen (ZMA Por. 07276), A, habit (circled area) encrusting a dead bivalve (scale bar = 1 cm), B, overview of the skeleton and spicules (scale bar = 100 μm), C-H, SEM images of the spicules, C-C1, structural style and detail of head and pointed end, D-D1,2, ectosomal subtylostyle and detail and variation of head and pointed end, E, larger echinating acanthostyle, F, smaller echinating acanthostyle, G-G1, shallow-curved oxhorn tox and detail of central curve, H-H1, accolada tox and detail of central curve.

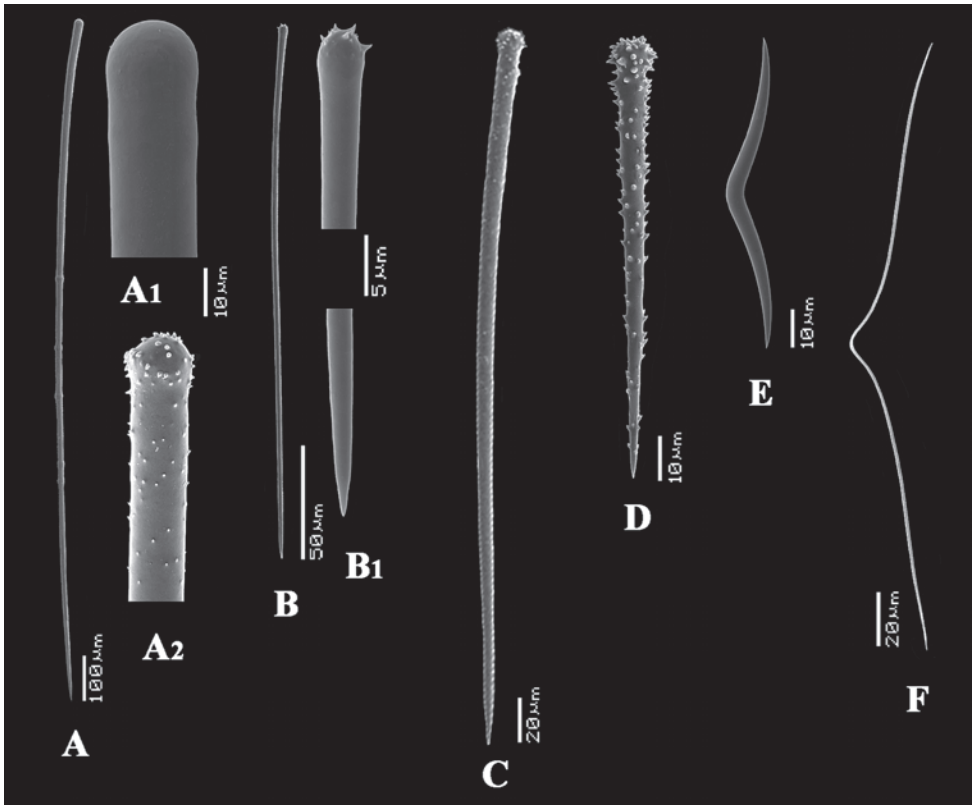


Fig. 18. *Hymantho bitoxa* Burton, 1930 (=*Clathria (Microciona) bitoxa*), SEM images of the spicules of the holotype (BMNH 1910.1.1.787) from Norway, A-A1,2, structural style and detail of variously ornamented heads, B-B1, ectosomal subtylostyle and detail of head and pointed end, C, large acanthostyle, D, small acanthostyle, E, oxhorn tox, F, accolada tox.

surrounded by echinating acanthostyles. Ectosomal subtylostyles scattered in the dermal membrane. Microscleres densely crowded in the dermal membrane and in the interior.

Spicules.— (figs 17C-H) Ectosomal subtylostyles, structural styles, echinating acanthostyles, two categories of toxas. No chelae.

Subtylostyles (fig. 17D), straight, with swollen microspined heads, 275-*325.2*-360 × 2.5-*3.6*-4.5 µm.

Styles (fig. 17C), straight, thick, with smooth, or rarely spined heads, 868-*1111.2*-1234 × 14-*20.8*-25 µm.

Acanthostyles (figs 17E-F), entirely spined, although the larger have the lower shaft smooth, in a large size variation, 54-*95.3*-162 × 4-*5.4*-7 µm.

Toxas in two distinct categories, (1, fig. 17G) short thick, oxhorn-shaped, with small median curvature and straight apices, 36-*49.5*-63 × 2-*3.1*-4 µm, and (2, fig. 17H) accolada type, long thin with small shallow median curve 160-*195.1*-210 µm.

Ecology.— Bathyal species.

Distribution.— Norway (Burton, 1930), Skagerrak (Alander, 1942), NW Spain (Solórzano et al., 1991), Cape Verde Islands.

Remarks.— The present material conforms to the type specimen (see figs 18A-F), of which we present SEM images of the spicules for comparison purposes. The combination of thin accolada toxas and fat shallow oxhorn toxas is very characteristic. There are some discrepancies between the Cape Verde and Norwegian specimens: the former has predominantly smooth structural styles and the acanthostyles are less easily divisible in two distinct sizes, whereas in the type the spination of the style heads and acanthostyle shafts are more obvious. The short thick toxas combined with the lack of isochelae remind of the Mediterranean deep-water species *Clathria (Microciona) frogeti* (Vacelet, 1969), but that species lacks the long thin toxas. The species differs from the similar *C. (M.) ditoxa* (Stephens, 1916) from bathyal waters on the west coasts of Europe in the shape of the two toxa categories, the smaller size of the structural styles and the presence of isochelae.

The large distance between the type locality and Alander's Sweden record versus the present locality extend the distribution of this species over a very large area. We can further support this with the so far unpublished occurrence of *C. (C.) bitoxa* at Rockall Bank, W of Ireland and Mingulay Reef, W of Scotland (Van Soest in prep.), while Solórzano et al.'s (1991) record from the coast of Northwest Spain, although not substantiated with a description or illustration, neatly connects the present locality with the North European localities.

By the possession of two separate toxa categories (accolada- and oxhorn-like), the present species seems to resemble the shallow-water Senegalese species *Clathria (Microciona) africana* (Lévi, 1956 as *Microciona*), but that has much smaller styles (250 × 12-13 μm).

Clathria (Microciona) boavistae **spec. nov.**

(figs 19A-H)

Material.— Holotype (ZMA Por. 07346), Cape Verde Islands, W of Boa Vista, SW of Ilheu Calheta do Velho, 16.2333°N 22.9667°W, 20-25 m, hard calcareous bottom, Van Veen grab, R.W.M. van Soest, CANCAP 7 Exped. stat. 064/03, 27.viii.1986; paratype (ZMA Por. 07356), Cape Verde Islands, W of Boa Vista, SW of Ilheu Calheta do Velho, 16.2333°N 22.9667°W, 24-25 m, hard calcareous bottom, Van Veen grab, R.W.M. van Soest, CANCAP 7 Exped. stat. 069/08, 27.viii.1986; paratype (ZMA Por. 07358), Cape Verde Islands, W of Boa Vista, WSW of Ilheu Calheta do Velho, 16.1667°N 22.9667°W, 25-27 m, bottom basaltic stones with calcareous overgrowth, Van Veen grab, R.W.M. van Soest, CANCAP 7 Exped. stat. 070/01, 27.viii.1986.

Description.— Thin lightly hispid dull-red patches on calcareous stones. Individual patches usually less than 1 × 1 cm (holotype, fig. 19A), many are smaller; thickness 1-2 mm. Consistency soft, easily damaged.

Skeleton.— Microcionid (fig. 19B), with spongin-ensheathed plumose columns of spicules rising from the spongin-plate on the substratum. The columns are cored by robust styles and echinated by shorter but more or less equally thick acanthostyles. Ectosomal spicules inconspicuous, crowning the columns near the surface of the sponge. Small toxas numerous, densely distributed among the columns.

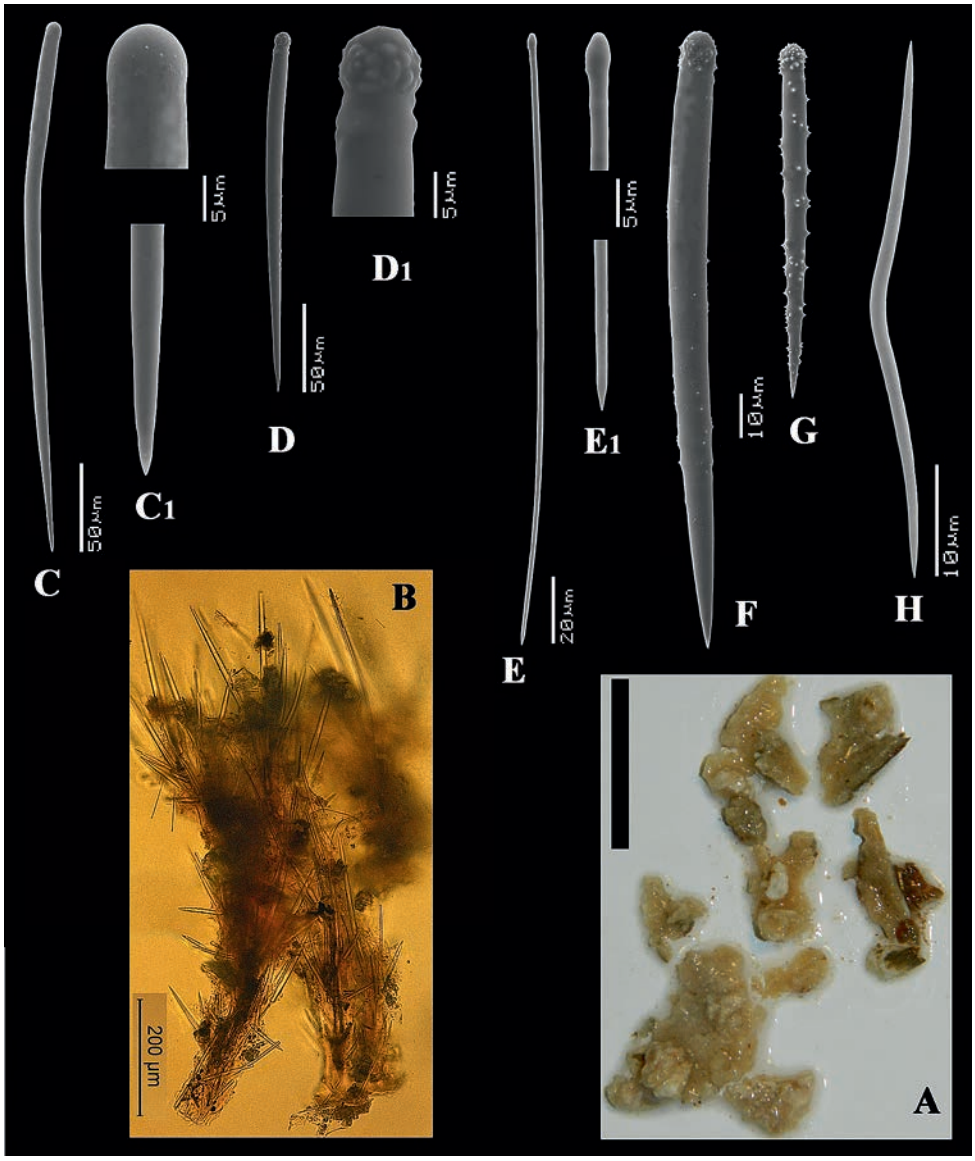


Fig. 19. *Clathria (Microciona) Boavistae* spec. nov., holotype (ZMA Por. 07346) from the Cape Verde Islands, A, the fragmented holotype (scale bar = 1 cm), B, cross section of skeleton showing microcionid structure (scale bar = 200 µm), C-H, SEM images of spicules, C-D, structural styles, C-C1, smooth style and detail of head and pointed end, D-D1, smaller rugose style with detail of head, E-E1, ectosomal subtylostyle and detail of head and pointed end, F-G, echinating acanthostyles, F, larger acanthostyle resembling structural style, G, genuine echinating styles, H, shallow-curved wing/oxhorn tox.

Spicules.— (figs 19C-H) Subtylostyles, styles, echinating acanthostyles, toxas. Chelae absent.

Subtylostyles (fig. 19E) relatively short and thin, with elongately swollen smooth heads, 132-*176.8*-204 × 1-*1.2*-1.5 μm.

Coring styles (figs 19C-D), predominantly smooth (fig. 19C), but occasionally with spined-warty heads (fig. 19D), somewhat fusiform but slightly curved or straight, 192-*295.4*-341 × 8-*10.5*-18 μm.

Echinating styles (figs 19F-G), spined all-over, but varying from short truly echinating acanthostyles (fig. 19G) to larger lesser spined partly coring, partly echinating spicules (fig. 19F), grading in shape towards larger coring styles, 64-110.9-183 × 5-*6.8*-10 μm.

Toxas (fig. 19H), thin, wing-shaped, with shallow curve and relatively straight smooth apices, 18-*30.9*-50 μm.

Etymology.— The name refers to the type locality, the island of Boa Vista, Cape Verde Islands.

Ecology.— Encrusting hard substratums at 20-27 m.

Distribution.— Known only from the island of Boa Vista, Cape Verde Islands.

Remarks.— The species resembles *Clathria (Microciona) angularis* Sarà & Siribelli (1960 as *Microciona*) from Naples, which also lacks palmate isochelae (or at least these were not observed) and the toxas were also small and shallow-curved. However, megascleres described and drawn by Sarà & Siribelli are clearly different: much longer and thinner (474-544 × 8-10 μm), and spined. Requests to obtain type material were unsuccessful (not present in the collection of the Stazione Zoologica of Naples, Dr F. Bentivegna, *in litteris*). A further similar species is *Clathria plurityla* Pulitzer-Finali, 1983 (from the Ligurian coast, Italy), lacking chelae and with short toxas, but the styles of that species are polytylote and the subtylostyles are much longer and thicker than *C. (M.) boavistae* spec. nov.

The absence of chelae is also shared with the bathyal *C. (M.) bitoxa* (Burton, 1930) (see above), but the sizes of the megascleres are clearly larger in that species and the toxas occur in two morphologically distinct types. Northern European *Clathria (Microciona) laevis* (Bowerbank, 1866) as redescribed by Picton & Goodwin (2007) from Northern Ireland also lacks chelae and has rather similar toxas, but it has a hymedesmioid skeleton, its subtylostyles are twice as long (up to 750 μm) and structural styles are much longer and thinner (up to 1000 × <10 μm) than those of our new species. The absence of chelae aside, the high density of small thin toxas with shallow curve, and the variation in size of echinating acanthostyles are characteristic features delimiting the new species from other thinly encrusting red *Clathria (Microciona)* species in the Cape Verde Islands.

Clathria (Microciona) calloides spec. nov.

(figs 20A-C, 21A-E)

Clathria calla; Van Soest, 1993b: 212 (Table 3).

Not: *Axociella calla* De Laubenfels, 1934: 16; nec: *Clathria (Microciona) calla*; Van Soest, 1984: 100, pl. VII fig. 1, text-fig. 39.

Material.— Holotype ZMA Por. 07119 (Fig. 19B), Cape Verde Islands, São Vicente, W coast near Ponta do Manellinho Cambado, vertical cliff above sandy bottom with corals, 16.8667°N 25.0667°W, 10-12 m,

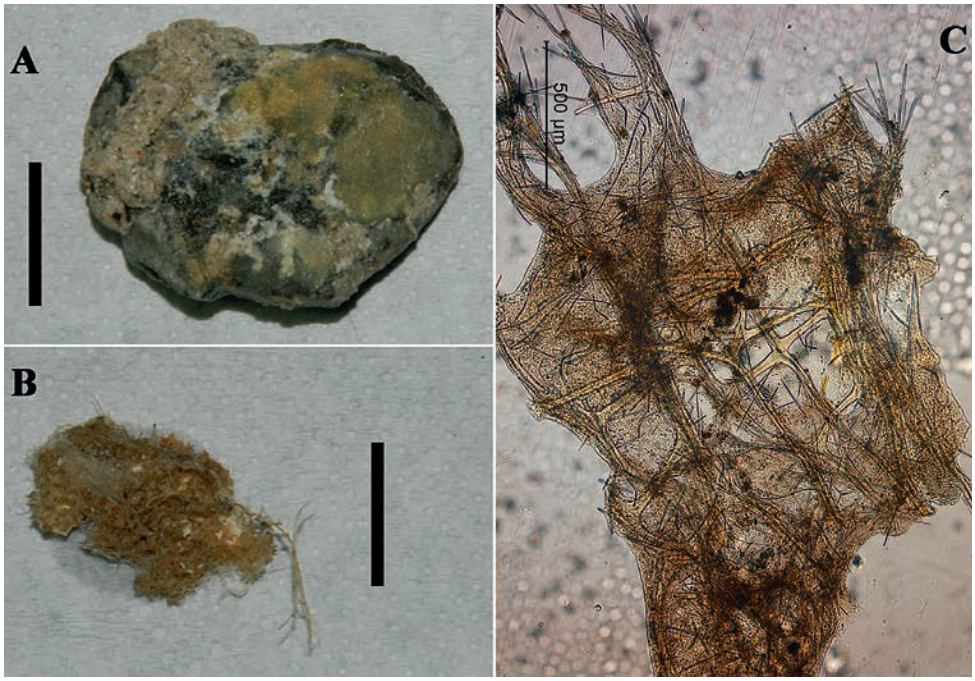


Fig. 20. *Clathria (Microciona) calloides* spec. nov., A, paratype (ZMA Por. 07910) from Boa Vista, Cape Verde Islands (scale bar = 1 cm), B, holotype (ZMA Por. 07119) from São Vicente, Cape Verde Islands (scale bar = 1 cm), C, paratype (ZMA Por. 7200) from Sal, Cape Verde Islands, cross section of skeleton showing rectangular spongin reticulation (scale bar = 500 µm).

SCUBA diving, R.W.M. van Soest, CANCAP 7 Expedition stat. D16/09, 7.ix.1986; paratype (ZMA Por. 07185), Cape Verde Islands, Boa Vista, W coast, NW coast of Ilhéu de Sal Rei, sandy bottom with stones, rocks, sabellariid reefs, 16.1667°N 22.9667°W, 1-4 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K16/09, 28.viii.1986; paratype (ZMA Por. 07190) (Fig. 19A), Cape Verde Islands, Boa Vista, W coast, NW coast of Ilhéu de Sal Rei, sandy bottom with stones, rocks, sabellariid reefs, 16.1667°N 22.9667°W, 1-4 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K16/14, 28.viii.1986; paratype (ZMA Por. 07200), Cape Verde Islands, Sal, W coast, Baia de Palmeira, 16.75°N 23.0°W, 0-4 m, snorkeling, coll. R.W.M. van Soest, CANCAP 7 Expedition stat. K19A/02, 30.viii.1986; paratype (ZMA 07226), Cape Verde Islands, São Nicolau, Branco, S coast, 16.65°N 24.683°W, 0-4 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K23/05, 5.ix.1986; paratype (ZMA Por. 07244), Cape Verde Islands, São Vicente, NE coast, Baia das Gatas, 16.9617°N 24.9617°W, 0-2 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K28/09, 6.ix.1986; paratype (ZMA Por. 07245), Cape Verde Islands, São Vicente, NE coast, Baia das Gatas, 16.9617°N 24.9617°W, 0-2 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K28/10, 6.ix.1986; (ZMA Por. 20833), Ascension Island, W part, site nr. 12, coll. R. Irving, Operation Origin #163, 11.xi.1985.

Examined for comparison.— Holotype slide (USNM 22333), *Axociella calla* De Laubenfels, 1934, Puerto Rico, 18.2194°-18.2417°N 67.425°W, 36-72 m, First Johnson-Smithsonian Deep Sea Expedition stat. 45, 13.ii.1933; (ZMA Por. 03782), *Clathria (Microciona) calla*, Florida, E of Elliott Key, 25.45°N 80.1833°W, depth 2-6 m, P.Wagenaar-Hummelinck, #1414, 5.ix.1963; (ZMA Por. 03817 and 03859b), *Clathria (Microciona) calla*, Curaçao, Vaarsenbaai, 12.162°N 69.014°W, 20 m, N. Broodbakker, 21.xi.1975 ((SEM figures here included: Figs 20F-J).

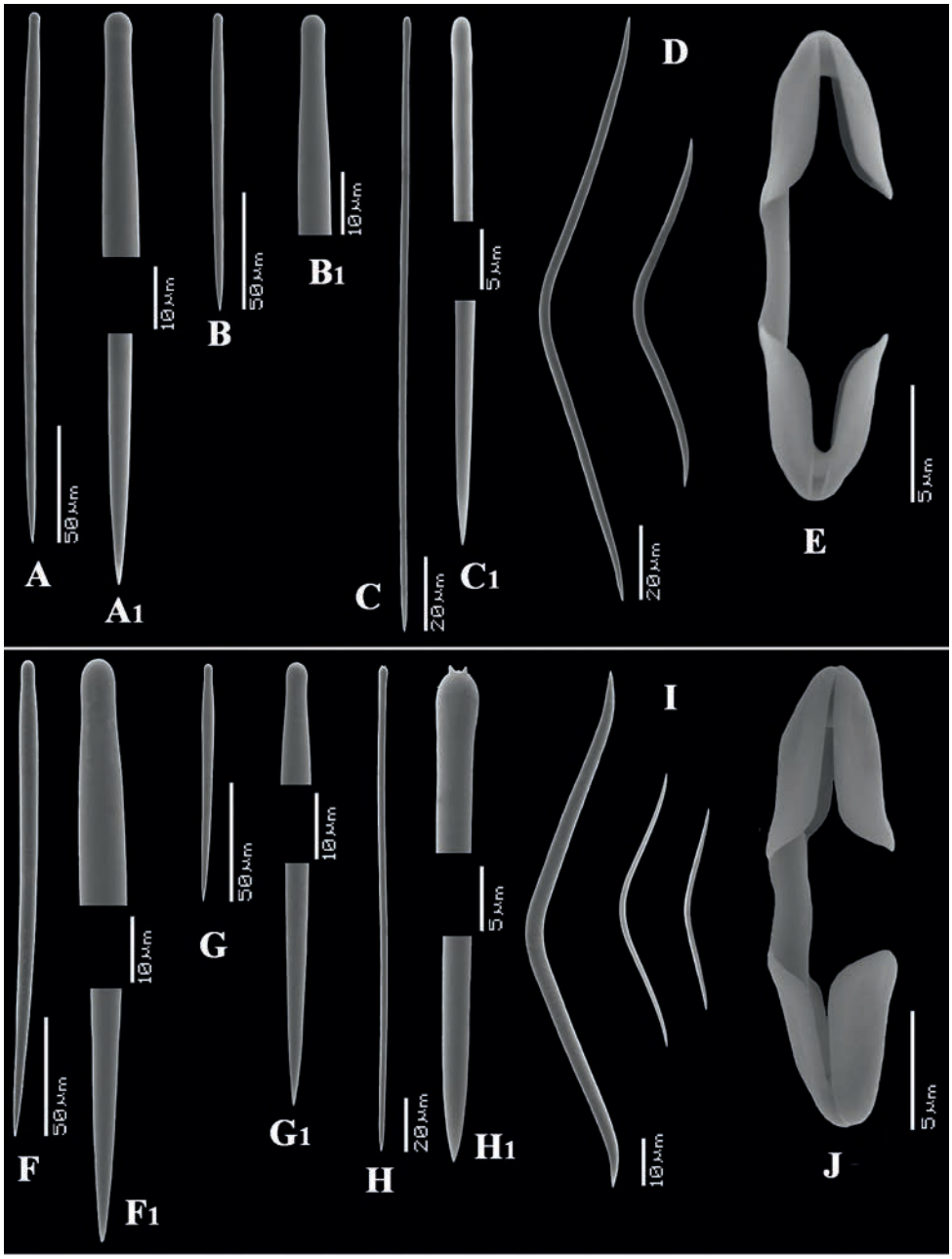


Fig. 21. A-F, *Clathria (Microciona) calloides* spec. nov., holotype (ZMA Por. 07119), SEM images of spicules, A-A1, structural style and detail of head and pointed end, B-B1, echinating style and detail of head, C-C1, ectosomal subtylostyle and detail of head and pointed end, D, toxas, E, palmate isochela, F-J, *Clathria (Microciona) calla* (De Laubenfels, 1934), specimen from Florida (ZMA Por. 03817), SEM images of the spicules, F-F1, structural style and detail of head and pointed end, G-G1, echinating style and detail of head, H-H1, ectosomal subtylostyle and detail of head and pointed end, I, toxas, J, palmate isochela.

Description.— Thickly encrusting on dead corals (figs 20A-B), colour red, yellow-orange, orange. Size 0.5-3 cm in lateral expansion, thickness up to 3 mm. Surface hispid, clathrous. No discernible oscules. Consistency fibrous.

Skeleton.— Rectangular spongin reticulation (fig. 20C) with ascending fibers 30-60 μm in diameter, cored by up to 4 spicules per cross section, connected by thinner uncored fibers. Meshes 150-200 μm in diameter. Fibers sparingly echinated. Ectosomal skeleton consisting of loosely arranged subtylostyles surrounding protruding choanosomal styles.

Spicules.— (figs 21A-E) Subtylostyles, styles, echinating styles, toxas, palmate isochelae.

Subtylostyles (fig. 21C), thin, straight, with elongate smooth heads, 219-*242.4*-264 × 1.5-*2.1*-2.5 μm.

Styles (fig. 21A), fusiform, with narrower heads, smooth, 108-*148.7*-201 × 5-*7.0*-10 μm.

Echinating styles (fig. 21B), similar to the coring styles, but smaller, 66-*72.1*-84 × 5-*5.6*-7 μm.

Toxas (fig. 21D), wing-shaped, thin, with shallow curvature, in a large size range, possibly divisible in a smaller (18-78) and a larger (117-159) category, overall length 18-*84.9*-159 μm.

Palmate isochelae (fig. 21E), typical shaped, 18-*21.2*-22 μm.

Etymology.— The name reflects the similarity in shape, skeleton and spiculation with the West Atlantic species *Clathria (Microciona) calla*.

Ecology.— Encrusting on shells and other hard objects, shallow-water down to 12 m.

Distribution.— Cape Verde Islands, Ascension Island.

Remarks.— Although *Clathria (Microciona) calla* (De Laubenfels, 1934 as *Axociella*) is reported so far only from Central West Atlantic localities, the present material cannot be easily separated from it on morphological grounds. Shapes and detailed measurements of all spicules are so similar (compare figs 21A-E with the comparable spicule images of the Florida specimen in figs 21F-J) that only minor differences are available to distinguish the East Atlantic from the West Atlantic populations: Caribbean subtylostyles are normally microspined, whereas this is absent or rare in West African specimens. Caribbean toxas are on the average shorter and the largest may be distinctly thicker compared to those of West African specimens. It remains to be seen whether these minor differences, which are also subject to considerable variation, will be found to be consistent. However, in view of the ocean depths separating the two populations, specific difference is likely.

Clathria (Microciona) cancapseptima **spec. nov.**

(figs 22A-I)

Clathria cleistochela; Van Soest, 1993b: 210 (Table 2, in part) (not: Topsent, 1925: 650, fig. 9).

Material.— Holotype (ZMA Por. 07533), Cape Verde Islands, NE of São Vicente, Baia das Gatas, 16.9°N 24.9°W, 60 m, bottom calcareous nodules, rectangular dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 164/02, 6.ix.1986; paratype (ZMA Por. 07333), Cape Verde Islands, SW of Maio, Ponta Inglez/Ponta Preta, 15.1167°N 23.2333°W, 16 m, bottom calcareous nodules, rectangular dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 59/22, 26.viii.1986; paratype (ZMA Por. 07336), Cape Verde Islands, SW of Maio, Ponta Inglez/Ponta Preta, 15.1167°N 23.2333°W, 16 m, bottom calcareous nodules, rectangular

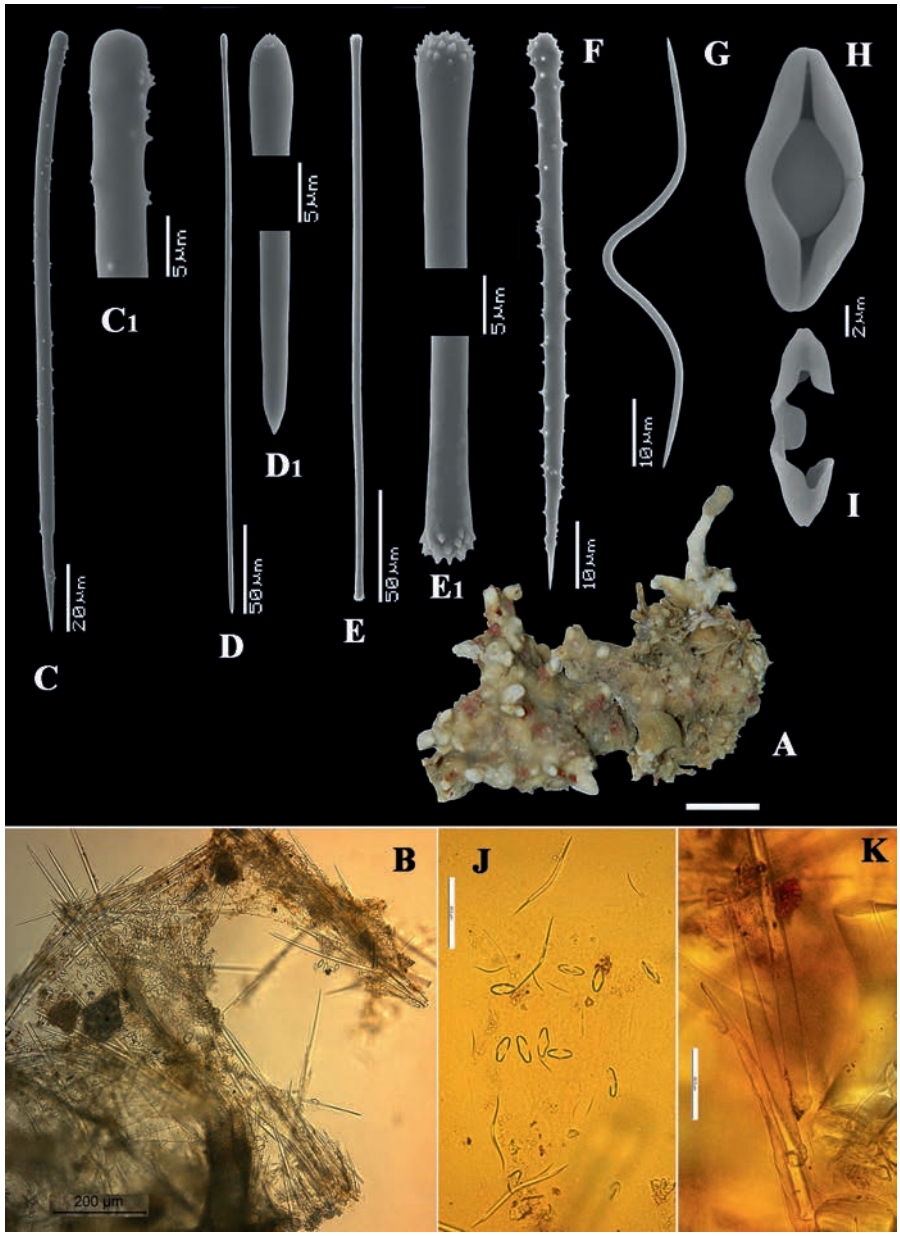


Fig. 22. A-I, *Clathria (Microciona) cancapseptima* spec. nov., holotype (ZMA Por. 07533) from the Cape Verde Islands, A, habitus encrusting calcareous module (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C-I, SEM figures of spicules, C-C1, structural style and detail of head, D-D1, 'normal' subtylostyle and detail of head and pointed end, E-E1, quasitylote and details of endings, F, echinating acanthostyle, G, tox, H, cleistochela, I, palmate isochelae with incipient ridge on shaft, J-K, holotype (MNHN LBIM D.T. 329), *Clathria (Microciona) cleistochel*a Topsent, 1925 from Naples, J, overview of microscleres including cleistochelae and two size categories of wings-shaped shallow-curved toxas (scale bar = 50 µm), K, echinating acanthostyles (scale bar = 50 µm).

dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 59/25, 26.viii.1986; paratype (ZMA Por. 07337), Cape Verde Islands, SW of Maio, Ponta Inglez/Ponta Preta, 15.1167°N 23.2333°W, 16 m, bottom calcareous nodules, rectangular dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 59/26, 26.viii.1986; paratype (ZMA Por. 07341), Cape Verde Islands, SW of Maio, Ponta Inglez/Ponta Preta, 15.1167°N 23.2333°W, 16 m, bottom calcareous nodules, rectangular dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 59/30, 26.viii.1986; paratype (ZMA Por. 07348a), Cape Verde Islands, W of Boa Vista, WSW of Ilheu Calheta do Velho, 16.1833°N 22.9833°W, 40 m, bottom fine yellow sand, van Veen grab, R.W.M. van Soest, CANCAP 7 Expedition stat. 68/01D, 27.viii.1986; paratype (ZMA Por. 07400), Cape Verde Islands, W of Sal, off Palmeira, 16.75°N 23.0°W, 70 m, bottom calcareous nodules, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Expedition stat. 107/02, 30.viii.1986; paratype (ZMA Por. 07491), Cape Verde Islands, S of Branco, 16.6667°N 24.7°W, 64 m, bottom calcareous nodules, rectangular dredge, R.W.M. van Soest, CANCAP 7 Expedition stat. 146/01, 4.ix.1986; paratype (ZMA Por. 21287), Cape Verde Islands, CANCAP 6 Expedition, no further data.

Examined for comparison.— Holotype slide (MNHN LBIM D.T.329), *Clathria cleistochela* Topsent, 1920, Naples, '7', one slide.

Description.— Encrusting sponge (fig. 22A) with colours varying from yellow to orange to red, thickness up to 2 mm, lateral size of holotype 4 × 2 cm, overall measurements 1-6 cm, depending on size of substratum, which are mostly coralline algae, shells, calcareous nodules, and dead bryozoans. Consistency soft.

Skeleton.— Hymedesmioid or microcionid (fig. 22B), with choanosomal styles singly or in groups erect on the substratum surrounded by echinating acanthostyles. At the surface longer 'typical' subtylostyles are perpendicularly arranged around the protruding points of the choanosomal styles, whereas a shorter derived category of quasitylote subtylostyles are more tangentially arranged.

Spicules.— (figs 22C-I) Subtylostyles, quasitylotes, choanosomal styles, acanthostyles, toxas, palmate isochelae.

Subtylostyles (figs 22D), straight with smooth or microspined tyles, and gradually and sharply pointed or mucronate ends, 243-*363.5*-516 × 2-*4.7*-8 μm

Quasitylotes (fig. 22E), curved, with elongate, unequal, smooth or microspined tyles, 238-*288.6*-345 × 2.5-*3.8*-5 μm.

Styles (fig. 22C), spined or warty at the head, lightly spined on the shaft, with large parts near the pointed end smooth, 186-*369.7*-564 × 7-*12.6*-19 μm.

Echinating acanthostyles (fig. 22F), similar to the choanosomal styles but shorter and more heavily spined, 75-*113.0*-168 × 4-*6.9*-11 μm.

Toxas (fig. 22G), wing-shaped, with deeply arched middle part and upturned endings, in a large size range but not divisible in size categories, 30-*108.6*-294 μm.

Palmate isochelae of two types, approximately equal in number, (1, fig. 22I)) typical shaped, slightly smaller, but in SEM an expanded ridge is visible ('ctenichelate' condition), 13-*15.8*-19 μm, and (2, fig. 22H) cleistochelate, slightly larger, 16-*21.3*-27 μm.

Etymology.— The name literally means 'seventh CANCAP', referring to the CANCAP 7 Expedition 1986, which yielded all but one of the above-cited specimens.

Ecology.— Encrusting dead shells and calcareous nodules at 16-70 m.

Distribution.— Cape Verde Islands, spread over the islands of Maio, Boa Vista, Sal, Branco and São Vicente.

Remarks.— The quasitylotes are obviously derived from ectosomal subtylostyles. They usually have microspines on the larger of the two tyles, but frequently both ends have spines. They are on average distinctly shorter than the 'typical' subtylostyles, but

overlap. The new species is assigned to the subgenus *Microciona* and not to the subgenus *Thalysias*, despite the occurrence of two categories of ectosomal spicules, because *Thalysias* has the smaller category erected as bouquets or a palisade. This is not the case in the arrangement of the quasitylotes. Although microcionid sponges are defined to have predominantly ectosomal subtylostyles, several other species of *Clathria* have been described with ectosomal quasitylotes or anisotylotes (e.g. *Clathria (Clathria) chelifera* (Hentschel, 1912) and *Clathria (Thalysias) basilana* Lévi, 1961). More unusual is the combination of the two and also the fact that they are differentiated in their position in the skeleton (forming a sheath around the choanosomal styles vs. arranged tangentially). Indonesian *C. (Thalysias) major* Hentschel, 1912 was redescribed by Hooper (1996) as possessing also this feature of differentiated (sub-)ectosomal subtylostyles and tylotes. All the mentioned species were assigned to *Clathria* by Hooper (1996), and not to e.g. *Megaciella*, which is a member of the family Acarnidae, defined as having microspined tylotes as ectosomal spicules. If such species indeed fall within the variation of *Clathria*, then perhaps Caribbean *Megaciella incrustans* Van Soest, 2009 should be transferred to *Clathria (Microciona)*.

Several other encrusting *Clathria* species of the Mediterranean-Atlantic region possess cleistochelae, the best known of which is Mediterranean *C. (Microciona) cleistochela* Topsent, 1925 (see also Lévi, 1960a: 70, fig. 14), reported also from the Azores [Boury-Esnault & Lopes (1985:193, fig. 42)] and the Canary Islands (Cruz, 2002). We examined a slide from the type of *C. cleistochela* from Naples, containing tissue fragments, showing that the species has a hymedesmioid structure with structural styles and acanthostyles erect on the spongin plate at the base. Spicules are subtylostyles with microspined heads, 204-339 × 2.5-4 μm, smooth styles with spined-rugose heads, 172-618 × 12-22 μm, rare entirely spined acanthostyles (fig. 22K), 54-141 × 5.5-10 μm, wing-shaped toxas (fig. 22J) appearing in two non-overlapping size categories, thin short ones, 12-52 μm, thicker ones with shallow curvature, 63-96 × 3 μm, and a single category of cleistochelae (fig. 22J), 13-19 μm. *C. cleistochela* differs from the present new species in the absence of quasitylotes, the shorter and thinner subtylostyles, the smaller toxas which are divisible in two categories, the absence of typical shaped chelae, and the smaller size of the cleistochelae. Data on *C. (M.) cleistochela* differ between the various records, possibly indicating specific distinctness: the type does not have two types of chelae, nor does the Azorean record of Boury-Esnault & Lopez (1985), but Lévi (1960) distinguishes larger normal chelae and smaller cleistochelae in a specimen from Banyuls, as did Cruz (2002) from La Palma. Boury-Esnault & Lopes (1985) distinguished the two size categories of toxas (30 and 75 μm), but this was not described by other authors. There are also differences in spination of the structural styles in the recorded specimens, rugose-spined in the type, smooth in the other specimens. All specimens of *C. (M.) cleistochela* have the toxas more shallow-curved and the apices are barely upturned.

Further cleistochelate species are Mediterranean *C. (Microciona) tunisiae* Hooper, 1996 (= *chelifera* sensu Lévi, 1960a), Mediterranean *Clathria (Microciona) toxirecta* (Sarà & Siribelli, 1960 as *Microciona*), boreal Atlantic *C. (Microciona) elliptichela* Alander, 1942, and *C. (M.) bicleistochelifera* spec. nov. (see above). None of these have quasitylote ectosomal spicules. *C. (M.) elliptichela* like our new species has normal-looking chelae next to the cleistochelae, whereas *C. (M.) tunisiae* and *C. (M.) toxirecta* only have cleistochelae. Possibly, *C. (M.) cleistochela* and *C. (M.) tunisiae* are part of a single variable species,

which differs collectively from our new species in the lack of quasitylotes, smaller cleistochelae, and shorter shallow-curved toxas. *C. (M.) toxirecta* apparently has toxa-like spicules without a median curve. *C. (M.) elliptichela* has the toxas deeply curved like our new species, but it has additionally a small thicker category of toxas. Its subtylostyles and styles are clearly longer than those of the new species and the other two species. *C. (M.) bicleistochelifera* spec. nov. has the cleistochelae in two distinct size categories and it lacks toxas and echinating acanthostyles.

On the opposite side of the Atlantic, there is another species possessing cleistochelae, *Clathria (Microciona) echinata* (Alcolado, 1984 as *Axociella*), with junior synonym *Clathria (Microciona) simpsoni* Van Soest, 1984. This differs clearly in lacking echinating acanthostyles and having differentiated short toxas and long toxiform oxeotes. In contrast to our new species the cleistochelae are here larger than the typical isochelae.

Clathria (Microciona) capverdensis **spec. nov**.
(figs 23A-H)

Material examined.— Holotype (ZMA Por. 07380), Cape Verde Islands, W of Boa Vista, W of Ilheu de Sal Rei, 16.1833°N 23.0°W, 70 m, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Exped. stat. 081/07, 28.viii.1986; paratype (RMNH Por. 8120), Cape Verde Islands, W of Boa Vista, W of Ilheu de Sal Rei, 16.1833°N 23.0°W, 70 m, 1.2 m Agassiz trawl, J. van der Land, CANCAP 7 Exped. stat. 081, 28.viii.1986.

Description.— Hispid-hairy, bright orange cushion (fig. 23A) on a dead solitary coral, size 1.5 × 0.5 × 0.5 cm. No apparent oscules. Consistency compressible, fibrous.

Skeleton.— A reticulation (fig. 23B) of spongin-encased spicule bundles, with smooth coring styles and echinated by acanthostyles. Ectosomal subtylostyles scattered near the surface.

Spicules.— (figs 23C-H) Subtylostyles, coring styles, echinating acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 23D), thin, relatively short, heads barely developed, microspined, with sharply pointed ends or strongylote modifications, 177-*229.6*-285 × 1.5-*2.4*-3 μm.

Styles (fig. 23C), long, thick, straight or slightly curved, with sparingly spined or occasionally smooth heads, 255-*351.4*-624 × 8-*13.4*-18 μm.

Acanthostyles (fig. 23E), relatively robust, spined entirely and densely with hook-like spines, 78-*99.4*-147 × 6-*8.4*-12 μm.

Toxas (fig. 23F), accolada-type, curved or straight, long and thin, with small median curve, 120-*215.5*-301 μm.

Palmate isochelae, in two distinct size categories, both typical shaped, larger (fig. 23G) 13-*14.8*-17 μm, smaller (fig. 23H) 4.5-*5.6*-7 μm.

Etymology.— The name refers to the type locality, the Cape Verde Islands.

Ecology.— On hard bottom with corals, at lower depth (70 m).

Distribution.— So far known only from the type locality, near Ilheu de Sal Rei, Cape Verde Islands.

Remarks.— The new species is characterized by the occurrence of two sizes of typical palmate isochelae, which has not been reported in Northeast Atlantic *Clathria* so far (except perhaps the above described *C. (M.) bicleistochelifera* spec. nov. but there the chelae include cleistochelae). The combination with long thin toxas with small median curvature is unique in the region. It is similar in spiculation to the Mediterranean *Clathria*

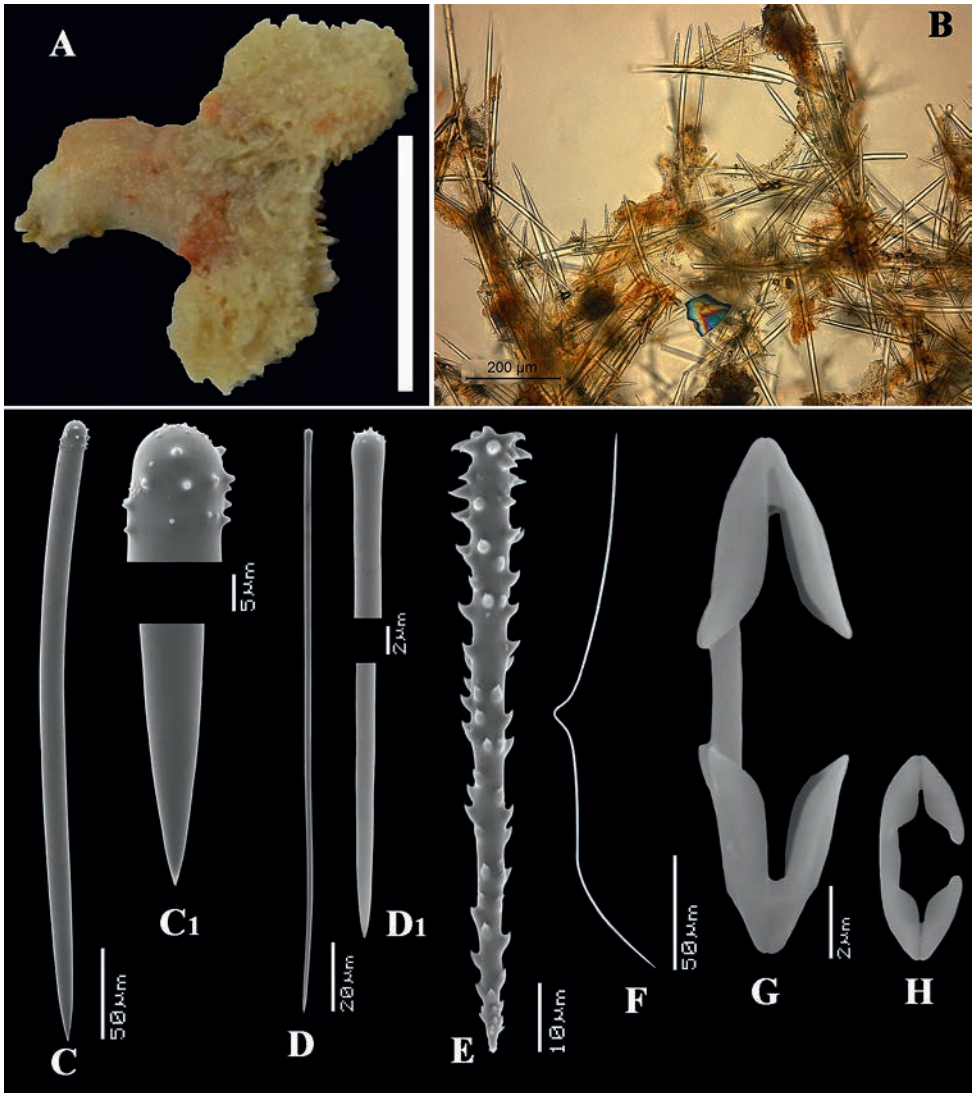


Fig. 23. *Clathria (Microciona) capverdensis* spec. nov., A, holotype (ZMA Por. 07380) from the Cape Verde Islands (scale bar = 1 cm), B, cross section of peripheral skeleton (scale bar = 200 µm), C-H, SEM images of the spicules, C-C1, structural style and detail of head and pointed end, D-D1, ectosomal subtylostyle and detail of head and pointed end, E, echinating acanthostyle, F, accolada tox, G, larger category of palmate isochela, H, smaller category of palmate isochela.

(Microciona) poecilosclera (Sarà & Siribelli, 1960 as *Microciona*), which has two size categories of chelae, and comparable megascleres. However, the toxas of this species are deeply curved and have spines on the ends, which is a clear and definite difference. Mediterranean *Clathria (Microciona) gradalis* Topsent (1925) (see also Lévi, 1960a: 75), shares the large size of the structural styles (up to 700 × 20 µm), strongly spined echinating acanthostyles,

thin toxas and relatively small isochelae (11-14 in the type). However, the isochelae of that species occur in a single size category. Also, the ectosomal subtylostyles are larger in *C. (M.) gradalis* and the toxas have a deep curvature, not accolada shaped. A species with very small palmate isochelae is the Mediterranean *C. (M.) assimilis* Topsent (1925), with sizes down to 5 μm according to Lévi (1960: 76). That species has thicker toxas with spined apices and the principal styles are shorter in length. The possibility that *C. (M.) poecilosclera* is conspecific with *C. (M.) assimilis* cannot be excluded.

Across the Atlantic, two chelae size categories occur in the Caribbean species *Clathria (Thalysias) curacaoenis* Arndt, 1927 (= *schoenus* De Laubenfels, 1936), but that species has two sizes of subtylostyles and toxas (Van Soest, 1984: 112 as *Rhaphidophlus schoenus*).

N.B. The name *C. (T.) schoenus* (De Laubenfels, 1936 as *Aulospongus*) is a junior synonym of *Clathria copiosa* var. *curacaoensis* Arndt, 1927. Van Soest (1984: 112) erroneously concluded that the varietal status of Arndt's name precluded its use as a valid senior synonym. According to ICZN Art. 45.6.4, Arndt's variety is to be treated as a name of subspecific rank, and thus it is subject to the Principle of Priority. The history of its use also prevents suppression of the name as an unused name, so the name for that common Caribbean species is *Clathria (Thalysias) curacaoensis* Arndt, 1927 with *C. (T.) schoenus* as a junior synonym.

Clathria (Microciona) conchicola **spec. nov.**
(figs 24A-H)

Clathria spec.; Van Soest, 1993a: 103, Table 1.

Material.— Holotype (ZMA Por. 06590), Mauritania, off Banc d'Arguin, 18.8333°N 16.3333°W, 20 m, coarse yellow sand with shell gravel, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 013/01, 8.vi.1988; paratype (ZMA Por. 06591), Mauritania, 18.8333°N 16.3333°W, 20 m, coarse yellow sand with shell gravel, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 013/02, 8.vi.1988; paratypes (ZMA Por. 06594), Mauritania, off Banc d'Arguin, 18.8333°N 16.3167°W, 20 m, sandy with diverse bottom fauna, 1.2 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 017/02, 8.vi.1988; paratype (ZMA Por. 06750), Mauritania, 20.0°N 17.15°W, 20 m, hard bottom with some muddy sand, gorgonians, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 063/14, 13.vi.1988; paratype (ZMA Por. 06814), Mauritania, 19.7167°N 16.9833°W, 61-78 m, bottom sticky grey mud with shell gravel, spidercrabs and gastropods, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 101/01, 16.vi.1988; (ZMA Por. 06825), Mauritania, off Banc d'Arguin, 20.5167°N 17.0833°W, 22 m, bottom shell gravel with diverse fauna, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 110/03, 18.vi.1988; paratype (ZMA Por. 06827), Mauritania, off Banc d'Arguin, 20.5167°N 17.1667°W, 29 m, 2.4 m Agassiz trawl, coarse sand and shell gravel, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 112/02, 18.vi.1988; paratypes (ZMA Por. 06828), Mauritania, off Banc d'Arguin, 20.4833°N 17.2333°W, 36 m, 2.4 m Agassiz trawl, bottom shell gravel with calcareous tubes, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 114/01, 18.vi.1988; paratype (ZMA Por. 06835), Mauritania, off Banc d'Arguin, 20.4167°N 17.1°W, 17 m, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 119/03, 19.vi.1988; paratype (ZMA Por. 06864), Mauritania, off Cap Blanc, 20.7°N 17.4167°W, 63-71 m, diverse bottom fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 139/03, 21.vi.1988.

Examined for comparison.— Holotype slides (MNHN LBIM D.T.327), *Clathria toxistricta* Topsent, 1925, Naples, 1920, '62', two slides; holotype slides (MNHN LBIM D.T.325), *Clathria toxitenuis* Topsent, 1925, Naples, 1920, '66', two slides; holotype slide (MNHN LBIM D.T.327, Naples, 1902, '62'', one slide; holotype slide (MNHN LBIM D.T.327) *Clathria toximajor* Topsent, 1925, Naples, 1920, '62', one slide.

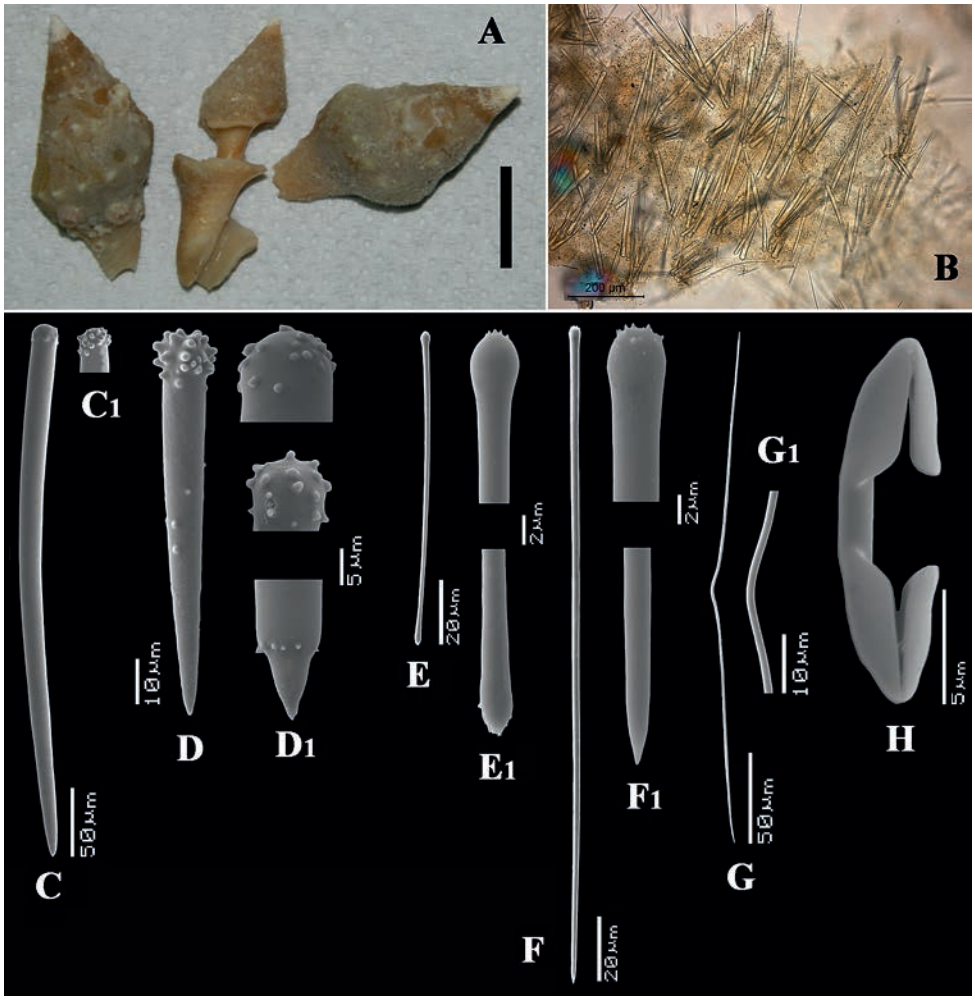


Fig. 24. *Clathria (Microciona) conchicola* spec. nov., A, paratypes (ZMA Por. 06594) from Mauritania encrusting on gastropods (scale bar = 1 cm), B, holotype (ZMA Por. 06590) from Mauritania, cross section of skeleton (scale bar = 200 µm), C-H, SEM images of spicules of the holotype, C-C1, structural style and detail of head, D-D1, echinating acanthostyles and details of variation of ornamentation of the heads, E-E1, quasitylotes and details of endings, F-F1, normal ectosomal subtylostyles and details of head and pointed ending, G-G1, accolada tox and details of central curvature, H, palmate isochela.

Description.— Thin, light beige, orange or pale reddish encrustations, on living or dead gastropods (fig. 24A). Colour apparently dependent of depth: red in shallow samples, beige or greyish below 30 m. Size dependent on substratum, up to 2 cm in lateral expansion, thickness approximately 1 mm. Consistency soft, surface hispid, somewhat bumpy.

Skeleton.— (fig. 24B) Hymedesmioid, with all megascleres erect on the substratum, or microcionid, with basal spongin plate slightly elevated to form low spongin cushions

filled with erect and plumose groups of styles. Structural styles more common than echinating acanthostyles. Larger ectosomal subtylostyles are perpendicularly arranged, flanking the structural styles, while the smaller subtylostyles are arranged at all angles. The surface membrane contains small subtylostyles and microscleres in moderate abundance.

Spicules.— (figs 24C-H) Subtylostyles, quasitylotes, styles, echinating acanthostyles, toxas, isochelae.

Subtylostyles (fig. 24F) and quasitylotes (fig. 24E), with microspined heads, apparently occurring in partially overlapping size categories, the smaller are invariably quasitylotes, which are swollen-mucronate at the pointed ends (99-147 μm), the larger are straight (141-402), overall size of subtylostylote spicules 99-*225.9*-402 × 1-*2.8*-6 μm.

Styles (fig. 24C), straight, fusiform, with warts or spines on the head and the region immediately under it, smooth along the remaining shaft, pointed end sharp, occasionally bluntly rounded, variable in size, 119-*306.7*-495 × 5-14.7-21 μm.

Echinating acanthostyles (fig. 24D), similar in shape to structural styles, but spines also along the shaft, 57-*80.8*-111 × 3.5-*7.2*-13 μm.

Toxas (fig. 24G), accolada-type, long, thin, with a small median curvature, and straight or low-angled legs, 141-*215.6*-321 μm.

Palmate isochelae (fig. 24H), typical shaped, 12-*16.1*-19 μm.

Etymology.— The name is a combination of concha (L.) = shell or snail, and -cola (L.) = dweller or inhabitant, reflecting the preferred substratum of the new species.

Ecology.— On hard objects, almost exclusively gastropod shells, in sandy shelf environment, at depths from 20 to 78 m.

Distribution.— Mauritania.

Remarks.— Of the numerous species with long thin accolada shaped toxas occurring in the Mediterranean-Atlantic region, the Mauritanian specimens described above appear closest to *C. (M.) levii* (Sarà & Siribelli, 1960 as *Microciona*). We were unable to borrow the type material (this has not been traced to any known collection so far), so some doubt over its identity vis à vis our new species remains. Differences appear to be the smaller acanthostyle size in our specimens (the length is about half of those of *C. (M.) levii*) and the quasitylotes, which were not observed by Sarà & Siribelli; presumably these were not present. The toxas of *C. (M.) levii* appear more diverse in shape and size than those of our new species.

There is also considerable similarity with *Clathria (Microciona) toxitenuis* Topsent, 1925 from Naples and its close sister species *C. (C.) toxistricta* and *C. (M.) toximajor*. For comparison, we borrowed slides from MNHN of these species (see above figs 14A-F). The presence of a minority of anisotylote modifications of the ectosomal subtylostyles has been reported previously for *Clathia (Clathria) toxistricta* Topsent, 1925 from Naples and the same was reported in *Clathria (Microciona) toxivaria* (Sarà, 1959) by Pulitzer-Finali (1983: 568). However, these were not clearly differentiated from the normal straight subtylostyles, having the same length and merely being bluntly rounded, rather than swollen at the 'pointed' end as in our new species (see Fig. 14D). The acanthostyles of our material are smaller than those of Topsent's species and the upper size of the structural styles is also consistently higher in Mediterranean specimens. The structural styles of our new species are also different from the three Naples species, ours have warty heads and relatively short and thick shaft, whereas the Naples species have relatively

long and thin styles with only modestly rugose or bumpy heads, not warty. Furthermore, the type slides of *C. (M.) toxitenuis* and *C. (M.) toxistricta* did not contain any palmate isochelae, and these were also not described by Topsent. However, Lévi (1960) mentions rare chelae in material he examined and ascribed to these species. *C. (C.) toxistricta* differs from our new species is having a plumoreticulate skeleton, for which reason it is assigned to the subgenus *Clathria*. *C. (M.) toximajor* differs by having two clearly distinct categories of toxa, the longer are rhaphidiform, the smaller 'triangular', technically probably wing-shaped.

C. (M.) toxitenuis was reported outside the Mediterranean at Roscoff (60 m) by Cabioch (1968, but because he did not supply a description, this record remains uncertain. Cruz (2002) reports occurrence on Tenerife, Canary Islands, but his account and drawings look different from our material, but also from Topsent's Naples specimens (see also below).

C. (M.) conchicola spec. nov. is part of a complex of closely similar species sharing the possession of long thin toxas with a small median curve, accolada toxas in the terminology of Hooper (1996), including apart from the species discussed above several more East Atlantic and Mediterranean species. Topsent (1925) compared *C. (M.) toxitenuis* with *Clathria (Microciona) tenuissima* (Stephens, 1916 as *Eurypon*). This was described from 700 m depth off the coast of Ireland. It shares the long thin toxas with *C. (M.) toxitenuis*, but its styles and subtylostyles considerably exceed those of the latter species (styles up to 1500 μm, subtylostyles up to 700 μm). *Clathria (Microciona) ascendens* Cabioch, 1968 possesses also similar toxas but it has smooth and spined oxeas among the spicule complement. Another close species is the widespread Atlanto-Mediterranean *Clathria (Microciona) strepsitoxa* (Hope, 1889) (see above), but this has two categories of toxas, the smaller of which has a gradual curve, while the larger have a twisted median curve. *Clathria (M.) aurea* spec. nov. described here (see above), has also twisted long thin toxas like *C. (M.) strepsitoxa*, but it lacks a second category of toxas and has bright yellow live colour. Two separate toxa categories also occur in bathyal Irish *Clathria (Microciona) ditoxa* (Stephens, 1916 as *Eurypon*), and *C. (M.) osismica* Cabioch, 1968 from Bretagne on the W coast of France.

Clathria (Microciona) gorgadensis spec. nov.
(figs 25A-J)

? *Tenacia jolicoeuri*; Lévi, 1959: 133, fig. 26

Not: *Rhaphidophlus jolicoeuri* Topsent, 1892: xxv; Topsent, 1925: 658, fig. 14; Lévi, 1960a: 65; Boury-Esnault, 1971: 327; nec: *Clathria (Thalysias) jolicoeuri*; Hooper, 1996: 409

Material examined.— Holotype (ZMA Por. 07156), Cape Verde Islands, São Tiago, S coast near Praia, intertidal to shallow sublittoral, in small bay, 14.9°N 23.5167°W, 0.5-1.5 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K01/21, 22.viii.1986; paratype (ZMA Por. 06961), Cape Verde Islands, São Tiago, Ilheus Rombos, Ilheu Cima, SE coast, 5-15 m, rock platform, 14.95°N 24.65°W, SCUBA diving, R.W.M. van Soest, CANCAP 7 Expedition stat. D03/22, 23.viii.1986; paratype (ZMA Por. 06999b), Cape Verde Islands, Maio, SW coast off Ponta Preta, 15.1167°N 23.3°W, 5-8 m, exposed sandy bottom with large rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/16, 26.viii.1986; paratype (ZMA Por. 07043), Cape Verde Islands, Sal, S coast near Santa Maria, 16.5833°N 22.9167°W, 5-15 m, SCUBA diving, R.W.M. van Soest, CANCAP 7 Expedition stat. D08/14, 29.viii.1986; paratype (ZMA Por.

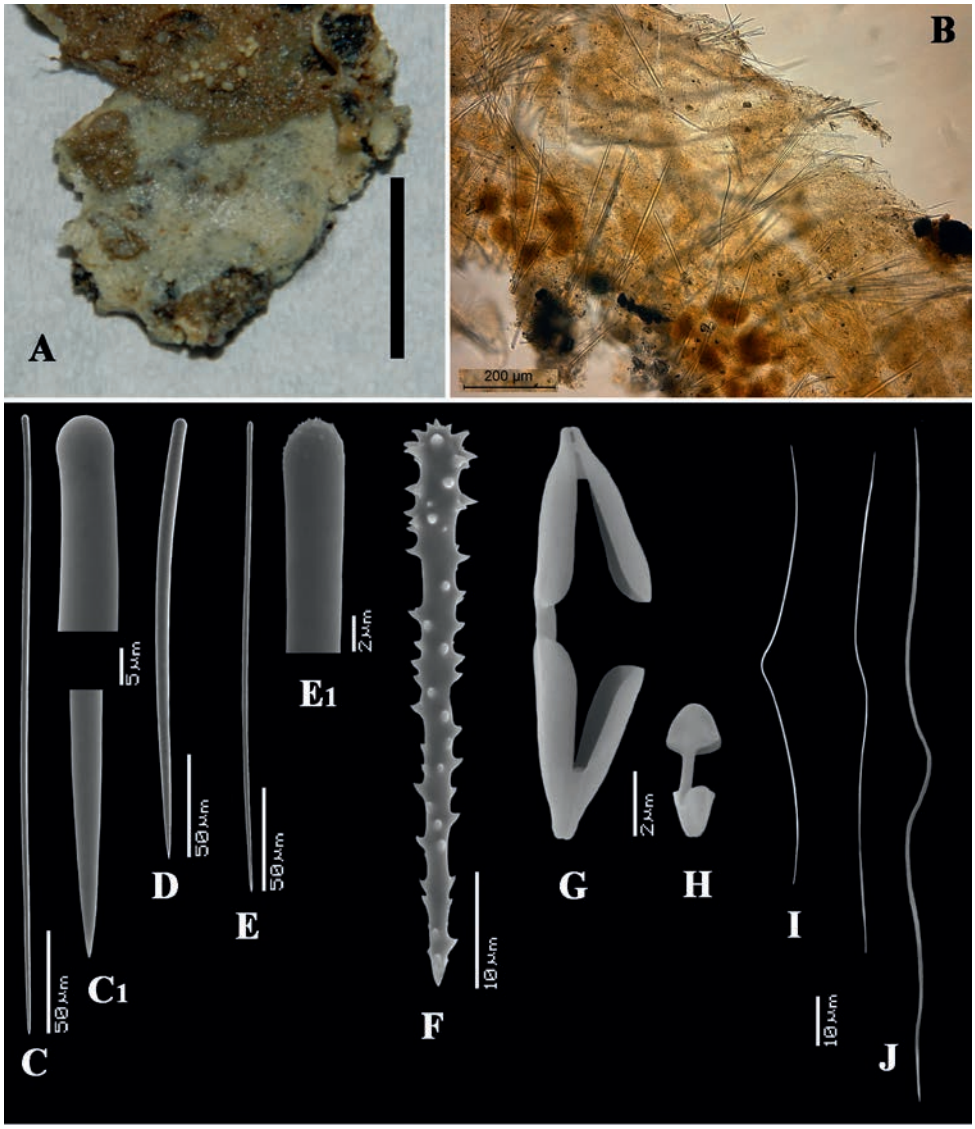


Fig. 25. *Clathria (Microciona) gorgadensis* spec. nov., A, holotype (ZMA Por. 07156), encrusting a stone (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C-J, SEM figures of spicules, C-C1, structural style and detail of head and pointed end, D, smaller structural style, E-E1, ectosomal subtylostyle and detail of head, F, acanthostyle, G, larger typical shaped category of isochelae, H, smaller contorted isochela, I, smaller acccolada-type tox, J, larger rhaphidiform toxa.

07151a), Cape Verde Islands, São Tiago, S coast near Praia, intertidal to shallow sublittoral, in small bay, 14.9°N 23.5167°W, 0.5-1.5 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K01/16A, 22. viii.1986; paratype (ZMA Por. 07160), Cape Verde Islands, São Tiago, S coast near Praia, intertidal to shallow sublittoral, in small bay, 14.9°N 23.5167°W, 0.5-1.5 m, snorkeling, R.W.M. van Soest, CANCAP

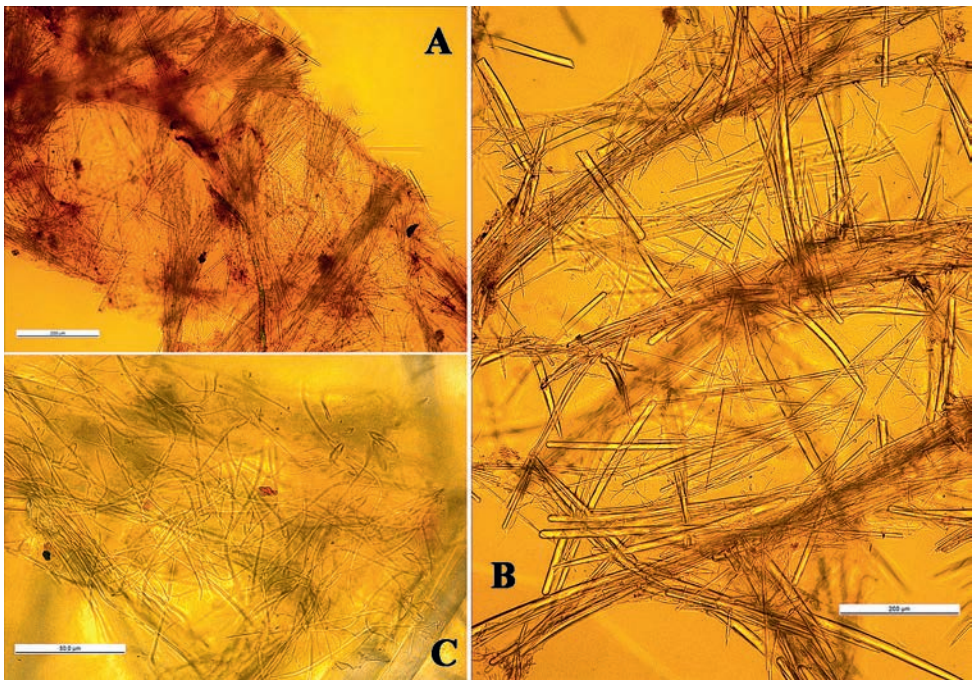


Fig. 26. Holotype slides (MNHN LBIM D.T.323 and 324) of *Rhaphidophlus jolicoeuri* Topsent, 1925 (= *Clathria (Thalysias) jolicoeuri*), from Naples, A, cross section of peripheral skeleton (scale bar = 200 μm), B, cross section of choanosomal skeleton (scale bar = 200 μm), C, overview of toxa diversity (scale bar = 50 μm).

7 Expedition stat. K01/25, 22.viii.1986; paratype (ZMA Por. 07166), Cape Verde Islands, São Tiago, S coast near Praia, intertidal to shallow sublittoral, in small bay, 14.9°N 23.5167°W, 0.5-1.5 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K01/31, 22.viii.1986; paratype (ZMA Por. 07199), Cape Verde Islands, Sal, W coast, Bay of Palmeira, intertidal to shallow sublittoral, sandy bottom with stones, rocks and sabellariid reefs, 16.75°N 23.0°W, 0-4 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K19A/01, 30.viii.1986; paratype (ZMA Por. 07212), Cape Verde Islands, Sal, W coast, Bay of Palmeira, intertidal to shallow sublittoral, sandy bottom with stones, rocks and sabellariid reefs, 16.75°N 23.0°W, 0-4 m, snorkeling, R.W.M. van Soest, CANCAP 7 Expedition stat. K19A/14, 30.viii.1986.
Examined for comparison.— holotype slides (MNHN LBIM D.T.323 ('8') & D.T. 324 ('47') of *Rhaphidophlus jolicoeuri* Topsent, 1925, Naples; (ZMA Por. 07684), *Clathria (Thalysias) jolicoeuri*, Greece, Attiki, Vouliagmeni, coll. R. Ates, 8.vii.1987.

Description.— Yellow, yellow-brown, yellow-green, to orange or red crust on stones (fig. 25A). Lateral expansion 0.5-4 cm, thickness about 1 mm. Suface punctate, optically smooth. Consistency soft.

Skeleton.— (fig. 25B) Basically hymedesmioid with single styles and echinating acanthostyles erect on the basal plate of sponging. Styles may be grouped and then verge towards microcionid condition, but echinating acanthostyles remain most common at the substratum. Ectosomal skeleton formed by bouquets of subtylostyles, which carry a loose tangential crust of smaller subtylostyles. Surface membrane crowded with toxas.

Spicules.— (figs 25C-J) Ectosomal subtylostyles, choanosomal styles, echinating acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 25E), variable in size but relatively long and straight, with microspined heads, 182-*277.1*-345 × 2-*3.4*-4.5 μm.

Styles (figs 25C-D), entirely smooth, with narrow smooth heads, pointed end variably sharply pointed or bluntly rounded, 165-*305.3*-384 × 7-*11.4*-15 μm.

Acanthostyles (fig. 25F), relatively thin, entirely spined, 48-*75.1*-130 × 3-*4.4*-7 μm.

Toxas (figs 25I-J), thin, variable in length and curvature, the smaller accolada-type more deeply curved and regular, the larger raphidiform-type irregular with shallow narrower curvature or overall sinuous, not separable in distinct categories, 80-*166.3*-285 μm.

Palmate isochelae, in two distinct categories, the larger (fig. 25G) typical-shaped, 10-*12.3*-14 μm, the smaller contorted (fig. 25H), 4-6 μm.

Etymology.— The name refers to the mythological Gorgades, an island group mentioned a.o. in the Historia naturalis by Pliny the Elder (died A.D. 79), presumed to be the eldest name for the Cape Verde Archipelago (http://en.wikipedia.org/wiki/History_of_Cape_Verde).

Ecology.— Intertidal to shallow sublittoral, down to 15 m, encrusting stones.

Distribution.— Cape Verde Islands; possibly São Tomé.

Remarks.— *C. (M.) capverdensis* spec. nov. described above has the spiculation rather similar to the present new species: two size categories of chelae, fully spined thin acanthostyles, and long thin toxiform spicules. There are nevertheless compelling differences: the present species is an optically smooth thin crust with hymedesmioid skeleton, whereas *C. (M.) capverdensis* spec. nov. is thicker and hispid-hairy with clathriid skeleton. The structural styles differ clearly in having warty heads (*capverdensis* spec. nov.) versus smooth (present species). The smallest category of chelae is 'normal' (*capverdensis* spec. nov.) vs. contorted (present species). Finally, the toxiform spicules are uniformly accolada toxas (*capverdensis* spec. nov.) vs. variable including long thin sinuous raphidiform toxas (present species).

This species might possibly belong to the subgenus *Thalysias*, as the structure of the ectosomal skeleton consists of larger subtylostyles carrying smaller subtylostyles fanning out and becoming partially tangential. However, a large size range of subtylostyles is not unusual in proper *Clathria (Microciona)* species (see above), and since there is no continuous arrangement of bouquets of smaller subtylostyles at the surface (see Fig. 25B), we prefer to assign the species to *C. (Microciona)*.

The specimens were at first assigned to *Clathria (Thalysias) jolicoeuri* (Topsent, 1892 as *Rhaphidophlus*) because it seemed to match with the type, with a ZMA specimen (ZMA Por. 07684) from Greece, and with the descriptions of Lévi (1960a) and Boury-Esnault (1971). When the smaller twisted chelae were detected under SEM, which were overlooked in light microscopy, a close comparison was made with slides of specimens of *Rhaphidophlus jolicoeuri*, MNHN D.T.323 and 324 (figs 26A-C), from Naples (reported by Topsent, 1925) to check this preliminary identification. The subtylostyles of this species differ from our new species by being clearly in two size categories as is proper for the subgenus *Thalysias*. They are arranged in bundles formed by longer subtylostyles with predominantly smooth heads, 305-*356.2*-424 × 4.5-*5.7*-7.5 μm carrying bouquets of smaller subtylostyles with microspined heads, 108-*145.5*-188 × 1.5-*2.4*-3 μm. The structural styles are arranged in a plumoreticulation of spongin-encased bundles with regu-

lar cross connections, in contrast to our new species; the styles are smooth, with elongated heads, 244-*335.9*-394 × 13-*16.9*-21 μm. Acanthostyles are distinctly smaller, 55-*63.9*-71 × 5-*6.1*-8 μm. Toxas differ in having a regular wing-shaped smaller category with upturned apices, varying in length from very tiny, as small as 4 μm in length to approximately 90 μm, next to raphidiform longer ones, 102-205 μm in length. Typical shaped palmate isochelae occur in two size categories, longer 13-18 μm and smaller 6-8 μm, which are in contrast to our new species, not twisted. These smaller isochelae were not previously recorded by either Topsent or subsequent authors, probably because they are difficult to observe in light microscopy. It is possible that Lévi's (1959) record of *Tenacia jolicoeuri* belongs to our new species, but this needs to be verified as he provided for the palmate isochelae only 12 μm as average size.

The toxa shapes in the present new species also remind of those of the Naples species *Clathria (Microciona) toxistyla* (Sarà, 1959), but that species lacks chelae and has a special category of thick toxas in addition to the thin variable ones. *Clathria (Microciona) toxivaria* (Sarà, 1959) likewise has variable toxas like our new species, but chelae are of uniform size, and do not include small twisted ones.

On the other side of the Atlantic, *Clathria (Thalysias) curacaoensis* (Arndt, 1927) (senior synonym of *Clathria (Thalysias) schoenus* (De Laubenfels, 1936), has similar spiculation as our new species, smooth styles, small echinating acanthostyles, thin shallow-curved toxas and larger normal and smaller contorted isochelae. Differences are the shape of the echinating acanthostyles with a characteristic smooth area between the head and the heavily spined lower shaft and the more distinct differentiation in small subtylostyles of the surface bouquets and large subtylostyles carrying these in *C. (T.) curacaoensis*. Nevertheless, the two seem closely related.

Clathria (Microciona) spinarcus (Carter & Hope, 1889)
(figs 27A-G)

Microciona spinarcus Carter & Hope, 1889: Topsent, 1892: 113; Lévi, 1960a: 76, fig. 18; Maldonado, 1992: 1152.

Clathria (Microciona) spinarcus; Cruz, 2002: 178; Van Soest et al. 2000: http://species-identification.org/species.php?species_group=sponges&id=172&menuentry=soorten (with further synonyms)

Material.— (ZMA Por. 07409), W of Sal, off Palmeira, 16.7667°N 23.0333°W, 85-97 m, hard bottom with calcareous nodules, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Expedition stat. 111/06, 31.viii.1986.

Examined for comparison.— (ZMA Por. 05948), Ireland, Sherkin Island, Truhane Point, 51.477°N 9.434°W, 9 m, M. Reichert #48-83, 2.viii.1982.

Description.— Thickly encrusting on barnacles (fig. 27A), colour orange-red. Surface with faint venal pattern (preserved condition), compact and smooth, microhispid. Size 1.5 × 1.5 cm, thickness 2 mm.

Skeleton.— Microcionid (fig. 27B), with small groups or single styles surrounded and echinated by acanthostyles, and sheathed in bundles of subtylostyles. At the surface, subtylostyles form a loose tangential crust.

Spicules.— (figs 27C-G) Ectosomal subtylostyles, structural (acantho-)styles, echinating acanthostyles, toxas, palmate isochelae.

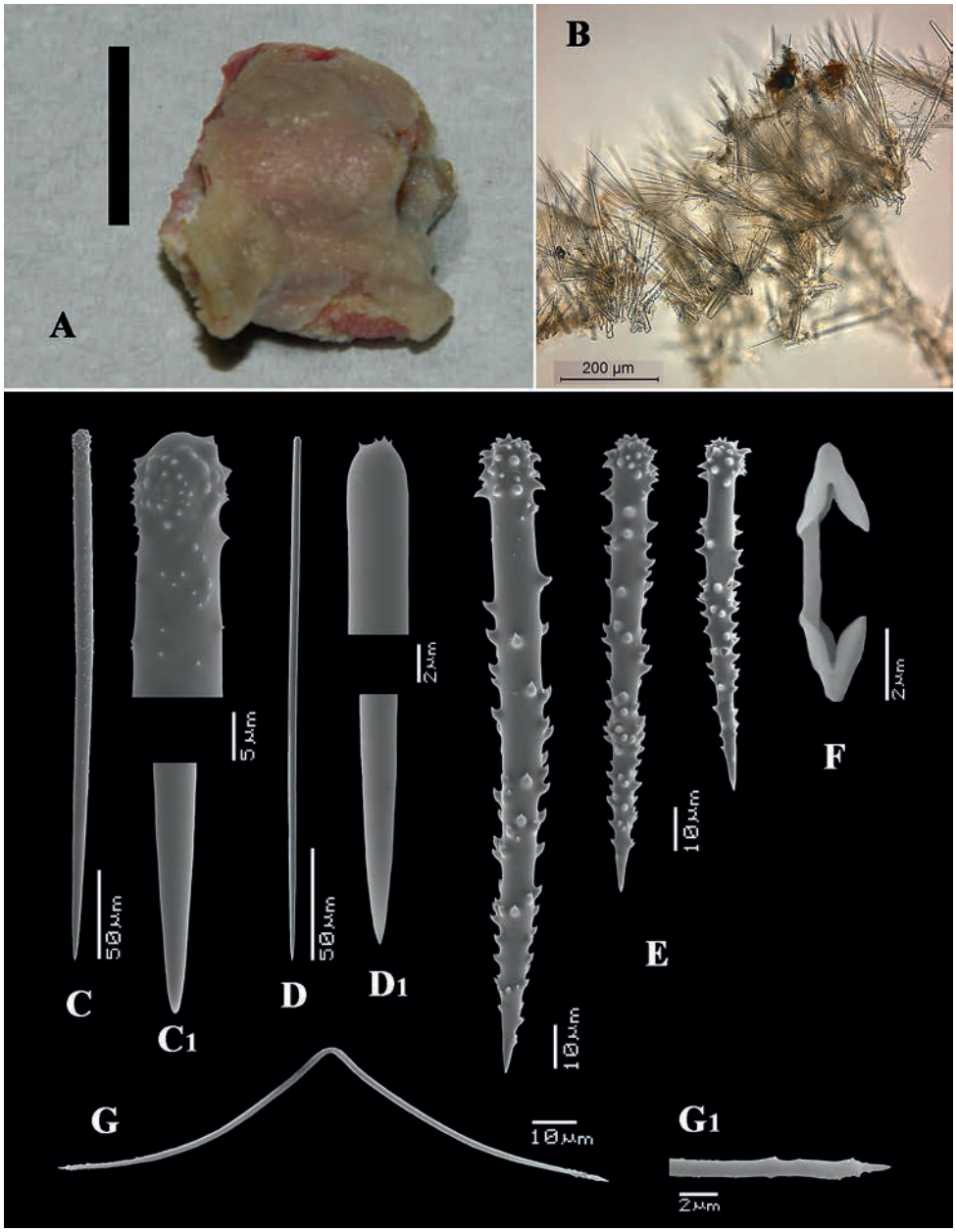


Fig. 27. *Clathria (Microciona) spinarcus* (Carter & Hope, 1889), Cape Verde Islands specimen (ZMA Por. 07409), A, habit (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C-G, SEM images of spicules, C-C1, structural style and detail of head and pointed end, D-D1, ectosomal subtylostyle and detail of head and pointed end, E, various sizes and shapes of echinating acanthostyles, F, palmate isochela, G-G1, wing-shaped tox and detail of spined ending.

Subtylostyles (fig. 27D), straight, faintly fusiform (thickest in the middle), with elongate, barely swollen, microspined, occasionally smooth. heads, 153-*237.6*-300 × 2.5-*3.6*-4.5 μm.

Styles (fig. 27C), robust, straight, lightly spined all over, heads not conspicuous, 237-*319.8*-367 × 12-*13.7*-16 μm.

Acanthostyles (fig. 27E), straight, heavily spined all over, in a wide size range, the larger with a smaller subterminal smooth area, 77-*120.9*-237 × 6-*8.5*-13 μm.

Toxas (fig. 27G), wing-shaped, deeply sharply curved, with finely spined upturned ends, 69-*111.2*-132 μm.

Palmate isochelae (fig. 27F), not very frequent (only a dozen were found in the slides), small, typical shaped, 9-*11.5*-16 μm.

Ecology.— Deeper water down to 90 m; elsewhere in more shallow locations.

Distribution.— Cape Verde Islands, Azores, Canary Islands; elsewhere English Channel, Northern Island, Brittanny, NW Spain, Western Mediterranean, Namibia.

Remarks.— Our record extends the distribution of this predominantly Northeast Atlantic species southwards to the Cape Verde Islands, but Uriz (1987, 1988) records it from Namibia. The characters of the present material generally match those of Lévi (1960), and also the description of the type. Comparison with a specimen from the Celtic Seas, ZMA Por. 05948, shows strong similarity (see also e.g. Van Soest et al. 2000). However, there are some discrepancies: our specimen has the toxas rather smaller and thinner than the type and the palmate chelae larger. Acanthostyles appear larger than in the type. A difference with Cruz' (2002) record from the Canary Islands is the condition of the structural styles, which are drawn and described as entirely smooth. Lévi (1960) quoted various spicule sizes indicating that this species is apparently variable, but we do not subscribe to the suggestion of Boury-Esnault (1971: 324) and Boury-Esnault & Lopes (1985: 193, fig. 41) that *Clathria (Microciona) assimilis* Topsent, 1925, would fall within the variation of this species. We agree with Maldonado (1992) it is likely that specimens with extremely small isochelae (less than 9 μm) belong to a separate *C. (M.) assimilis*. Combined records demonstrate a very large morphological and geographic range for a single panmictic species, so it is likely a complex of sibling species that should be subjected to phylogeographic analysis.

Subgenus *Axosuberites* Topsent, 1893

Clathria (Axosuberites) papillata spec. nov.

(figs 28A-G)

Material.— Holotype (ZMA Por. 06738), Mauritania, off Banc d'Arguin, 20.0°N 17.15°W, 20 m, hard bottom with some muddy sand, gorgonians, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 63/02, 13.vi.1988.

Description.— Orange-red papillae (fig. 28A) arising from an encrusting base. Surface glistening, may have a shallow lengthwise groove, compact, not hispid, no apparent oscules (preserved condition). Height of papillae 0.5-1 cm, diameter 2-3 mm. Consistency firm.

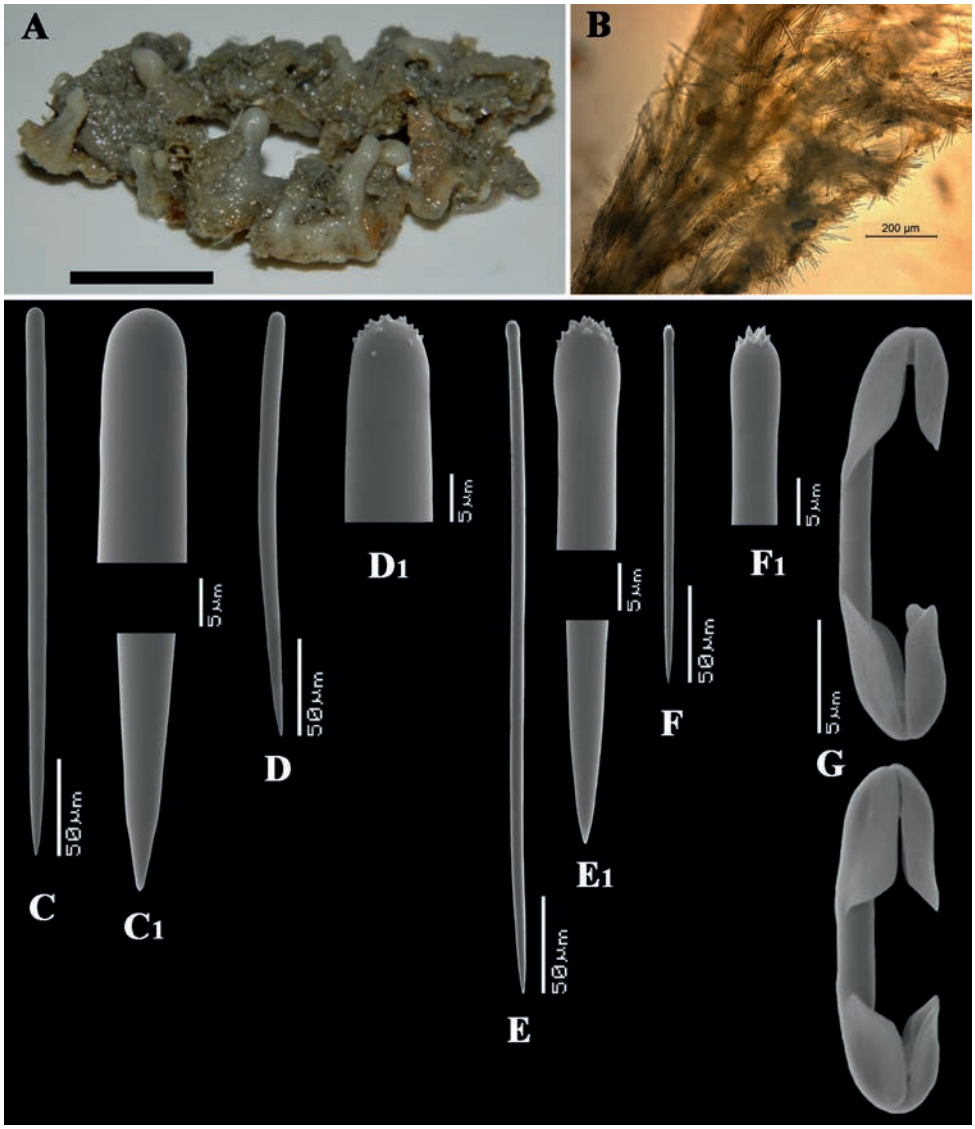


Fig. 28. *Clathria (Axosuberites) papillata* spec. nov., A, holotype (ZMA Por. 06738) from Mauritania (scale bar = 1 cm), B, cross section of skeleton of papilla (scale bar = 200 µm), C-G, SEM images of spicules, C-C1, large smooth style of axial skeleton and detail of head and pointed end, D-D1, smaller microspined style of basis of ectosomal bouquets and detail of head, E-E1, larger subtylostyle, F-F1, smaller subtylostyle, G, palmate isochelae.

Skeleton.— (fig. 28B) Axially condensed, spicules in dense spicate bundles, ending in extra-axial plumose bouquets, fanning out to the surface. Larger stylote forms concentrated in the axial regions and at the base of the extra-axial bouquets, smaller concentrated at the surface

Spicules.— (figs 28C-G) Subtylostyles, styles, and palmate isochelae; no toxas.

Styles and subtylostyles intergrading (figs 28C-F), not absolutely divisible in differentiated categories; there are distinct subtylostylote forms (figs 28E-F) always with swollen microspined heads, in a large size range, divisible in small (ectosomal) subtylostyles (fig. 28F, 123-241 × 2.5-4.5 μm) and large subectosomal subtylostyles (fig. 28E, 246-346 × 5.5-7 μm), and there are distinct stylote forms (Figs 28C-D) with a fusiform or cylindrical shaft and evenly rounded heads that may be smooth (fig. 28C) or microspined (fig. 28D, 201-451 × 7-15 μm. Next to these, there are many non-classifiable stylote forms and overlapping sizes and shapes. Overall megasclere sizes 123-*292.6*-451 × 2.5-*7.4*-15 μm.

Palmate isochelae (fig. 28G), typical shaped, rather elongated, 16-*17.9*-20 μm.

Etymology.— The name refers to the shape of the sponge.

Ecology.— On hard bottoms covered in sediments.

Distribution.— So far known only from the Mauritanian type locality.

Remarks.— No other *Clathria (Axosuberites)* have been reported from Northwest Africa and neighbouring regions, although *Axociella pachyaxia* Lévi, 1960b, described from Senegal and assigned to *Clathria (Thalysias)* by Hooper (1996) is likely a representative of the subgenus. It is rather similar in habit (massively encrusting with lamellate folds) and skeletal structure, but differs from our new species in possessing thin wing-shaped toxas (50-80 μm) and thinner megascleres (only up to 8 μm). Southwards, *C. (A.) benguelaensis* Samaai & Gibbon, 2005 occurs in South African waters; it differs clearly in shape (elaborate erect form) and spiculation (possession of toxas). The subgenus predominantly occurs in the southern hemisphere (cf. Van Soest et al. 2013).

Subgenus *Thalysias* Duchassaing & Michelotti, 1864

***Clathria (Thalysias) minutoides* spec. nov.**
(figs 29A-H)

Clathria minuta; Van Soest, 1993b: 212 (Table 3).
Not: *Rhaphidophlus minutus* Van Soest, 1984: 115, fig. 45.

Material.— Holotype (ZMA Por. 06988), Cape Verde Islands, Maio, SW coast off Ponta Preta, 15.1167°N 23.3°W, 5-8 m, exposed sandy bottom with large rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/05, 26.viii.1986; paratype (ZMA Por. 06940), Cape Verde Islands, São Tiago, SW coast near Ponta da Cidade, near Ciudad Velha, 14.9°N 23.6333°W, 5-15 m, loose boulders on coarse sand, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D01A/16, 21.viii.1986; paratype (ZMA Por. 06992b), Cape Verde Islands, Maio, SW coast off Ponta Preta, 15.1167°N 23.3°W, 5-8 m, exposed sandy bottom with large rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/08, 26. viii.1986; paratype (ZMA Por. 07001), Cape Verde Islands, Maio, SW coast off Ponta Preta, 15.1167°N 23.3°W, 5-8 m, exposed sandy bottom with large rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/18, 26.viii.1986; paratype (ZMA Por. 07020), Cape Verde Islands, Boa Vista, W coast, NW coast of Ilheu Sal Rei, 16.1667°N 22.95°W, 5-15 m, exposed sandy bottom with large rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D06/15, 27.viii.1986; paratype (ZMA Por. 07076), Cape Verde Islands, São Nicolau, S coast near Preguiça, 16.5667°N 24.2833°W, 5-15 m, SCUBA, R.W.M. van Soest, CANCAP 7 Expedition stat. D11/09, 2.ix.1986; paratype (ZMA Por. 07181), Cape Verde Islands, Boa Vista, NW coast of Ilheu Sal Rei, 16.1667°N 22.9667°W, 0-6 m, sandy bottom with stones and sabellariid reefs, snorkeling, R.W.M. van Soest, CANCAP 7 Exped. stat. K16/05, 28.viii.1986; paratype

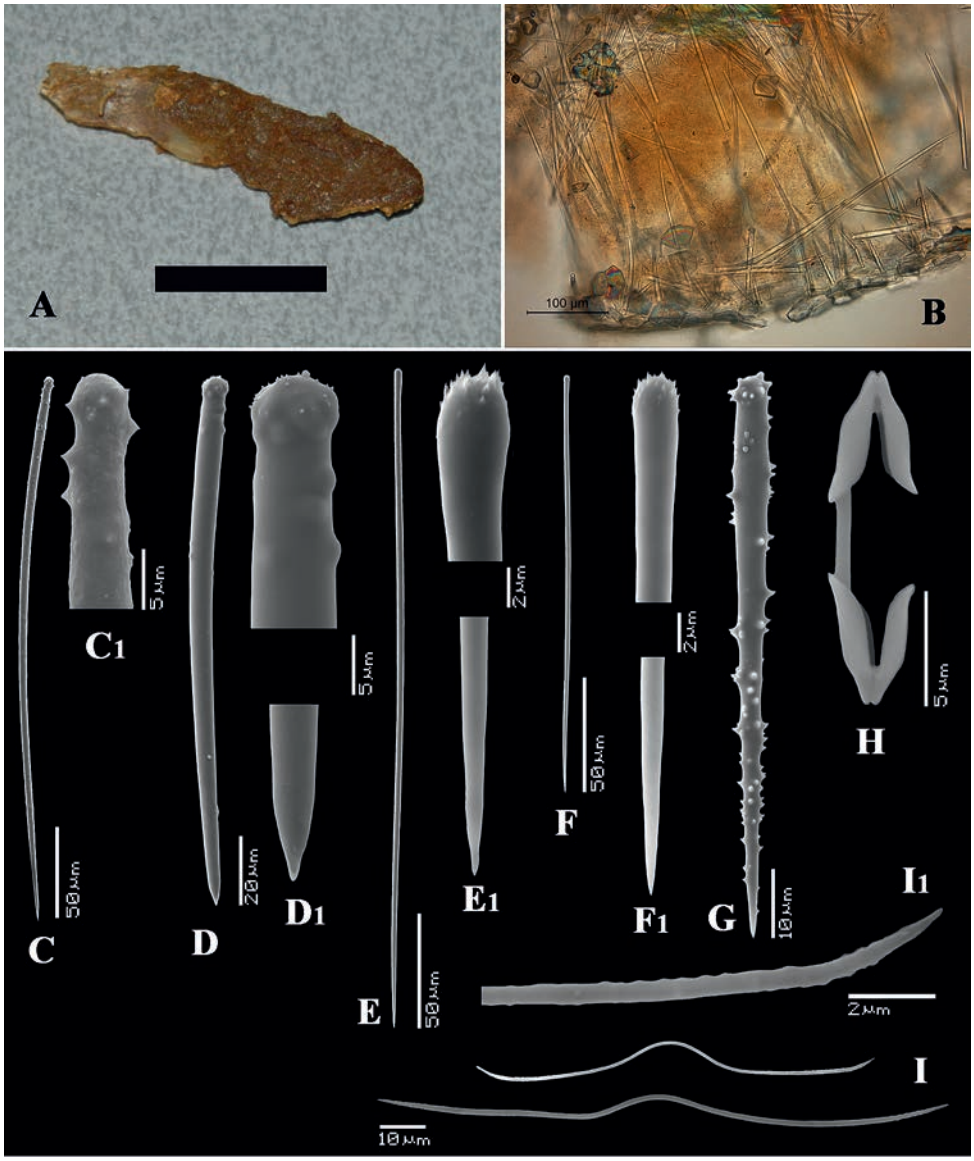


Fig. 29. *Clathria (Thalysias) minutoides* spec. nov., A, holotype (ZMA Por. 06988) from the Cape Verde Islands (scale bar = 1 cm), B, cross section of skeleton (scale bar = 100 µm), C-I, SEM images of spicules, C-D, longer (C-C1) and shorter (D-D1) structural styles and details of apices, E-E1, larger subtylostyle, F-F1, smaller subtylostyle, G, echinating acanthostyle, H, palmate isochela, I-I1, toxas and detail of spined ending.

(ZMA Por. 07189), Cape Verde Islands, Boa Vista, NW coast of Ilheu Sal Rei, 16.1667°N 22.9667°W, 0-6 m, sandy bottom with stones and sabellariid reefs, snorkeling, R.W.M. van Soest, CANCAP 7 Exped. stat. K16/13, 28.viii.1986; (ZMA Por. 07285), Cape Verde Islands, São Tiago, SE of Cima, 14.95°N 24.6333°W, 30-90 m, sandy bottom, 1.2 m Agassiz trawl, R.W.M. van Soest, CANCAP 7 Exped. stat.

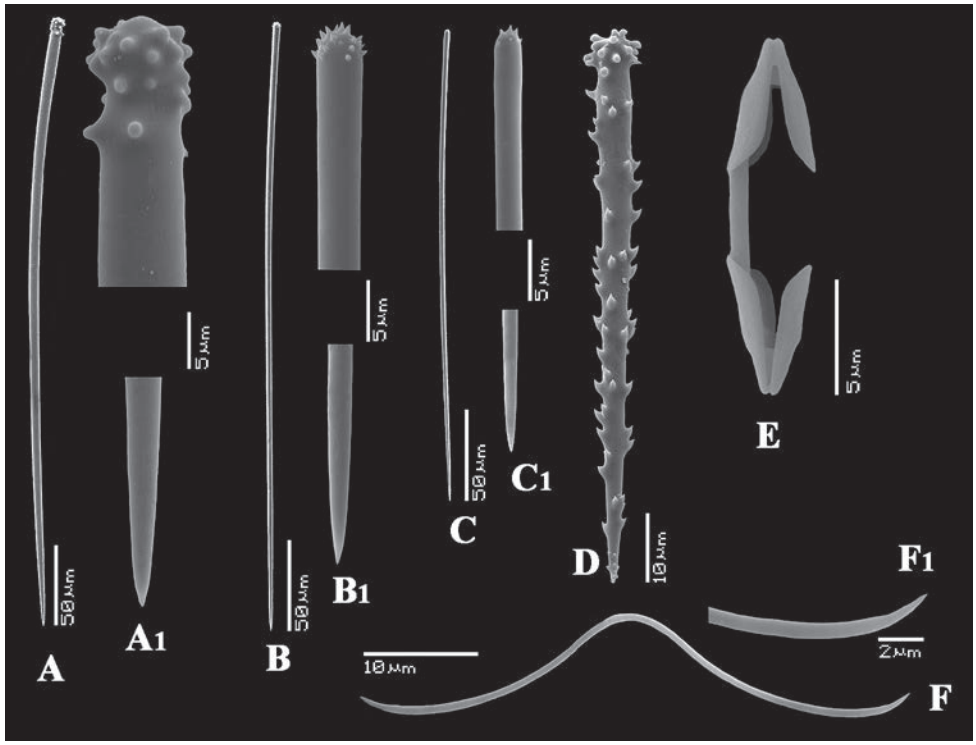


Fig. 30. SEM images of spicules of holotype (ZMA Por. 04796) of *Clathria (Thalysias) minuta* (Van Soest, 1984) from Curaçao, A-A1, structural styles and details of apices, B-B1, larger subtylostyle, C-C1, smaller subtylostyle, D, echinating acanthostyle, E, palmate isochela, F-F1, tox and detail of smooth ending.

036/02, 24.viii.1986; (ZMA Por. 14001), Ascension Island, on barnacles, 3-6 m, SCUBA diving, R. Irving #290, x-xi.1985; (ZMA Por. 21366), Ascension Island, site nr. 24, 6 m, SCUBA diving, R. Irving #122, 9. xi.1985.

Examined for comparison.— Holotype (ZMA Por. 04796), *Rhaphidophlus minutus* Van Soest, 1984, Curaçao, 300 m SE of Hilton Hotel, 33 m, 12.124°N 68.975°W, SCUBA diving, R.W.M. van Soest, 17. xii.1980.

Description.— (fig. 29A) Red, red-brown, orange or yellow microhispid crusts on (volcanic) rocks, shells and barnacles. Size varies from small patches of several mm to large crusts of up to 3 × 4 cm, thickness less than 1 mm.

Skeleton.— (fig. 29B) Hymedesmioid, with single structural styles erect on the substratum with heads embedded in the basal spongin plate and surrounded by a group of echinating acanthostyles. The ectosomal skeleton consists of two-layered bouquets of subtylostyles, the smaller at the periphery, spreading out in the dermis.

Spicules.— (figs 29C-H) Ectosomal subtylostyles, structural styles, echinating acanthostyles, toxas and palmate isochelae.

Subtylostyles (figs 29E-F), with microspined heads, in two size categories, larger (Fig. 29E) 171-*259.4*-370 × 1.5-*2.7*-4 µm, smaller (Fig. 29F) 123-*137.7*-153 × 1-*1.4*-2.5 µm.

Styles (figs 29C-D), thin, straight or slightly curved, with slightly swollen spined or

rugose heads, occasional spines along the shaft, in a large size range, 201-*321.6*-483 × 4-*6.9*-9 μm.

Acanthostyles (fig. 29G), thin, straight, entirely spined 42-*88.8*-135 × 3-*5.4*-8 μm.

Toxas (fig. 29I), wing-shaped, thin, shallow-curved, with upturned, finely spined or rugose apices (fig. 29I11), 54-*79.3*-96 μm.

Palmate isochelae (fig. 29H), typical-shaped, 13-*15.8*-19 μm.

Etymology.— The name means 'similar to *minuta*', to acknowledge similarity to *Clathria (Thalysias) minuta* (Van Soest, 1984 as *Rhaphidophlus*).

Ecology.— Shallow depth down to 30 m, in sandy bays.

Distribution.— Cape Verde Islands, Ascension.

Remarks.— The specimens from the Cape Verde Islands and Ascension are closely similar in spiculation to the Caribbean type of *Rhaphidophlus minutus* (for comparison SEM images of the spiculation of the holotype of that species are presented in figs 30A-F): the spicule size data are almost exactly the same for styles, large category of ectosomal subtylostyles, styles, echinating acanthostyles, toxas, palmate isochelae. Also the shapes of these spicules are basically the same. In a table in a previous publication (Van Soest, 1993b), the present material was indeed assigned to *C. (T.) minuta*. However, the smaller category of ectosomal subtylostyles is substantially larger in Caribbean *C. (T.) minuta* (up to 258 μm vs. 153 in *C. (T.) minutoides* spec. nov.) and the apices of the toxas are smooth in *C. (T.) minuta* vs. finely spined in the present species (compare fig. 30F1 with fig. 29I1). These are minor differences, and if not for the distance and great ocean depths separating these localities, the West African specimens could easily have been assigned to *C. (T.) minuta* without hesitation. In the present situation, we erect a new species but its name reflects the close similarity of populations on both sides of the Atlantic. Occurrence of the species in Ascension roughly half-way between the two sides of the ocean is a further indication of intimate relationship of these populations.
From the similar *C. (M) gorgadensis* spec. nov. (see above) this species differs in having the heads of the structural styles spined and the toxas smaller and provided with a deep curvature; there is only a single size of chelae; the subtylostyles are clearly divisible in two size categories.

Clathria (Thalysias) vacata spec. nov.

(figs 31A-F)

Material.— Holotype (ZMA Por. 07106), Cape Verde Islands, São Nicolau, Branco, SE coast near Ponta de Parede, 16.65°N 24.6833°W, 14-16 m, sandy bottom with small rock hills, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D14/06, 4.ix.1986.

Description.— Thinly encrusting on a limestone conglomerate (fig. 31A), brown-red in colour, with a distinct venal pattern. Size 3 × 3 cm, thickness less than 1 mm. Surface mucous, smooth. Choanosome with low spicular density, little spongin, and high content of granular cells (probably responsible for mucus development).

Skeleton.— (fig. 31B) Hymedesmioid architecture with single styles surrounded by small groups of acanthostyles, lodged with heads in thin spongin plate at the substrate. Styles are sheathed in bundles of long subtylostyles fanning out near the surface and then crowned with bouquets of smaller subtylostyles. No microscleres.

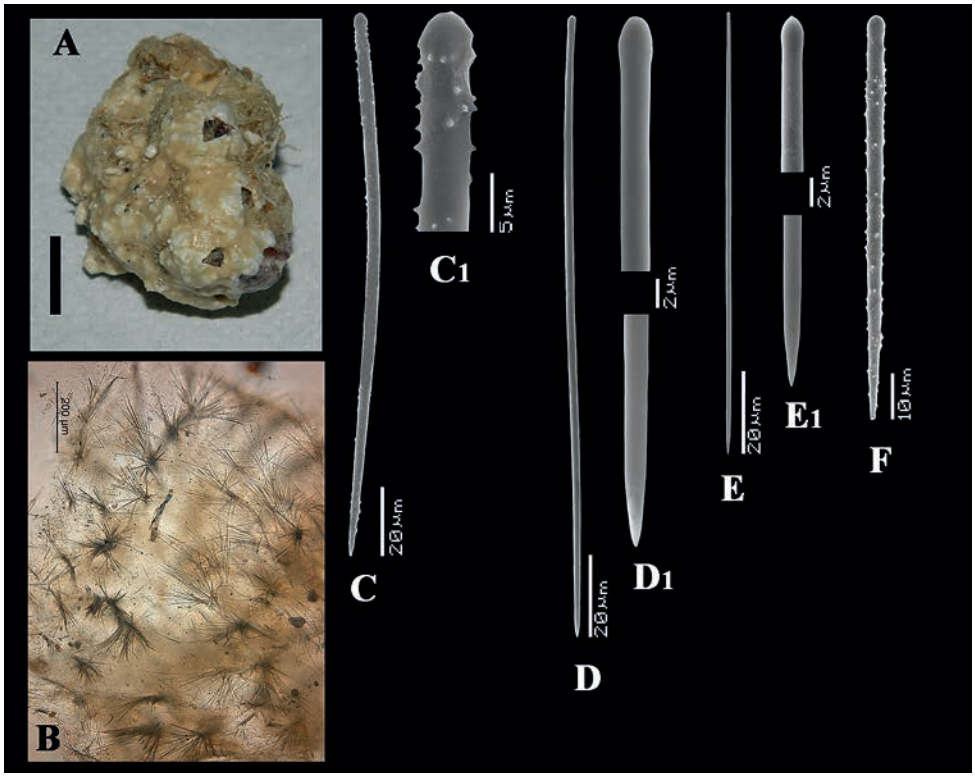


Fig. 31. *Clathria (Thalysias) vacata* spec. nov., A, holotype (ZMA Por. 07106) from the Cape Verde Islands (scale bar = 1 cm), B, overview of peripheral skeleton showing bouquets of subtylostyles (scale bar = 200 µm), C-F, SEM images of spicules, C-C1, structural style and detail of head, D-D1, larger subtylostyle, E-E1, smaller subtylostyle, F, echinating acanthostyle.

Spicules.— (figs 31C-F) Ectosomal subtylostyles, choanosomal styles, echinating acanthostyles.

Subtylostyles (figs 31D-E), in two distinct but slightly overlapping size categories, (1) long straight with elongate, barely swollen heads (fig. 31D), smooth or rarely provided with one or a few spines, 162-*200.4*-240 × 1-*1.3*-1.5 µm, and (2) short, thin (fig. 31E), often curved, with slightly developed smooth heads, 96-*125.2*-168 × 0.5-1 µm.

Styles (fig. 31C), relatively thin, straight, with slightly developed, lightly spined heads, with spines also scattered some distance over the shaft, 198-*257.3*-315 × 3-*3.4*-4 µm.

Acanthostyles (fig. 31F), similar to structural styles, but shorter, entirely lightly spined, 91-*103.2*-129 × 3-*3.7*-5 µm.

Etymology.— Vacatus (L.) means 'be empty from' or 'free from', referring to the entire absence of microscleres in this species.

Ecology.— On rocks in sandy environment, down to 16 m.

Distribution.— Only known from the type locality, off the SE coast of the island of Branco, Cape Verde Islands.

Remarks.— No *Clathria* species are known in the region lacking microscleres entirely. The Adriatic species *Clathria marissuperi* Pulitzer-Finali (1983) is the only species in the nearby Mediterranean without microscleres, but this is lamellate in shape and has smooth thick styles and only a single category of subtylostyles. *C. (T.) vacata* spec. nov. may be rather similar to Madeiran *Clathria (Microciona) haplotoxa* (Topsent, 1928 as *Leptoclathria*) in the shape and size of the styles and acanthostyles, but that species has both toxas and palmate isochelae.

Subgenus *Cornulotrocha* Topsent, 1927

***Clathria (Cornulotrocha) cheliglomerata* spec. nov.**
(figs 32A-H)

Material.— Holotype (ZMA Por. 09966), Mauritania, off Cap Blanc, 11-35 m, F.P. Vermeulen, 1906; paratype (ZMA Por. 06698), Mauritania, 19.083°N 16.4167°W, 20 m, hard bottom with shells, gorgonians and hermitcrabs, 2.4 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 050/02, 11.vi.1988; paratype (ZMA 06831), Mauritania, off Banc d'Arguin, 20.4°N 17.3167°W, 35-40 m, sandy bottom with diverse bottom fauna, 3.5 m Agassiz trawl, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 117/01, 18.vi.1988.
Examined for comparison.— Holotype slide (MNHN LBIM D.T. 1208), *Cornulotrocha cheliradians*, Banc de Gorringe, 36.625°N 11.5667°W, 116 m, on a stone, Campagne de Princesse-Alice 1904, stat. 1664, 25. vii.1904.

Description.— Thickly encrusting (fig. 32A) on stones, dead gorgonians, nodules, and gastropods. Size depends of substratum, largest 4 × 2 cm, thickness 1-3 mm. Colour: orange to red. No evidence of a fistular growth form as in Topsent's type material.

Skeleton.— (fig. 32B) Generally microcionid, i.e. the basal spongin plate extends upwards to form thick short fibers cored and echinated by megascleres, but without lateral connections other than the basal spongin. Ectosomal spicules single, arranged at all angles. Chelae arranged in clusters of rosettes (fig. 32H) at the surface crowning the choanosomal spiculo-fibres. Size of rosettes 26-42 μm, number of chelae in a rosette variable between 6 and 18.

Spicules.— (figs 32C-G) Subtylostyles, styles, echinating acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 32D), thin, straight, with microspined heads, 141-*243.9*-378 × 1-*2.5*-4.5 μm.

Styles (fig. 32C), coring and echinating the spongin fibers, curved, fusiform, with smooth shaft, usually subterminally constricted, heads most often warty/spined or rugose, but occasionally smooth, in a large size variation: 168-996 × 12-26 μm.

Echinating acanthostyles (fig. 32E), realtively thick, curved, and usually with warty head, shaft entirely lightly spined, rather uniform in size and shape, 66-*84.2*-114 × 4-*7.1*-9 μm.

Toxas (fig. 32F), thin, wing-shaped but with shallow curvature with barely upturned apices, in a single size category, 30-*63.2*-99 μm.

Palmate isochelae (fig. 32G-H), typical-shaped, 16-*17.2*-19 μm.

Etymology.— The name combines 'chela' and 'glomeratus' (L. = gathered into a ball) referring to the rosettes of palmate isochelae.

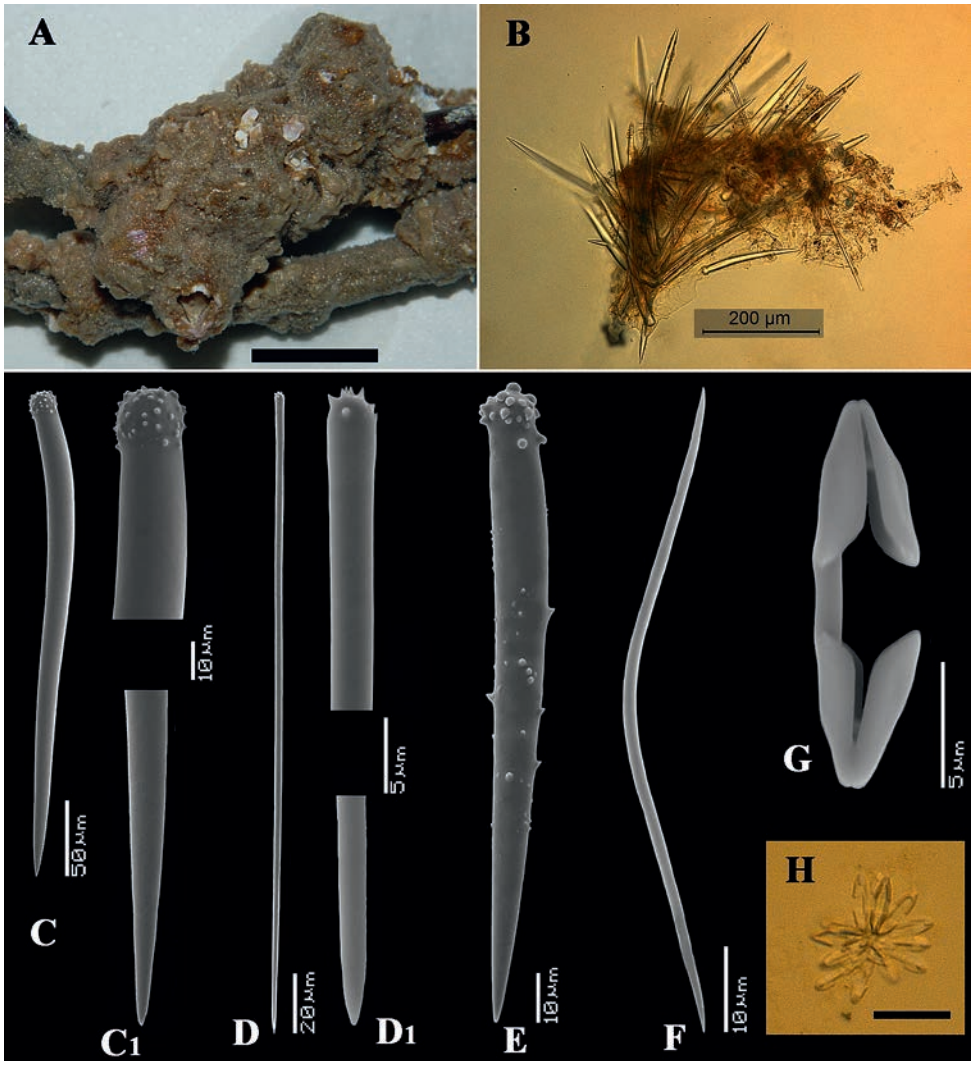


Fig. 32. *Clathria (Cornulotrocha) cheliglomerata* spec. nov., A, holotype (ZMA Por. 09966) from Mauritania (scale bar = 1 cm), B, cross section of skeletal column (scale bar = 200 µm), C-G, SEM images of spicules, C-C1, structural style and detail of head and pointed end, D-D1, ectosomal subtylostyle and detail of head and pointed end, E, echinating acanthostyle, F, tox, G, palmate isochela, H, light microscopic image of rosette of chelae (scale bar = 20 µm).

Ecology.— On shells and rocks, on sandy gravel bottom on the continental shelf, 11-40 m.

Distribution.— Mauritania, off Cap Blanc.

Remarks.— The unique feature of the subgenus is the occurrence of numerous rosettes (fig. 32H) of palmate isochelae, shared with the Mycalina genera *Mycale* Gray, 1867 and *Esperiopsis* Carter, 1882 (as *Mycalopsis* Topsent, 1927), which likely indicates a

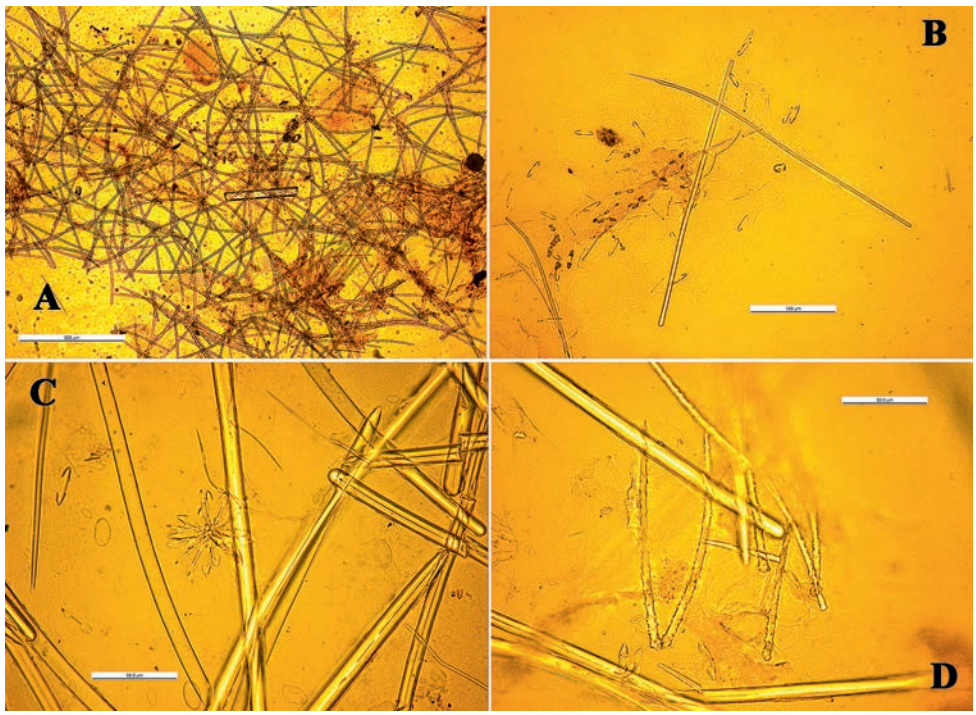


Fig. 33. Light microscopic images made from a slide of the holotype (MNHN LBIM D.T. 1208) of *Clathria (Cornulotrocha) cheliradians* (Topsent, 1927) from Gorringe Bank, A, overview of skeleton (scale bar = 500 μm), B, strongyle and style (scale bar = 100 μm), C, rosette of chelae (scale bar = 50 μm), D, acanthostyles (scale bar = 50 μm).

parallel evolution. The type species of *Cornulotrocha*, *C. cheliradians* Topsent, 1927 was recorded only once from a locality (Gorringe Bank, off the coast of Portugal, see also Xavier & Van Soest, 2007) not too far away from our present localities (Mauritania), and at first it was assumed that our material was conspecific. Topsent describes a hollow fistular shape for *C. cheliradians*, but none of our specimens show evidence that they had a fistular habit in life. The spicules described by Topsent, and confirmed by our reexamination of a slide from the holotype (see figs 33A-D), deviate strongly from those of our specimens: the subtylostyles are apparently modified to smooth curved strongyles (fig. 33B), 246-392 × 3-9 μm in *C. cheliradians*; if these are not derived from subtylostyles they comprise a separate spicule category not present in our specimens; the styles (fig. 33B), 390-444 × 8-11 μm, are all entirely smooth, curved and are abruptly pointed; the acanthostyles (fig. 33D), 126-243 × 4.5-7 μm, are relatively long and thin; toxas, 66-99 μm, are straight with a deep curvature, clearly different from the toxas in our material; palmate isochelae, 23-27 μm, are typical shaped but distinctly longer than in our material. The rosettes of chelae (fig. 33C) are 48-68 μm in diameter and the number of chelae in each varies substantially from approximately 11 to 35 or more, whereas those of our material are smaller and have fewer chelae, 26-42 μm, 6-18 chelae. Taken together, these differences are too great to accommodate our spec-

imens in *C. cheliradians*, and accordingly we distinguish a separate species for them.

Clathria (Microciona) armata growing on dead shells and live gastropods in the Mauritanian region (see description above) appears closest in spiculation to *C. (C.) cheliglomerata* spec. nov., with all stylote spicules essentially similar in shape, size and ornamentation. The toxas of that species are distinctly more deeply curved and they are frequently roughened or wobbly at the apices. The chelae of *armata* are never arranged in whorls or any kind of groupings.

The only other known *Cornulotrocha* species, *Clathria (Cornulotrocha) rosetafiordica* Hajdu et al. 2006 is likewise simply an encrusting sponge, like ours, so the fistular habit is not a subgeneric feature. For that reason, these authors assigned *Cornulotrocha* to the status of a subgenus of *Clathria* (see Hajdu et al. 2006: 959). The fact that the present new species and *C. (Cornulotrocha) rosetafiordica* are similar to *Clathria (Microciona)* species, whereas *C. (Cornulotrocha) cheliradians* is quite dissimilar in shape and spicule characters, may indicate that the rosettes could be a homoplasy, developed independently like those occurring in the Mycalidae. This would mean that *Cornulotrocha* is not a monophyletic subgenus.

Subgenus *Paresperia* Burton, 1930

Definition: *Clathria* possessing a loosely reticulate, undifferentiated, unispicular choanosomal skeleton with single tangential ectosomal subtylostyles.

Type species.— *Paresperia intermedia* Burton, 1930 (by monotypy). This is general considered a junior synonym of *Clathria anchorata* (Carter, 1874 as *Dictyocylindrus*).

Remarks.— Hooper (2002) assigned this species to the subgenus *Clathria (Clathria)*, but the type species lacks a differentiated skeleton, a prerequisite for membership of *Clathria (Clathria)*. The larger styles form a vague, loosely reticulated skeleton, not anisotropic or plumoreticulate, with occasional smaller styles in echinating position, but there is no binding spongin and no clear differentiation in structural and auxiliary choanosomal styles. It is proposed here to revive Burton's (1930) genus *Paresperia* at the level of a subgenus of *Clathria*.

Clathria (Paresperia) anchorata (Carter, 1874)

(figs 34A-F)

Dictyocylindrus anchorata Carter, 1874: 251, pl. XV figs 43a-c.
Microciona plana Carter, 1876: 238.
Clathria anchorata; Vosmaer, 1880: 153; Stephens, 1916: 242; Stephens, 1921: 56, pl. III fig.4; Burton, 1959: 42; Lévi, 1960a: 63.
Clathria longichela Topsent, 1928: 300, pl. X fig. 9
Paresperia intermedia Burton, 1930: 501.
Microciona anchorata; Alander, 1942: 62.
Clathria (Clathria) intermedia; Van Soest et al. 2000: available at http://species-identification.org/species.php?species_group=sponges&id=167&menuentry=soorten
Clathria (Clathria) anchorata; Van Soest et al. 2007: Table 2.

Material.— (ZMA Por. 21217b), Morocco, Gulf of Cadiz, 35.21°N 6.52°W, 600 m, Guy de Smet, don. J. Reveillaud, CADI-POR Exped. III-10, 13.vi.2007.

Fig. 34. *Clathria (Paresperia) anchorata* (Carter, 1874), specimen (ZMA Por. 21217b) from Morocco, A, overview of skeleton (scale bar = 500 µm), B-F, SEM images of spicules, B-B1, structural style and detail of head and pointed end, C-C1, ectosomal subtylostyle and detail of head and pointed end, D-E, echinating acanthostyles, larger (D) resembling the structural styles, smaller (E) with sharper spination, F, palmate isochela.

Description.— Small encrustation of 3 × 2 × 2 mm on a piece of dead *Lophelia*. Colour greyish beige, consistency soft.

Skeleton.— (fig. 34A) A confused mass of spicules with no or very little binding spongin. No clear skeletal structure.

Spicules.— (figs 34B-F) Ectosomal subtylostyles, choanosomal styles, echinating acanthostyles, palmate isochelae.

Subtylostyles (fig. 34C), smooth straight or slightly curved, with mucronate head, 271-*323.5*-344 × 3-*3.7*-5.5 μm.

Styles (fig. 34B), curved, with swollen microspined heads, shaft with a few spines or bumps, outline may be bumpy, 686-*855.3*-1098 × 13.5-*15.6*-17.5 μm.

Acanthostyles (figs 34D-E), curved, with swollen head, resembling the choanosomal styles, but with spines on both head and shaft, in a large size range, 332-*440.3*-571 × 6.5-*7.8*-10 μm,

Palmate isochelae (fig. 34F), typical shaped, but somewhat elongated, 19-*27.0*-31 μm.

Ecology.— Bathyal, on dead *Lophelia* corals.

Distribution.— Gulf of Cadiz; elsewhere common along the continental margin of Europe (France, British Isles), Rockall Bank, northwards to Norway.

Remarks.— The holotype of Carter was destroyed during WW II, but there is little doubt about the properties of this common Northeast Atlantic bathyal species. There are several synonyms, which may have been caused by the fact that Carter did not distinguish subtylostyles from the styles. Burton (1930: 501) when he erected *Paresperia intermedia* failed to distinguish the subtylostyles and the echinating acanthostyles. Alander's (1942: 62) record of this species from as shallow as 85 m needs confirmation as he did not provide a description.

Additional Northwest African Microcioninae species

We briefly characterize further Microcioninae species from the region that we were unable to reexamine. The West African material of Lévi apparently could not be found in the collections of the Paris Museum and present whereabouts are unknown. The identities of the species recorded below all need verification. (data are summarized along with above described species in Table 2).

Clathria (Clathria) compressa sensu Lévi, 1960b

Clathria compressa Schmidt, 1862: 58, pl. VI fig. 1; Lévi, 1960b: 761, fig. 14.

Description.— Arborescent. Total height 4.5 cm, width 2.5 cm, diameter of branches 0.4 cm. Skeleton a plumoreticulation with spongin fibers cored by structural styles and echinated by acanthostyles. Spicules comprise ectosomal subtylostyles with microspined heads, 110-185 × 4-6 μm; structural styles are smooth and curved, occasionally microspined on the heads, 300-350 × 13-16 μm; echinating acanthostyles, heavily spined, but less so near the pointed end, 75-130 × 7-8 μm; wing-shaped toxas in a large size range, deeply curved and with clearly visible spined endings; rare typical shaped palmate isochelae, 7-8 μm.

Table 2. Data on morphology and spicule sizes of studied specimens and additional reported material of the subfamily Microcioninae in somal, echinat. = echinating, strong. = strongyle, isoch. = isochelae, region. = regional, distrib. = distribution, cont. = continental, msp. = microencrusting, occ. = occasionally, mucr. = mucronate,li. = lightly, s. = sensu, monact. = monactine, plumoretic. = plumoreticulate, hymed. = hymedes-

genus	subgenus	species	skeletal structure	subtylo. size (μm)	subtylo. morph.	quasi-tylotes	style size(μm)	style morph.	echinat.st. size(μm)	echinat.st. morph.
Clathria	*Clathria*	*compressa** s. Lévi 1960	plumo-retic.	110–185 × 4–6	head msp.	absent	300–350 × 13–16	head sm.	75–130 × 7–8	heavy sp.
Clathria	*Clathria*	*hjorti*	plumo-retic.	122–324 × 2–7	head msp.	absent	136–726 ×16–36	head sm.constr.	72–204 × 6–22	sm./ wrt.
Clathria	*Microciona*	*affinis** s. Topsent 1904	hymed.	730–750 × 5	head msp.	absent	1600 × 18–20	head sp.	110–300	entirely sp.
Clathria	*Microciona*	*africana**	hymed.	210 × 3	not given	absent	250 × 13–14	head sp.	250 × 13–14	entirely sp.
Clathria	*Microciona*	*anancora**	hymed.	730–750 × 5	head msp.	absent	1600 × 18–20	head sp.	110–300	entirely sp.
Clathria	*Microciona*	*armata*	microcion.	102–359 × 1.5–4.5	head msp.	absent	172–438 × 8–15	head wrt.	72–153 × 6–10	heavy sp.
Clathria	*Microciona*	*ascensionis* sp. nov.	hymed.	186–309 × 1.5–3	head msp.	absent	254–388 × 7–9	head wrt.-sp.	63–93 × 3–5	dense sp.
Clathria	*Microciona*	*atoxa*	hymed.	149–255 × 1.5–2	head msp.	absent	192–660 × 7–26	head wrt.-sp.	66–209 × 5–10	dense sp.
Clathria	*Microciona*	*aurea* sp. nov.	hymed.	162–520 × 2–5	head msp.	absent	418–660 × 18–25	head strong wrt.	65–198 × 8–13	strong wrt.
Clathria	*Microciona*	*bicleistochelifera* sp. nov.	plumo-microcion.	204–363 × 1–2.5	head sm.	absent	183–492 × 6–11	head sm.	absent	
Clathria	*Microciona*	*bitoxa*	hymed.	275–360 × 2.5–4.5	head msp.	absent	868–1234 × 14–25	head sm.	54–162 × 4–7	rugose/ sp.
Clathria	*Microciona*	*boavistae* sp. nov.	microcion.	132–204 × 1–1.5	head sm.	absent	192–341 × 8–18	head sm./sp.	64–183 × 5–10	entirely sp.
Clathria	*Microciona*	*calloides* sp. nov.	plumo-retic.	219–264 × 1.5–2.5	head sm.	absent	108–201 × 5–10	head sm.	66–84 × 5–7	head sm.
Clathria	*Microciona*	*cancapseptima* sp. nov.	hymed.	243–516 × 2–8	head sm./msp.	238–345 × 2.5–5	186–564 × 7–19	head wrt.-sp.	75–168 × 4–11	heavy sp.
Clathria	*Microciona*	*capverdensis* sp. nov.	plumo-retic.	177–285 × 1.5–3	head msp.	absent	255–624 × 8–18	head sm./sp.	78–147 × 6–12	heavy sp.
Clathria	*Microciona*	*cleistochela** s. B.E. & Lopes 85	microcion.	202–371 × 1.7–3.6	head sm.	absent	85.4–539 × 5–10.9	head sm.	82–284 × 4.9–10.5	li. sp.
Clathria	*Microciona*	*cleistochela** s. Cruz 2002	hymed.	224–416	not given	absent	112–560 × 16	head sm	76–96	entirely li.sp.
Clathria	*Microciona*	*conchicola* sp. nov.	hymed.	141–402 × 1–6	head msp.	99–147 × 1–2	119–495 × 5–21	head wrt.	57–111 × 3.5–13	wrt./ sp.
Clathria	*Microciona*	*coralloides** s. B.E. & Lopes 85	plumo-retic.	201–381 × 1.5–4.3	heads lobate	absent	224–415 × 6.8–15.5	head sm.constr.	64–182 × 2.6–14.4	entirely sm.
Clathria	*Microciona*	*gorgadensis* sp. nov.	hymed.	182–345 × 2–5	head msp.	absent	165–384 × 7–15	head sm.	48–130 × 3–7	entirely sp.
Clathria	*Microciona*	*gradalis** s. Cruz 2002	hymed.	160–344	head sm.?	absent	192–656	head wrt.	60–188	entirely sp.
Clathria	*Microciona*	*haplotoxa**	hymed.	absent		180–210 × 2–3	110–190 × 4	entirely li.sp.	60–78 × 3	entirely sp.
Clathria	*Microciona*	*haplotoxa** s. Lévi, 1956	hymed.	150–240	head msp.	absent	200–330	entirely li.sp.	66–120	entirely sp.
Clathria	*Microciona*	*jolicoeuri** s. Lévi, 1959	microcio.	125–425 × 2–9	not given	absent	175–450 × 10–22	head sm. curved	45–55 × 5	entirely sp.

Northwest African and Macaronesian waters. Abbreviations.– subtylo = subtylostyle, morph. = morphology, ecto. = ectosomal, choano. = choano-spined, sm.= smooth, constr. = subterminally constricted, sp. = spined(spines), typic. = typical, arboresc. = arborescent, mass. = massive, encr. = mioid, microcion. = microcionid, cond. = condensed, acco. = accolada, wrt. = warty, cleisto. = cleistochelae, contort. =contorted. * = literature data.

to×as 1 size(µm)	to×as 1 morph.	to×as 2 size(µm)	to×as 2 morph.	isoch. 1 size(µm)	isoch. 1 morph.	isoch. 2 size(µm)	isoch.2 morph.	habit	region. distrib.	depth (m)
40–55	wing sp. ends	80–130	wing sp. ends	7–8	typic.	absent		arboresc.	Senegal	60-100
18–135	wing sm.ends	absent		14–21	cleisto.	absent		arborecs.	contin. W Africa	10–52
10–215	wing sm.ends	absent		18–19	typic.	absent		encr.	Azores	1360
25–240	acco.?	50–60 × 3	oxhorn?	11–12	typic.	absent		encr.	Senegal	shallow water
10–120	wing sm.ends	absent		absent		absent		encr.	Azores	349
45–144	wing sp.ends	absent		12–18	typic.	absent		encr.	Mauritania Senegal	0–32
334–444	raphidif. sp.ends	absent		5–6	typic.	absent		encr.	Ascension Island	18
absent		absent		13–16	typic.	absent		encr.	Cape Verde Islands	5–120
105–423	strepsi-to×a	absent		absent		absent		encr.	Cape Verde Islands	155-248
absent		absent		16–22	typic.	(1)13–20 (2)22–31	cleisto. cleisto.	encr.+ mass.	Cape Verde Islands	0–15
160–210	acco.	36–63 × 2–4	wing/ oxhorn	absent		absent		encr.	Cape Verde Islands	515
18–50	wing sm.ends	absent		absent		absent		encr.	Cape Verde Islands	25–27
18–159	wing sm.ends	absent		18–22	typic.	absent		encr.+ mass.	Cape Verde I. Ascension I.	0–12
30–294	wing sm.ends	absent		13–19	typic.	16–27	cleisto.	encr.	Cape Verde Islands	16–70
120–301	acco.	absent		13–17	typic.	4.5–7	typic.	mass.	Cape Verde Islands	70
60–95	wing sm.ends	27–39	wing sm.ends	14–17	cleisto.	absent		encr.	Azores	10
28–100	wing sm.ends	absent		14–16	cleisto.	14–16	typic.	encr.	Canary Islands	not given
141–321	acco.	absent		12–19	typic.	absent		encr.	Mauritania Canary I.	22–71
27–156 × 0.4–6	o×h. ?	absent		16	typic.?	absent		encr.	Azores	12
80–285	acco.	absent		10–14	typic.	4–6	cont.	encr.	Cape Verde Islands	0–15
40–160	wing sm.ends	absent		12–14	typic.	absent		encr.	Canary Islands	deeper water
20–30	wing sm.ends	absent		12.5–14	typic.	absent		encr.	Porto Santo	100
20–45	wing sm.ends	absent		11–12	typic.	absent		encr.	Senegal	shallow water
60–200	wing sm.ends	absent		12	typic.	absent		encr.	Sao Tome	shallow water

Table 2. Continued.

genus	subgenus	species	skeletal structure	subtylo. size (μm)	subtylo. morph.	quasi-tylotes	style size(μm)	style morph.	echinat.st. size(μm)	echinat.st. morph.
Clathria	*Microciona*	spinarcus	microcion.	153–300 × 2.5–4.5	head msp.	absent	237–367 × 12–16	head li.sp.	77–237 × 6–13	heavy sp.
Clathria	*Microciona*	*strepsitoxa** s. B.E. & Lopes 85	microcion.	184–340 × 2–3.5	heads msp.	absent	181–574 × 5–10.5	head msp.	66.5–170 × 3.5–8	entirely sp.
Clathria	*Microciona*	*strepsitoxa** s. Cruz 2002	hymed.	168–304	not given	absent	144–384 × 4–8	head irreg. constr.	72–136	entirely sp.
Clathria	*Microciona*	*toxitenuis** s. Cruz 2002	plumose	192–412	not given	absent	184–720	head li. sp.	64–200	entirely li.sp.
Clathria	*Axosuberites*	*pachyaxia**	axially cond.	175–350 × 3–8	head msp.	absent	175–350 × 3–8	heads msp.	absent	
Clathria	*Axosuberites*	*papillata* sp. nov.	axially cond.	123–346 × 2.5–7	head msp.	absent	201–451 × 7–15	head sm.	absent	
Clathria	*Thalysias*	minutoides sp. nov.	hymed.	(a)171–370 × 1.5–4 (b)123–153 × 1–2.5	head msp. head msp.	absent	201–483 × 4–9	head rugose	42–135 × 3–8	entirely sp.
Clathria	*Thalysias*	vacata sp. nov.	hymed.	(a)162–240 × 1–1.5 (b) 96–168 × 0.5–1	head sm./msp. head sm./msp.	absent	198–315 × 3–4	head li.sp.	91–129 × 3–5	entirely li.sp.
Clathria	*Cornulotrocha*	*cheliglomerata* sp. nov.	microcion.	141–378 × 1–4.5	heads msp.	absent	166–996 × 12–26	head wrt./sm.	66–114 × 4–9	entirely sp.
Clathria	*Paresperia*	*anchorata*	confused	271–344 × 3–5.5	head mucron.	absent	686–1098 × 13.5–17.5	entirely li.sp.	332–571 × 6.5–10	entirely sp.

Distribution.— Senegal; 60-100 m.

Comment.— We compared Lévi's description with two dry specimens from the Adriatic present in the collections of Naturalis, RMNH Por. 269 (Vosmaer's number 317), locality 'Adriatic', and RMNH Por. 270 (Vosmaer's number 176) from Triest, Italian Adriatic. Although the growth form of the Adriatic material was much coarser and the branches were anastomosed into flat lamellated structures, there was nevertheless a remarkable similarity in spicule shapes and sizes. We tentatively confirm Lévi's decision to extend the distribution of *Clathria (Clathria) compressa* Schmidt, 1862 from the Adriatic to Senegalese waters. However, there are few if any records from areas inbetween these distant localities.

Clathria (Clathria) coralloides sensu Boury-Esnault & Lopes, 1985

Clathria coralloides; Boury-Esnault & Lopes, 1985: 194, fig. 43.
Not: *Spongia coralloides* Scopoli, 1772: 412, pl. 64.

Description.— Small, thin, orange crust of several cm^2. Finely hispid surface. Skeleton plumoreticulate consisting of spongin fibres cored by structural styles and echinated by smaller styles. Spicules include subtylostyles with ovate or trilobate heads, 201-381 × 1.5-4.5 μm; structural styles, smooth, fusiform, lightly curved, slightly constricted underneath the head, 224-415 × 7-15.5 μm; small echinating styles, smooth and

to×as 1 size(µm)	to×as 1 morph.	to×as 2 size(µm)	to×as 2 morph.	isoch. 1 size(µm)	isoch. 1 morph.	isoch. 2 size(µm)	isoch.2 morph.	habit	region. distrib.	depth (m)
69–132	wing sp.ends	absent		9–16	typic.	absent		encr.	Cape Verde I. Canary I.	85–97
72–384	acco.	18–57 × 0.6–1.5	wing sm.ends	11.5–18	typic.	absent		encr.	Azores	5–20
80–336	strepsi-to×a	14–56	wing sm.ends	12–14	typic.	absent		encr.	Canary islands	shallow water
172–400	acco.	absent		10–14	typic.	absent		encr.	Canary Islands	shallow water
50–80	wing sm.ends	absent		15–16	typic.	absent		mass./ lamell.	Senegal	not given
absent		absent		16–20	typic.	absent		papill.	Mauritania	20
54–96	wing sp.ends	absent		13–19	typic.	absent		encr.	Cape Verde I. Ascension I.	0–30
absent		absent		absent		absent		encr.	Cape Verde Islands	14–16
30–99	wing sm.ends	absent		16–19	typic.	absent		mass./ encr.	Mauritania	18–120
absent		absent		19–31	typic.	absent		mass./ encr.	Morocco	600

similar in shape to the structural styles, 64-182 × 3-14.5 µm; wing-shaped toxas, with shallow curvature, with ending straight or only slightly upturned, 27-156.5 × 0.4-6 µm; rare palmate isochelae, not drawn or described, 16 µm.

Distribution.— Azores; 12 m.

Comment.— The growth form and the rare and undescribed isochelae preclude its assignment to *Clathria (C.) coralloides* (see above). The presence of short fairly robust toxas could point to *Clathria (Clathria) arcifera* (Schmidt, 1868, see above). Less likely is conspecificity with *Clathria (Microciona) calloides* spec. nov. (see above), which has generally similar skeletal structure and spicule shapes, but the spicule size data appear to differ substantially. A further possibility is conspecificity with Cruz' (2002) material described as *Ophlitaspongia papilla* (see below).

Clathria (Microciona) affinis sensu (Topsent, 1904a)

Hymeraphia affinis; Topsent, 1904a: 162

Not: *Hymeraphia affinis* Topsent, 1889: 43, fig. 8A; nec: *Clathria (Microciona) campecheae* Hooper, 1996: 220 (replacement name fot the preoccupied combination *Clathria (Microciona) affinis* Topsent, 1889)

Description.—Thin greyish crusts on dead corals. Spicules comprise subtylostyles with microspined heads, 730-750 × 5 µm; structural styles with spined heads, 1600 × 18-20 µm; echinating acanthostyles, entirely spined, variable in length, 110-300 µm;

smooth wing-shaped toxas, up to 215 μm; typical shaped palmate isochelae, 18-19 μm.

Distribution.— Azores; bathyal, 1360 m.

Comment.— The spicules sizes clearly exceed these of the Caribbean shallow-water species named *Hymeraphia affinis* by Topsent, 1889 (and which was subsequently assigned to *C. (M.) campecheae* by Hooper, 1996). The present species thus needs to be renamed as well, as it does not conform to *Clathria (Microciona) campecheae*, nor to *Clathria (Microciona) affinis* (Carter, 1880).

Clathria (Microciona) africana (Lévi, 1956)

Microciona africana Lévi, 1956: 402, fig. 8.

Description.— Red, solid crust on mollusk shell. Hispid surface, no visible oscules. Skeleton microcionid. Subtylostyles with microspined heads, 210 × 3 μm; styles with constricted, spined heads, grading into echinating acanthostyles, together up to 250 × 13-14 μm; toxas in two distinct categories, long thin wing-shaped, 25-240 μm and short, fat, shallow oxhorn-shaped, 50-60 μm; typical shaped palmate isochelae 11-12 μm.

Distribution.— Senegal (Dakar region).

Clathria (Microciona) anancora Topsent, 1904a

Hymeraphia affinis var. *anancora* Topsent, 1904a: 163.

Description.— Encrusting a lithistid. Spiculation similar to that of *C.(M.) affinis* sensu (Topsent, 1904a), see above. Differences are the absence of isochelae, and the smaller length of the toxas (only up to 120 μm).

Distribution.— Azores; bathyal, 394 m.

Comment.— This species needs to be redescribed, because insufficient data have been supplied by its author.

Clathria (Microciona) cleistochela sensu Boury-Esnault & Lopes, 1985 and Cruz, 2002

? *Clathria cleistochela* Topsent, 1925: 650, fig. 9.
Microciona cleistochela; Boury-Esnault & Lopes, 1985: 193, fig. 42
Clathria cheistochela (sic); Cruz, 2002: 180.

Description.—Extensive, very thin encrustations on barnacles, bright red colour. No visible oscules. Slightly hispid. Skeleton microcionid. Spicules consist of subtylostyles of 202-371 × 1.7-3.6 μm; structural styles smooth, slightly constricted below the head, 85-560 × 5-16 μm; echinating acanthostyles lightly spined, drawn as fusiform, 76-283.5 × 5-10.5 μm; two size categories of wing-shaped toxas (not distinguished by Cruz), 60.2-100 × 0.7-2.5 μm and 27.2-38.5 × 0.5-1.0 μm; cleistochelae 13.7-16.6 μm.

Distribution.— Azores, Canary Islands; 10 m.

Comment.— We compared the descriptions of Boury-Esnault & Lopez, 1985 and Cruz, 2002, (which both appear similar in spiculation) with a slide of the type from Naples, MNHN LBIM D.T.329 (see also above in the Remarks on *Clathria (Microciona)*

cancapseptima spec. nov.). We found the type to show some differences with the Azorean and Canarian specimens, the most obvious one being that structural styles were warty or spined, and up to 22 μm in thickness, in the type material. Minor differences were apparent in the toxas, which were not clearly divisible in two size categories, and were generally longer. Echinating acanthostyles appeared more heavily spined than in the drawing of Boury-Esnault & Lopes and Cruz. The value of these differences remains to be determined after more specimens have been examined.

Clathria (Microciona) gradalis sensu Cruz, 2002

Clathria gradalis Topsent, 1925: 651, fig.10.
Clathria (Microciona) gradalis; Cruz, 2002: 181.

Description.— Hispid red encrustation under stones. Skeleton hymedesmioid. Straight subtylostyles, 160-344 μm; structural styles with warty or lightly spined heads, slightly curved, constricted underneath the heads, 192-656 μm; echinating acanthostyles similar to the structural styles but entirely spined, 60-188 μm; wing-shaped toxas with deep curvature, 40-160 μm; typical shaped palmate isochelae, 12-14 μm.

Distribution.— Canary Islands (Tenerife, La Palma); shallow water.

Comment.— We compared Cruz' description with a spicule slide of the holotype from Naples, MNHN LBIM D.T.328. Small differences are apparent: the Naples styles may be as long as 820 μm, echinating acanthostyles are mostly somewhat longer, as are the toxas. Still, overall similarity is convincingly great and we support Cruz' decision to assign his material to *Clathria (Microciona) gradalis*.

Clathria (Microciona) haplotoxa (Topsent, 1928)

Leptoclathria haplotoxa Topsent, 1928: 298, pl. × fig. 16

Description.— Small thin crust, soft. Skeleton hymedesmioid. Spicules consist of ectosomal strongyles (presumably modified subtylostyles), 180-210 × 2 μm; structural styles short and thin, with spined or warty heads, 110-190 × 4 μm; echinating acanthostyles likewise small, 60-78 × 3 μm; small wing-shaped toxas, 20-30 μm; typical shaped palmate isochelae, 12.5-14 μm.

Distribution.— Porto Santo, Madeira archipelago.

Clathria (Microciona) haplotoxa sensu (Levi, 1956)

?Leptoclathria haplotoxa Topsent, 1928: 298, pl. × fig. 16
Microciona haplotoxa; Lévi, 1956: 400, Fig. 7.

Description.— Thin red crust. Skeleton hymedesmioid. Spicules consist of subtylostyles 150-240 μm; structural spined styles 220-330 μm; echinating acanthostyles, 66-120 μm; wing-shaped toxas, 20-35 μm; typical-shaped palmate isochelae, 11-12 μm.

Distribution.— Senegal.

Comment.— This differs from the type of *C. haplotoxa* by having subtylostyles instead of strongyles, and larger styles and acanthostyles. Conspecificity is uncertain.

Clathria (Microciona) strepsitoxa sensu (Boury-Esnault & Lopez, 1985 and Cruz, 2002)

Microciona strepsitoxa Hope, 1889: 334, pl. XVI figs 1-10; Boury-Esnault & Lopes, 1985: 192, fig. 40.
Clathria (Microciona) strepsitoxa; Cruz, 2002: 179.

Description.— (combined from Boury-Esnault & Lopes and Cruz). Red or orange encrustations, rather smooth, with visible oscules. Thickness 1-2 mm. Skeleton microcionid. Spicules comprise subtylostyles with microspined heads, 168-340 × 2-3.5 μm; structural styles largely smooth, but with a few spines on the heads or with heads irregular in shape, 144-574 × 4-10 μm; echinating acanthostyles, entirely spined, 66-170 × 3.5-8 μm; toxas in two distinct categories, strepsitoxas, 72-384 μm, and wing-shaped toxas 14-57 μm; typical shaped palmate isochelae, 11-18 μm.

Distribution.— Azores, Canary Islands (Tenerife); 7-15 m, and also deeper in the *Dendrophyllia ramea* community.

Comment.— We compared the above description with the type specimen of *Microciona strepsitoxa,* BMNH 1889.11.16.1 (see also above in the Remarks of *Clathria (Microciona) aurea* spec. nov.), and with a slide of a specimen from Banyuls in the Naturalis collection (Vosmaer slide collection). We discovered under SEM fine spines on the small toxas of the type, which were not recorded by Boury-Esnault & Lopes and Cruz, but these are virtually invisible under light microscopy. The styles of the type are up to 650 μm, and the small wing-shaped toxas my reach 110 μm. Spicules of the specimen from Banyuls are closely similar to the type, with wing-shaped toxas even reaching 156 μm. Nevertheless, overall similarity in spiculation with Boury-Esnault & Lopes' and Cruz' specimens is sufficiently great to confirm that the material from the Azores and the Canary Islands (and that of Banyuls) is likely to be conspecific with the type.

Clathria (Thalysias) jolicoeuri sensu (Levi, 1959)

?*Rhaphidophlus jolicoeuri* Topsent, 1892: xxv; Topsent, 1925: 658, fig. 14.
Tenacia jolicoeuri; Lévi, 1959: 133, fig. 26.

Description.— Thin crust on a hydrocoral. Skeleton microcionid-plumoreticulate, consisting of interconnected spongin-encased columns of structural styles, echinated by acanthostyles. Spicules subtylostyles, 125-425 × 2-9 μm; smooth, curved structural styles, 175-450 × 10-22 μm; echinating acanthostyles very short, 45-55 × 5 μm; one variable category of ?wing-shaped toxas 60-200 μm; palmate isochelae rare, 12 μm.

Distribution.— São Tomé, Central Gulf of Guinea.

Comment.— We compared slides (MNHN LBIM D.T.323 and 324) of Topsent's (1925) specimen from Naples with the above description. There are discrepancies with both Mediterranean *C. (T.) jolicoeuri* (toxa sizes and shapes, chelae sizes and shapes) and the above described *Clathria (Microciona) gorgadensis* spec. nov. (skeletal structure, contorted shape of small isochelae). Lévi's material needs further study.

Clathria (Axosuberites) pachyaxia (Lévi, 1960b)

Axociella pachyaxia Lévi, 1960b: 763, fig. 16.

Material.— The specimen is registered as MNHN LBIM DCL. 787, but apparently could not be found when requested on loan (2013).

Description.— Massively encrusting, rosy red sponge, size 6.5 × 2.5 × 0.6 cm, consisting of a series of parallel ridges with short digitations. The skeleton is an axially condensed, plumoreticulation, ending at the surface in tufts of diverging spicules. Spicules consist of styles and subtylostyles with microspined heads, 175-350 × 3-8 μm, small, thin, wing-shaped toxas, 50-80 μm, and typical shaped palmate isochelae, 15-16 μm.

Distribution.— Senegal.

Subfamily Ophlitaspongiinae De Laubenfels, 1936

Genus *Antho* Gray, 1867
Subgenus *Antho (Antho)* Gray, 1967

Remarks.— This genus was extensively revised by Hooper (1996 and 2002). His admirable effort has effectively grouped previous disparate genera of dubious status into a well-defined genus with synapomorphies clearly delimited from closely related genera like *Clathria* s.l., *Echinoclathria*, *Ophlitaspongia* and *Echinochalina* Thiele, 1903. Nevertheless, a few basic problems are still apparent, centering on the precise delimitation and content of two of the three subgenera distinguished by Hooper, viz. *Antho (Antho)* and *Antho (Acarnia)*. According to the definition provided in Hooper (2002) the two subgenera are distinguished by possessing [*Antho (Acarnia)*] or lacking [*Antho (Antho)*] a separate category of echinating styles next to the basal reticulation of (acantho-) styles or (acantho-)strongyles. A crucial issue is the precise nature of the type species of *Antho*, viz. *Myxilla involvens* Schmidt, 1864, because the original description by Schmidt (p. 37) and figures (pl. IV fig. 6) are incomplete and ambiguous, and there does not remain a certainly established type specimen (but see below). Currently, the type species, *Antho (Antho) involvens*, has seven nominal junior synonyms (in numerous combinations by assignment of these sponges to more than 10 different genera), which collectively differ substantially in shape, spicule types and sizes, and in geographic distribution, making this species one of the most variable and widespread in the family Microcionidae.

Hooper (1996: 26, 422) states that the holotype is in the Landesmuseum Joanneum Graz (LMJG), but fails to give further details, relying for the characters of the species on a slide in the Natural History Museum, BMNH 1867.3.11.92, stated to be made from the holotype by Burton (1930: 533). The O. Schmidt Catalogue (Desqueyroux-Faúndez & Stone, 1992), which contains information on all Schmidt specimens present in the Graz Museum, Strasbourg Museum, the Paris Museum and the Natural History Museum, makes no mention of any type material of *Myxilla involvens*. Already in 1894, no specimen with label *Myxilla involvens* was detected among the 233 specimens at that time assigned to the 'Schmidt collection' at LMJG (see list of Heider, 1894). This leads to the conclusion that there is no longer any type material left in the Johanneum at Graz. Schmidt was known to have been very casual with the type concept and liberal in distributing specimens, fragments or slides of many of his collections to other institutions (Wiedenmayer, 1977: 259). These facts indicate the possibility that the BMNH slide

might or might not belong to the original Schmidt type specimen, but could very well belong to a subsequently collected very similar sponge. We borrowed the BMNH slide of which the label carries the text 'Myxilla involvens Sdt 64 Adriatic 67.3.11.92'. Hooper's description of the BMNH type fragment mentions 'acanthostyles/acanthostrongyles' as forming the basal reticulation in accordance with Schmidt's (1864: plate IV) figure of the spicules, but curiously in his illustration of the spicules Hooper only shows several acanthostrongyles, no acanthostyles. Our reexamination of the slide content (figs 35A-C) resulted in the conclusion that only relatively few acanthostrongyles are present and these are obvious derivations of the predominant acanthostyles. The identity of the BMNH type fragment as belonging to the original type material is strengthened by the existence of an alleged – so far not clearly documented – fragment of the ?type specimen in the Naturalis Biodiversity Center, RMNH Por. 264. This fragment was obtained by G.C.J. Vosmaer, contemporary of Schmidt, and like his older colleague interested in the Mediterranean sponge fauna. The label of this fragment reads 'Microciona prolifera (Ell. & Sol.) (type van M. involvens O.S.) Mus. Graz, Coll. G.C.J. Vosmaer R 113 Lacroma'. Vosmaer (1880: 108), after providing the characters of '*Desmacodes involvens*' (= *Myxilla involvens*) in his unique code system, mentions having studied the 'original specimen', which is here taken as to mean the fragment obtained from Schmidt or from the Graz Museum. The fragment (fig. 36A) is a dried crust on a substratum of unknown nature, approximately 1 × 0.5 × 0.3 cm. Lévi (1960a: 78, table) apparently provides spicule measurements of this fragment, in a table comparing the various records of specimens he considered to belong to *Antho involvens*, ('M. involvens type GM 113 Vosm.'), but does not discuss it or its status. Lévi (l.c.) arranged the Vosmaer fragment among the 'formes dressées', but the RMNH fragment is best described as thickly encrusting.

Both the BMNH slide and RMNH fragment are essentially similar, and possibly are both part of the original type material, although certainty appears lacking. To take away the uncertainty of the exact properties of *Myxilla involvens*, created by the non-representative description and illustrations of the type provided by Hooper (2002), we will here provide a description of the remaining type material and SEM images of the spicules of RMNH 264 and a wet, relatively recent specimen (ZMA Por. 00214) collected near Roscoff.

Antho (Antho) involvens (Schmidt, 1864)

(figs 35A-C, 36A-I, 37A-G)

Myxilla involvens Schmidt, 1864: 37, pl. IV fig. 6.
Hymedesmia involvens; Schmidt, 1866: 16.
Isodictya beanii Bowerbank, 1866: 334; Bowerbank, 1874: 157, pl. LVIII figs 1-6.
Antho involvens; Gray, 1867: 524; Topsent & Olivier, 1943: 2; Lévi, 1960a (in part): 76; Ackers et al. 1992: 83.
Desmacodes involvens; Vosmaer, 1880: 108.
Dictyoclathria beanii; Burton, 1933: 504.

Material.— Slide (BMNH 1867.3.11.92), 'Myxilla involvens' Adriatic, Schmidt nr. 64, dissociated spicules; (RMNH 264) 'Myxilla involvens, Lacroma', collection Museum Graz, Vosmaer R 113; (ZMA Por. 00214) of *Antho involvens*, France, Roscoff, La Tortue, 20-25 m, coll. G. Kleeton, 7.viii.1964.

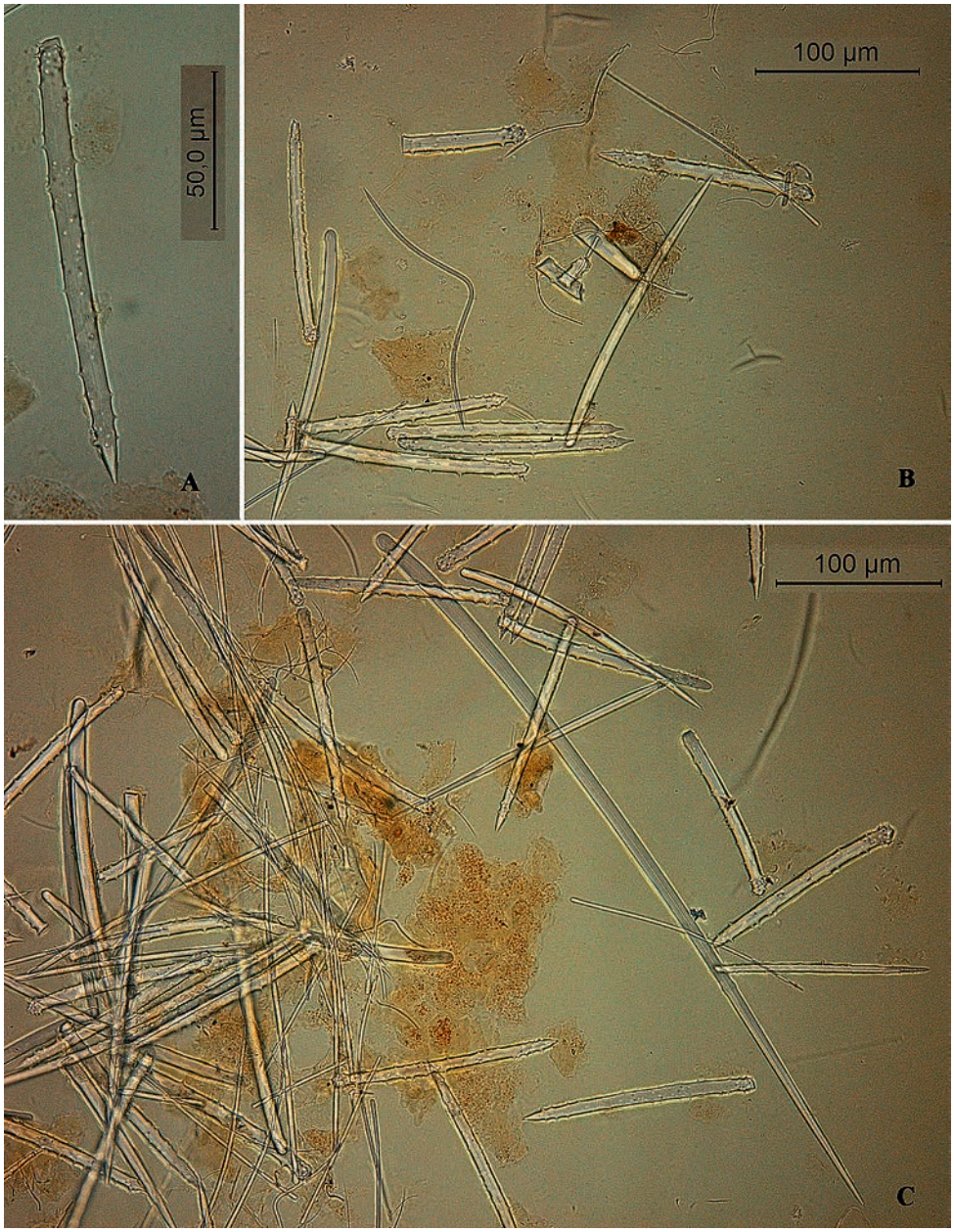


Fig. 35. *Antho (Antho) involvens* (Schmidt, 1864), light microscopic images of spicules from slide (BMNH 1867.3.11.92) made of the presumed holotype of *Myxilla involvens* (not presently located), A, acanthostyle of the basic reticulation (scale bar = 50 µm), B, smooth ended toxas, short smooth styles and acanthostyles (scale bar = 100 µm), C, overview of spicules with a.o. long ectosomal styles, subtylostyles and chelae (scale bar = 100 µm).

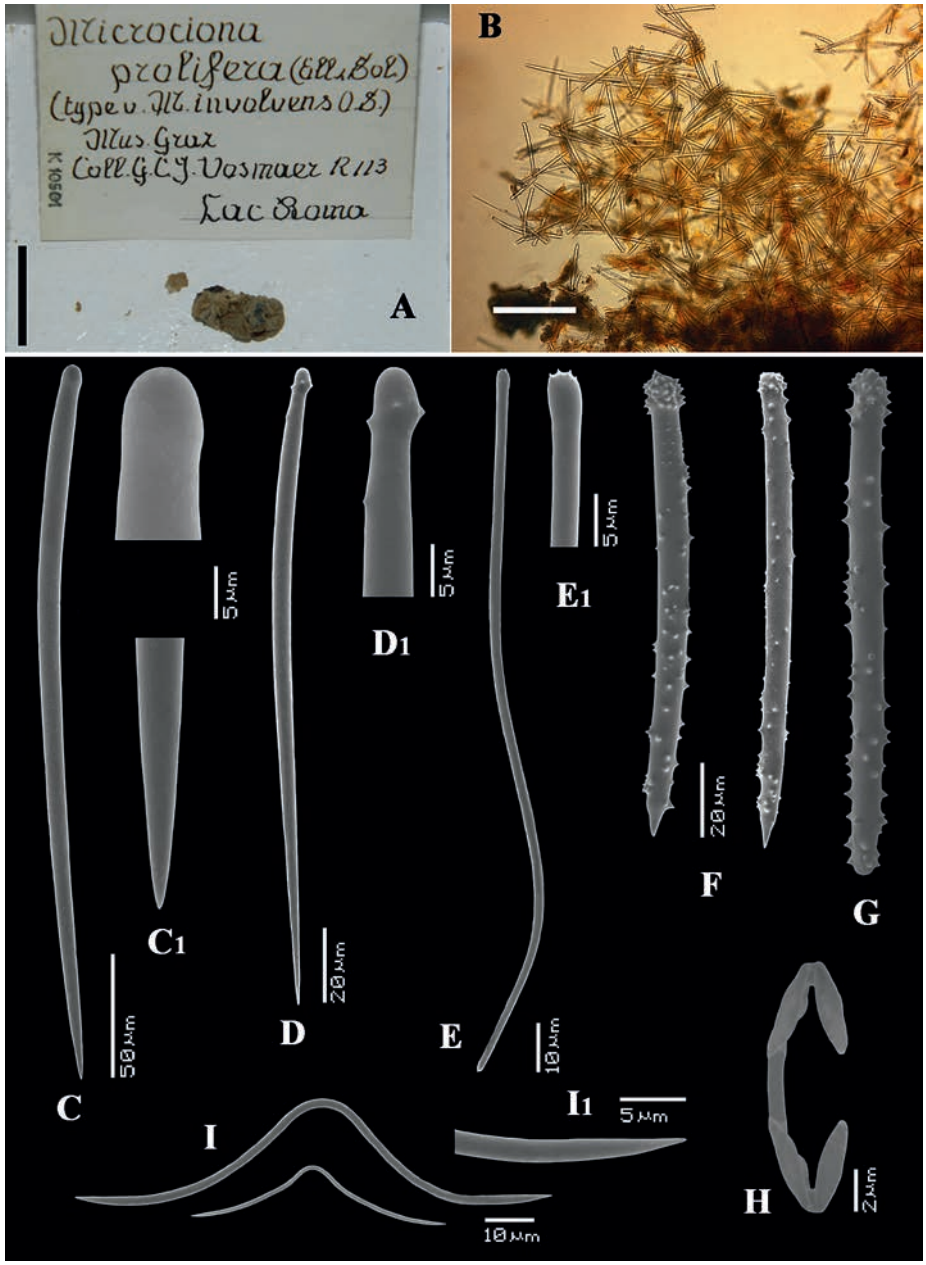


Fig. 36. *Antho (Antho) involvens* (Schmidt, 1864), possible original Schmidt material from the Landesmuseum Johanneum at Graz, presently preserved in Leiden (RMNH Por. 264), A, fragment from the Vosmaer collection (scale bar = 1 cm), B, cross section of skeleton (scale bar = 200 µm), C-I, SEM images of spicules, C-C1, ectosomal style and detail of head and pointed end, D-D1, choanosomal style and detail of head showing incipient spination, E-E1, ectosomal subtylostyle and detail of head, F, acanthostyles of the basal reticulation, G, acanthostrongyle from the basal reticulation considered a mere modification of the acanthostyles, H, palmate isochela, I-I1, wing-shaped toxas and detail of smooth ending.

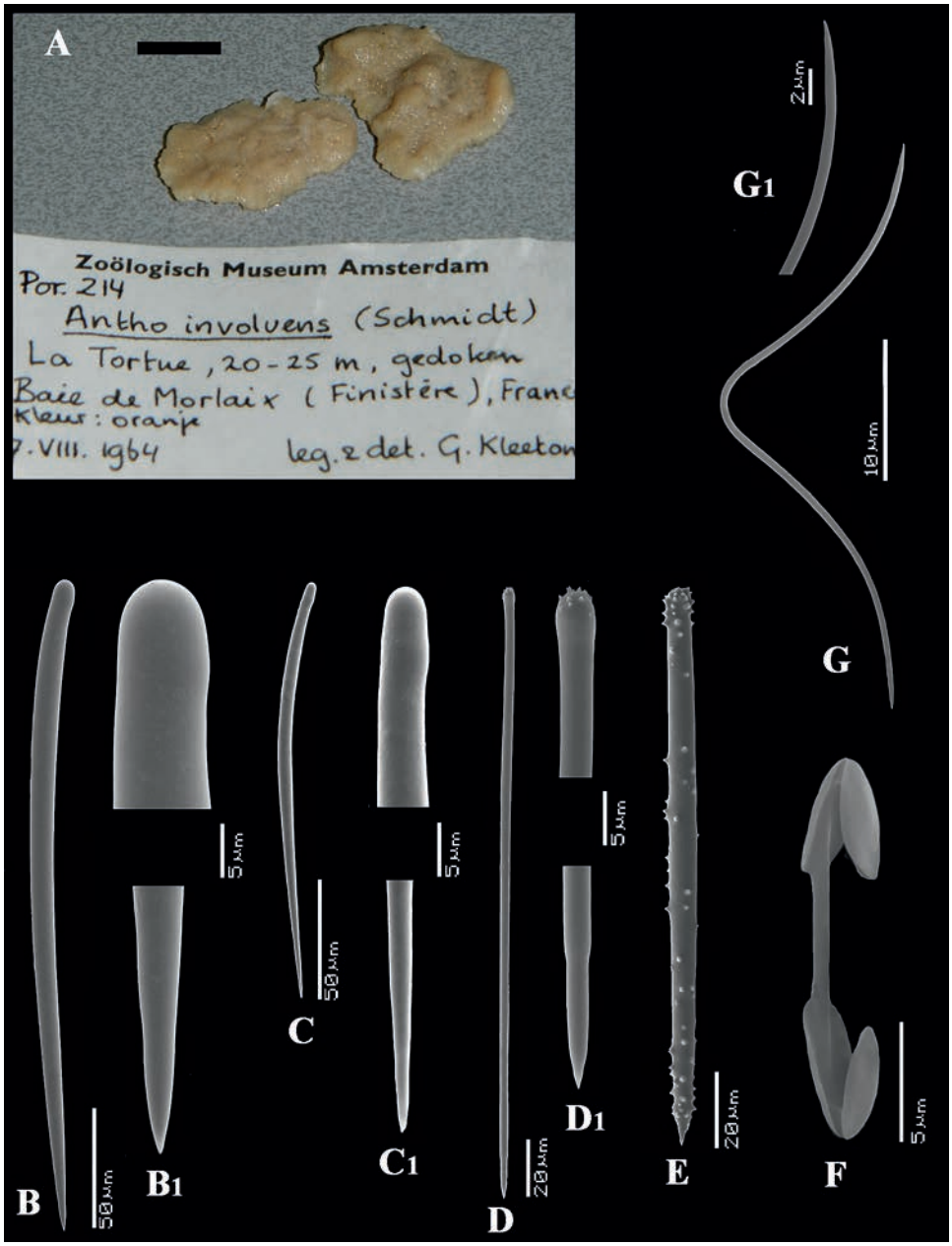


Fig. 37. *Antho (Antho) involvens*, specimen (ZMA Por. 00214) from Roscoff, A, habit (scale bar = 1 cm), B-G, SEM images of spicules, B-B1, ectosomal style and detail of head and pointed end, C-C1, choanosomal style and detail of head, D-D1, ectosomal subtylostyle and detail of head, E, acanthostyle of the basal reticulation, F, palmate isochela, G-G1, wing-shaped toxas and detail of smooth ending.

Description.— Material available from the Mediterranean, which comprised of dry fragments (fig. 36A) and slides, does not allow a detailed description of the habit. The Roscoff specimen (now in two fragments) is an uneven, rather thick crust, approximately 3 × 4 × 0.5 cm (fig. 37A). Consistency firm. Colour orange. A colour photo in Ackers et al. (1992: 83) shows evenly distributed slightly elevated oscules.

Skeleton.— Renieroid (fig. 36B), with long styles erect on the network and protruding slightly beyond the surface. Ectosomal subtylostyles are partially erect, partially in tangential position. Basal reticulation consisting of smaller smooth styles (usually in ascending tracts of one to three spicules) and acanthostyles connecting the ascending tracts. Acanthostrongyles occur in a low proportion and are obvious derivates of the acanthostyles.

Spicules.— (figs 35A-C, 36C-I, 37B-G) Ectosomal subtylostyles, subectosomal long styles, basal styles, basal acanthostyles/acanthostrongyles, toxas, palmate isochelae.

Subtylostyles (figs 36E, 37D)), with slightly swollen, microspined heads, 147-304 × 2-5 μm.

Long styles (figs 35C, 36C, 37B), slightly curved, with barely developed smooth heads, slightly subterminally constricted, 243-510 × 10-14 μm.

Short styles (figs 35B, 36D, 37C), shaft smooth, with occasional spines on or near the slightly constricted head, 164-300 × 8-11 μm.

Acanthostyles/strongyles (figs 35A, 36F-G, 37E), entirely heavily spined, robust or thick, with characteristic 'cut-off' heads, 123-165 × 5-13 μm.

Toxas (figs 35B, 36I, 37F), wing-shaped, smooth apices, not upturned, 21-228 μm.

Palmate isochelae (figs 36H, 37G), typical shaped, 13-19 μm.

Ecology: On hard substratum, subtidal.

Distribution: Adriatic, Western Mediterranean, Atlantic coasts of Spain and France, British Isles. Occurrence on the Atlantic islands (Canary Islands, Azores) needs confirmation.

Remarks.— Hooper (1996) assigned *Plocamia inconstans* Topsent, 1925 to the synonymy of *A. involvens*, but this is contested by Ackers et al. 1992 (more in particular by co-author B. Picton), who distinguish the two as separate species, occurring apparently side by side over a large geographic area from the Mediterranean to the Atlantic coasts of Spain and France, to Britain and Ireland. Lévi (1960a) followed by Descatoire (1969) and Solórzano & Babio (1979) maintained it as a variety of *A. involvens*. In view of the rarity or virtual lack of acanthostrongyles in most descriptions of *A. involvens*, it would seem to be prudent to keep *A. inconstans* as a separate species. No specimens of this species have been found in the present collection.

Isodictya beanii Bowerbank, 1866 is described (p. 334-335) and figured (Bowerbank, 1874: pl. LVIII figs 1-6) as an encrusting sponge of 2.5 × 2 × 0.3 cm, with an uneven surface and a reticulate skeleton of smooth styles (210 × 10 μm) in the primary 'lines' and robust acanthostyles (140 × 16 μm) in the secondary lines. At the surface there are 'bristling' spicules, presumably the long smooth styles, not shown in pl. LVIII, and subtylostyles of 160 × 2 μm. Microscleres are typical shaped palmate isochelae of 18 μm and wing-shaped toxas of 230 μm, not shown to have spines. This description conforms to *Antho (Antho) involvens*.

A further problem in delimiting the type species of *Antho* is the fact that *Clathria (=Antho) morisca* Schmidt, 1868 has been considered a junior synonym of *Myxilla invol-*

vens by authorative authors such as Topsent, Burton and Lévi, followed by almost all subsequent authors describing or listing *Antho involvens*. However, *Antho morisca* is an arborescent species distinguished also by having the apices of the toxas spined/rugose (faintly, but visible both under SEM and in light microscropy), whereas *Antho involvens* is encrusting and has smooth toxa apices. Below we record an arborescent specimen from near the Canary Islands and we will compare it with type and other original material to demonstrate the differences with *Antho involvens*. It is proposed here to revive *Clathria* (= *Antho*) *morisca* as a species distinct from *Myxilla* (=*Antho*) *involvens* until additional independent evidence (e.g. gene sequences) has been provided to decide one way or the other.

A frequently mentioned junior synonym of *Antho (Antho) involvens* is the encrusting *Artemisina mediterranea* Babiç, 1922, but the description of that species specifically mentions the spined toxas, which have not been found to occur in specimens of *A. (A.) involvens* described above. Babiç' material is no longer extant, but below we report a similar specimen from Madeira, and as a result we propose to revive *Antho (Antho) mediterranea* as a distinct species.

Antho (Antho) atlantidae **spec. nov.**
(figs 38A-I)

Antho involvens; Burton, 1956: 133 (not: *Myxilla involvens* Schmidt, 1864: 37, pl. IV fig. 6)

Material.— Holotype (ZMUC unnumbered, Burton's nr. 19w), Guinea, off Conakry, 9.3333°N 14.25°W, 32 m, bottom shell, foraminifera, Atlantide Expedition stat. 145, 13.iv.1946.

Description.— A mass of eight to ten small bushes (fig. 38A) consisting of knobby rounded dichotomously dividing branches. Individual bushes 2 to 5 cm high and wide, individual branches approximately 0.3-0.5 cm in diameter, up to 2 cm in length. Ends of branches rounded. Colour (preserved condition) warm brown. Consistency soft, but resilient. Surface finely hispid, without apparent apertures.

Skeleton.— (fig. 38B) Irregular basal reticulation of relatively thin and short styles, little visible binding spongin, arrangement largely unispicular, but with visible ascending tracts. At the surface single longer styles are protruding. Ectosomal skeleton of individual subtylostyles arranged partially tangential.

Spicules.— (figs 38C-I) Ectosomal subtylostyles, (sub-)ectosomal long styles, choanosomal styles, echinating acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 38F), straight, with barely developed microspined heads, 165-*219.7*-279 × 1.5-*1.9*-2.5 μm.

Styles of the ectosome (fig. 38C), long, thin, smooth with faint constriction below the slightly swollen smooth head, 186-*278.3*-396 × 3.5-*5.2*-6 μm.

Styles of the basal skeleton (figs 38D-E), shorter than those of the ectosome, either smooth (fig. 38D) or more often with a few spines spread along the shaft (fig. 38E), mostly in the region close below the head, 111-*135.4*-156 × 3.5-*4.6*-6 μm.

Acanthostyles of the basal skeleton (fig. 38G), similar to or perhaps intergrading with the smooth basal styles, but shorter and entirely spined, 63-*72.4*-81 × 3-*4.1*-6 μm.

Toxas (fig. 38I), wing-shaped, thin, with prominently spined apices, 9-*48.2*-105 μm.

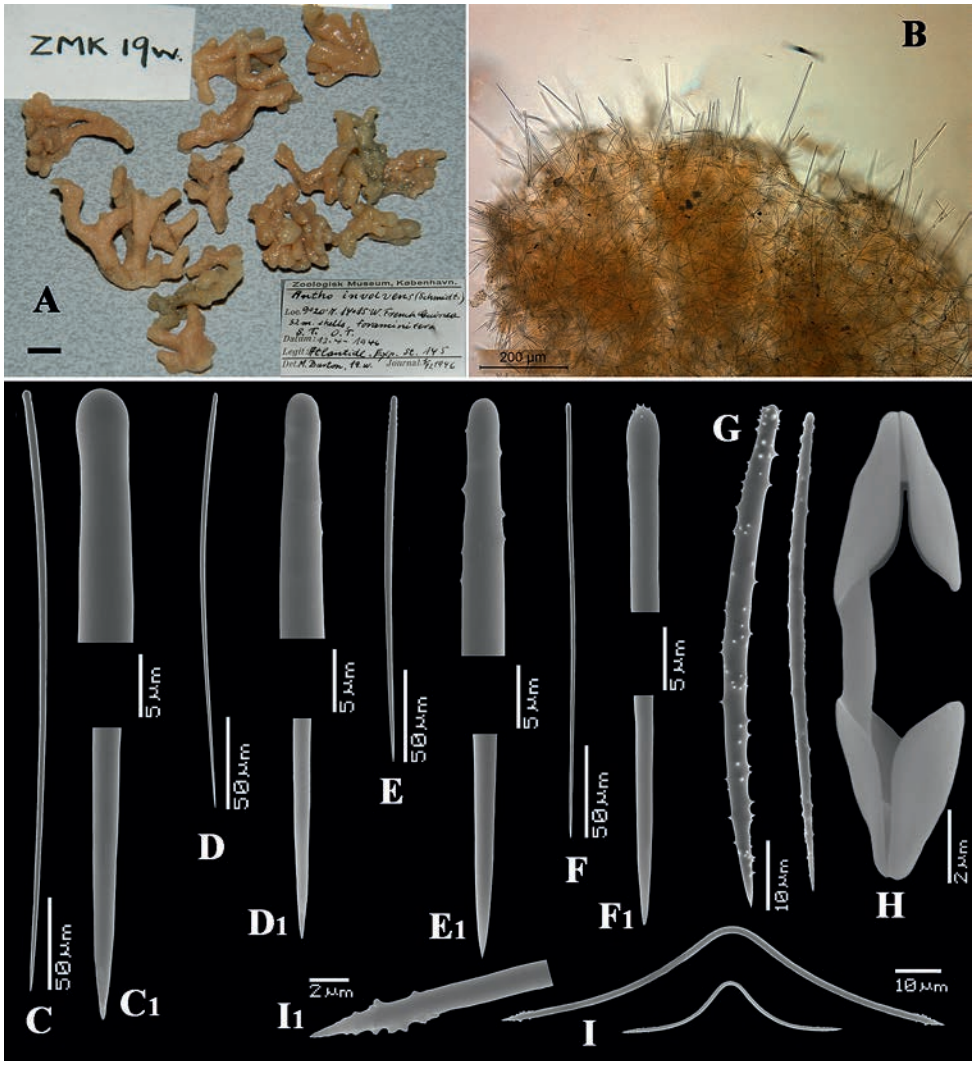


Fig. 38. *Antho (Antho) atlantidae* spec. nov., A, holotype (ZMUC, #19w) from Guinea (scale bar = 1 cm), B, cross section of apex of branch showing basal reticulation and protruding long styles (scale bar = 200 µm), C-I, SEM images of spicules, C-C1, long smooth style of peripheral skeleton and detail of head and pointed end, D-D1, short smooth choanosomal style, E-E1, faintly spined choanosomal style, F-F1, ectosomal subtylostyle, G, acanthostyles of the basal reticulation, H, palmate isochela, I-I1, toxas with detail of spined ending.

Palmate isochelae (fig. 38H), typical shaped, relatively small, 10-*12.3*-13 µm.

Etymology.— Named after the expedition vessel Atlantide.

Ecology.— Shelf water with hard bottom.

Distribution.— So far known only from Guinea in tropical West African waters.

Remarks.— Burton's identification of this species as *Antho involvens* is obviously

wrong as almost all morphological features of the present material differ clearly from the presumed type and other reliably identified material of that species (see also above). *A. (A.) involvens* is encrusting, its acanthostyles are different in size and ornamentation, the ectosomal styles are longer and thicker, and the toxas do not have spined apices. Comparison with *Antho (A.) morisca* is more relevant: this is larger-shaped, and less tightly branched, it has longer and thicker styles and acanthostyles, and a larger range of toxas. The other branching *Antho* species are more distantly related: *A. (Acarnia) elegans* (Ridley & Dendy, 1886) has acanthostrongyles, whereas *A. (Antho) paradoxa* (Babiç, 1922) differs in possessing giant toxas and its small normal-shaped toxas have smooth apices. *A. (Plocamia) erecta* (Ferrer Hernandez, 1923) and *A. (Plocamia) hallezi* (Topsent, 1904b) have dumbbell-shaped basal spicules.

Antho (Antho) mediterranea (Babiç, 1922)
(figs 39A-I)

Artemisina mediterranea Babiç, 1922: 258, fig. B1.

Material.— (RMNH 7401), Madeira, SE coast, E of Caniçal, 32.7333°N 16.7167°W, SCUBA diving 0-20 m, CANCAP I 'Onversaagd' Exped. stat. 47, 11.iii.1976.

Description.— Thickly encrusting on dead gorgonian (fig. 39A), size 4 × 1.5 × 0.3 cm, beige to pale yellow in alcohol. Surface irregular, with pits and grooves, some of which may be oscules. Consistency soft, easily damaged.

Skeleton.— (figs 39B-C) An anisotropic, neatly renieroid reticulation of spongin-ensheathed spicule tracts with a core of 2-4 spicules in cross section and interconnecting fibers cored by 1-2 spicules. Coring spicules of the ascending fibers are usually smooth styles, while the interconnecting fibers have spicules with spined heads, but the latter may occur frequently also in the ascending fibers. At the surface smooth styles protrude individually or in twos or threes, and these are surrounded by ectosomal subtylostyles.

Spicules.— (figs 39D-I) Ectosomal subtylostyles, longer and shorter smooth styles, acanthostyles with irregular heads and smooth shafts, toxas, palmate isochelae.

Subtylostyles (fig. 39G), straight, microspined heads, 135-*270.9*-375 × 2.5-*2.7*-3.5 μm.

Styles (figs 39D-E), smooth, fusiform, but there are often a few spines on the barely swollen heads which are slightly narrower than shaft; they are divisible in longer ectosomal (fig. 39D, 302-588 μm) and shorter choanosomal styles (fig. 39E, 174-219 μm), overall style size 174-*373.7*-588 × 4-*7.1*-10 μm.

Acanthostyles from the basal skeleton (fig. 39F), with irregular heads, but lacking proper spines and thus difficult to separate from smaller smooth styles, shaft smooth, fusiform, 135-*155.2*-186 × 4-6.3-8 μm.

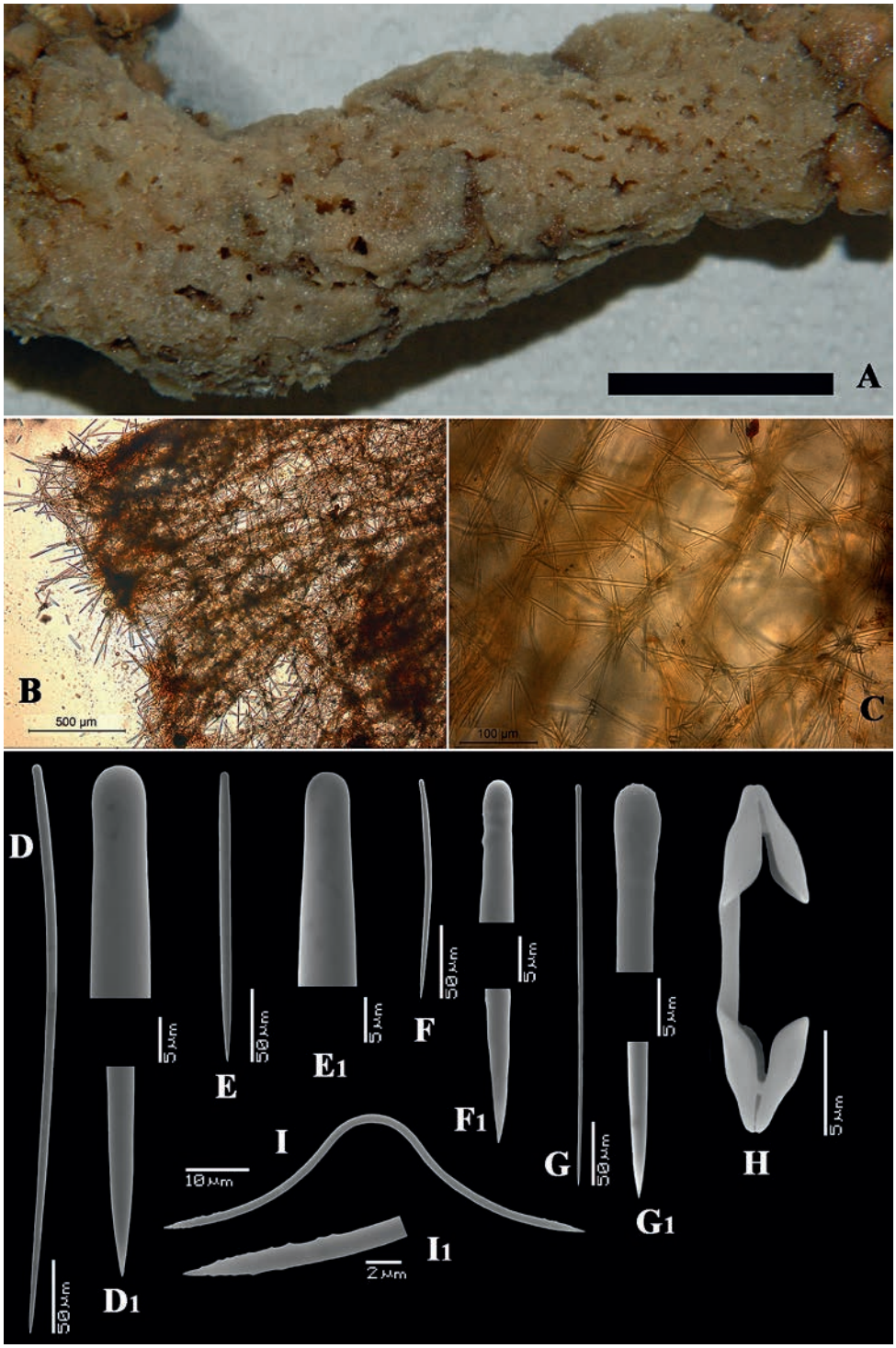
Toxas (fig. 39I), wing-shaped, thin, with a medium curvature and faintly spined apices, 36-*83.1*-114 μm.

Palmate isochelae (fig. 39H), typical-shaped, 17-*19.3*-22 μm.

Ecology.— Shallow depth, on hard substratums.

Distribution.— Madeira.

Remarks.— All material of Babiç (1922) was lost in the 1956 Budapest troubles (Boros, 1957), although Burton (1930: 533) has apparently studied a preparation from


A
B
500 µm
C
100 µm
D
5 µm
50 µm
D1
E
50 µm
E1
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F
50 µm
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I
10 µm
I1
2 µm
G
50 µm
5 µm
G1
H
5 µm

◀ Fig. 39. *Antho (Antho) mediterranea* (Babiç, 1922), specimen (RMNH Por. 7401) from Madeira, A, habit (scale bar = 1 cm), B, cross section of peripheral skeleton (scale bar = 500 μm), C, cross section of basal reticulation (scale bar = 100 μm), D-I, SEM images of spicules, D-D1, long ectosomal smooth style and detail of head and pointed end, E-E1, small choanosomal smooth style with detail of head, F-F1, irregular headed smooth style from the basal reticulation, presumably homologous to acanthostyle, with detail of head, G-G1, ectosomal subtylostyle with detail of head and pointed ending, H, palmate isochela, I-I1, wing-shaped tox and detail of spined ending.

the holotype. Babiç' description leaves little doubt that his encrusting specimen, synonymized with *A. (A.) involvens* by several authors (see e.g. Hooper, 1996), is distinct by having spined toxa endings. Babiç' material apparently had spined acanthostyles, whereas our specimen has them largely smooth, but overall there is considerable similarity. Our material conforms closely to Cruz's (2002) description from the Canary Islands as *Antho involvens*, although he did not discriminate between the various style types. Possibly, Pulitzer-Finali's (1983) *A. involvens* from Southern Italy also belongs here, as it is described as having almost smooth 'acanthostyles' and faintly spined apices on the toxas. *A. (A.) involvens* is widely recorded from the Mediterranean, NW Europe, Azores, Canary Islands; elsewhere from the Gulf of Guinea (Burton, 1956) and South Africa (Lévi, 1963), but many of these records are not conspecific. We compared our material with the slide from Schmidt's type in the Natural History Museum, BMNH 1867.3.11.92 (see above, fig. 35), a possible type fragment of *Myxilla (=Antho) involvens*, RMNH 264, labeled 'Mus. Graz, Coll. G.C.J. Vosmaer R 113 Lacroma' (Adriatic) (see above, fig. 36), and with a specimen from Roscoff, W coast of France, ZMA Por. 00214 (see above, fig. 37). These specimens are generally similar in structure and agree with Schmidt's slide in spicule morphology and sizes, but they differ in having much less spongin, and the styles of the basal reticulation are proper acanthostyles, thicker and much more heavily spined, than in our specimen, and having characteristic 'cut-off' heads. Additionally, the smooth subectosomal styles that project from the basal skeleton are somewhat thicker (8-14 μm) and the chelae are smaller (15-18 μm) than in our present specimen. The toxas have smooth apices in contrast to the spined condition in our present specimen. These differences are here treated as indication of specific distinctness.

Specimens reported as *Antho involvens* from Guinea (Burton, 1956) and Agulhas region, South Africa (Lévi, 1963) are certainly different, both from our present material and from the type material of *A. (A.) involvens*. Burton's specimen is arborescent with thin branches of 2 mm diameter and it has very small acanthostyles (66-81 μm), small toxas (up to 48 μm) and small palmate isochelae (10-13 μm). Above (see fig. 38), it is described as a new species, *A.(A.) atlantidae* spec. nov. Lévi's (1963) South African specimen is thickly encrusting and has acanthostrongyles, small (12 μm) isochelae, and spined apices on the toxas (Lévi, 1963: 62, fig. 72). It is clearly different from the restricted concept of *A. (A.) involvens* employed here.

Antho (Antho) burtoni (Lévi, 1952 as *Plocamilla*) from Senegal is also encrusting and appears closely related. It differs in having the spicules of the basal reticulation fully spined and many are acanthostrongyles; toxas are also more diverse (two or three separate sizes) and longer (see also below). Maldonado (1992) suggested that *A. (A.) mediterranea* could belong to *Antho novizelanica* (Ridley & Duncan, 1881), a New Zealand species possessing dumbbell spicules. It is unlikely that a New Zealand species would occur in

the Mediterranean-Atlantic region. It is more likely that Maldonado's record of *A. novizelanica* from the Alboran Sea could be conspecific with *Antho (Antho) burtoni* (see below).

Antho (Antho) morisca (Schmidt, 1868)
(figs 40A-H)

Clathria morisca Schmidt, 1868: 9, pl. II fig. 7; Topsent, 1938: 11 (incorrectly considered as a synonym of *A. (A.) involvens*).
Myxilla banyulensis Topsent, 1892: xxiii.
Dictyoclathria morisca; Topsent, 1920: 18; Topsent, 1928: 301, pl. III fig. 3 (not: Lévi, 1959: 134, pl. 5 fig. 1, text-fig. 27 = *Clathria (C.) hjorti*).
Clathria vicina Topsent, 1920: 18.

Material.— (RMNH 7423), Canary Islands, S of La Palma, 28.5333°N 17.8833°W, 1000 m, bottom sand, Van Veen grab, CANCAP 4 stat. 128, 30.v.1980.
Examined for comparison.— Holotype (MNHN D.T. 2170) *Clathria morisca* Schmidt, Expédition scientifique d'Algérie 1868 No. 24; holotype slide (BMNH 1868.3.2.21), *Clathria morisca* Schmidt, 1868, Algier No. 10, dissociated spicule slide; (Musée de Zoologie, Strasbourg unnumbered), *Clathria morisca*, Marseille; (MNHN LBIM D.T. 321 and 322), 3 slides, Naples, 1920, Topsent collection; (RMNH 956), Adriatic, Triest, Vosmaer collection; (RMNH unregistered), *Clathria morisca*, 'Paris, Type G.V. nr. 186', Vosmaer collection, 2 slides nrs. 1579-1580; holotype slide (MNHN LBIM D.T. 2169), *Clathria vicina* Topsent, 1920, Naples, Schmidt collection Musée de Zoologie Strasbourg.

Description.— Arborescent sponge (fig. 40A), densely dichotomously branched in all directions, with little or no anastomoses. Size 15 cm wide, 13 cm high, branches on average 5 mm in diameter, ends rounded. Colour in alcohol greyish light brown. Surface hispid. No apparent oscules. Consistency limp, easily damaged.

Skeleton.— (fig. 40B) Irregular renieroid reticulation of spongin-enforced ascending tracts, cored by smooth styles and lightly spined acanthostyles, connected by short tracts cored by acanthostyles. Surface skeleton consists of single long styles surrounded by ectosomal subtylostyles.

Spicules.— (figs 40C-H) Ectosomal subtylostyles, styles, acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 40E), straight, slightly fusiform in the longer ones, with elongated miscrospined heads, in a large size range, 126-*278.4*-391 × 1-*1.7*-3 μm.

Styles (figs 40C-D), often slightly constructed below the head, smooth, but with occasional spines especially in the shorter coring styles; the ectosomal longer styles (fig. 40C) measure 312-*417.1*-516 × 5-*6.7*-9 μm, the shorter styles (fig. 40D) from the basal reticulation 171-*203.2*-249 × 5-*7.2*-9 μm.

Acanthostyles (fig. 40F), occasionally resembling the shorter styles but entirely spined, 105-*117.3*-138 × 4-*5.3*-7 μm.

Toxas (fig. 40H), wing-shaped, thin, deeply curved, with faint spination on the endings, 33-*71.2*-138 μm.

Palmate isochelae (fig. 40G), typical-shaped, 14-*15.6*-17 μm.

Ecology.— Deeper water (43-1425 m), sandy bottom.

Distribution.— Canary Islands, Madeira Archipelago, Mediterranean.

Remarks.— Although the present specimen, like one of Topsent's (1928) specimens,

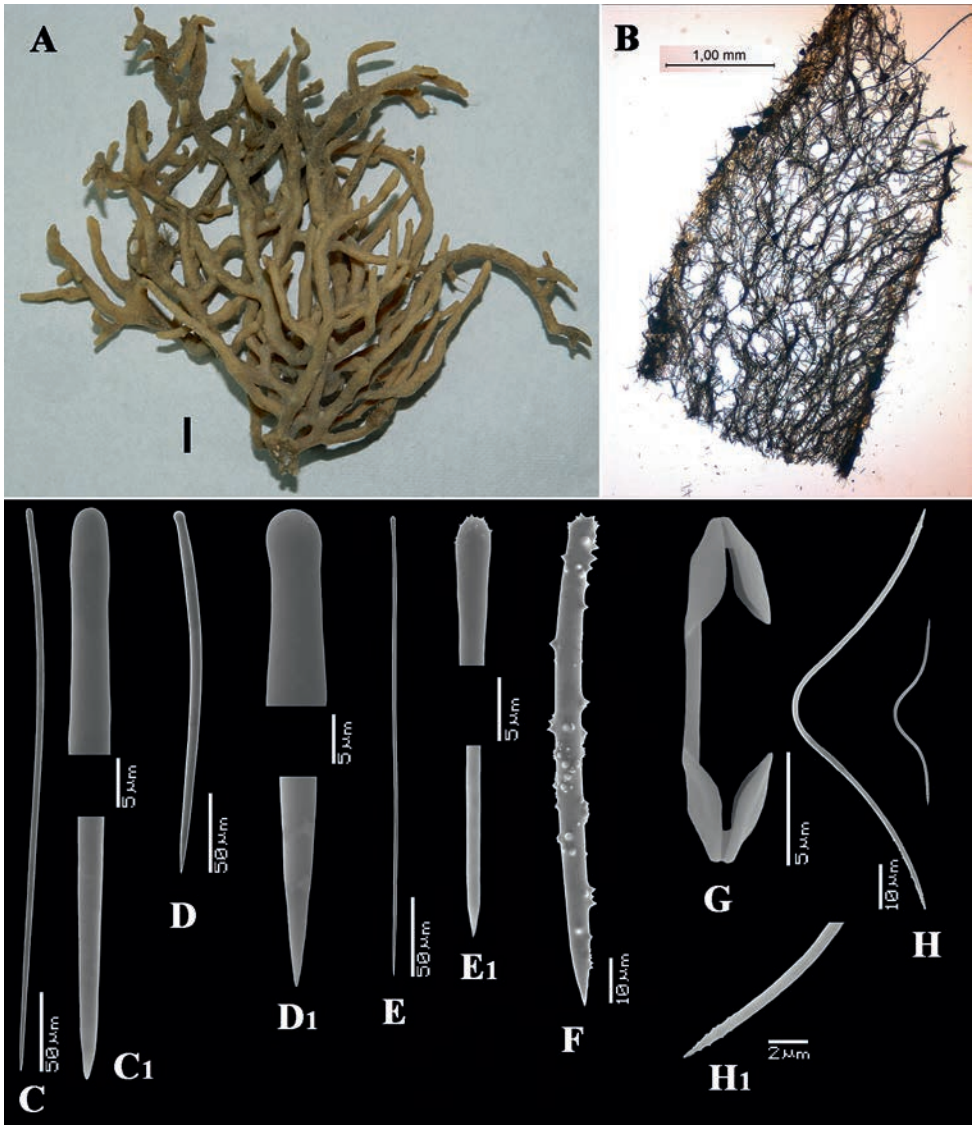

Fig. 40. *Antho (Antho) morisca* (Schmidt, 1868), specimen (RMNH Por. 7423) from the Canary Islands, A, habit (scale bar = 1 cm), B, cross section of branch to show the irregular reticulation (scale bar = 1 mm), C-H, SEM images of spicules, C-C1, long ectosomal smooth style and detail of head and pointed end, D-D1, small choanosomal smooth style with detail of head and pointed end, E-E1, ectosomal subtylostyle with detail of head and pointed end, F, acanthostyle from the choanosomal reticulation, G, palmate isochela, H-H1, wing-shaped toxas and detail of spined ending.

was collected at considerable depth (1000 m), the shape, skeletal structure and spicule characters are closely similar to those of specimens identified by Schmidt, following Topsent's (1920) redescription of these.

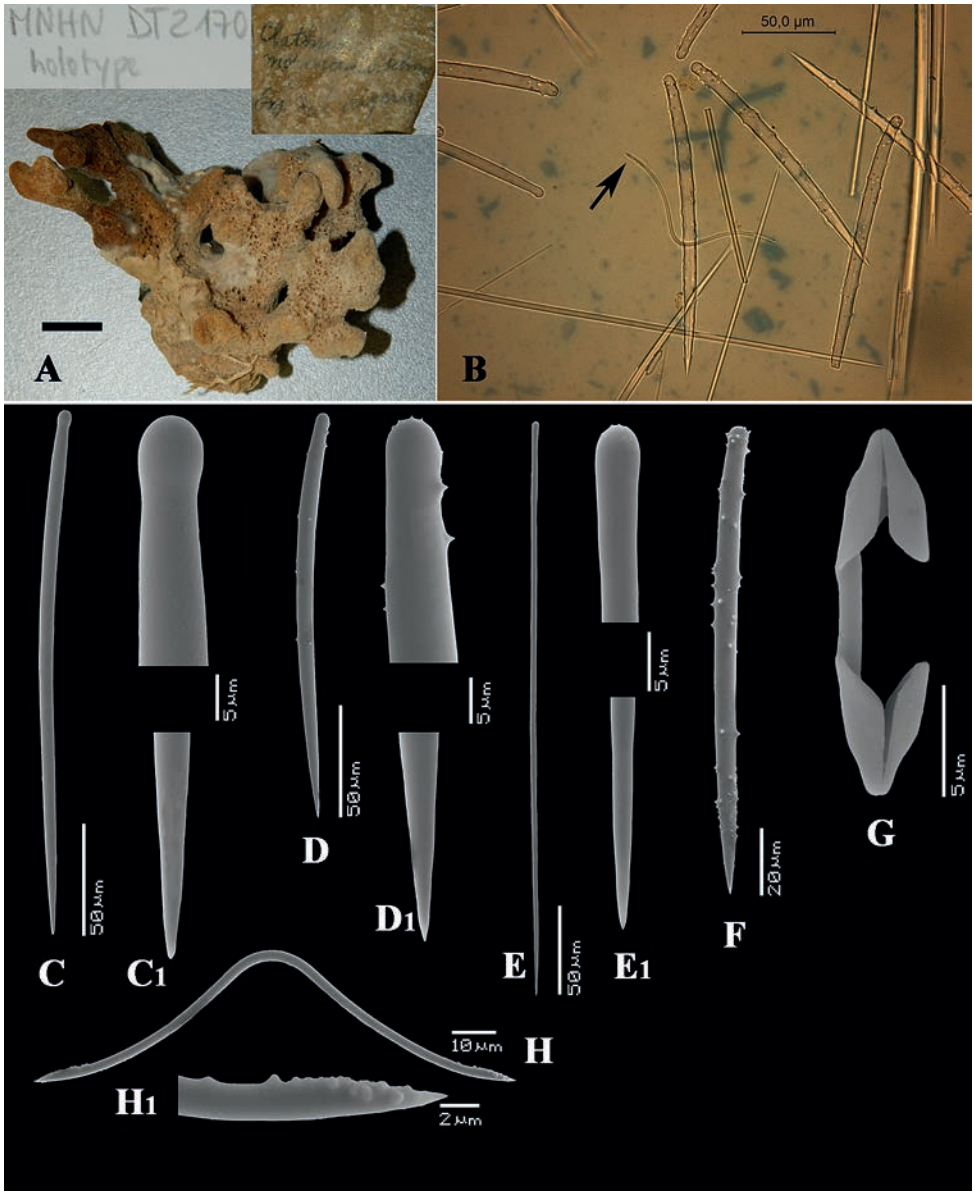

Fig. 41. Type material of *Clathria morisca* Schmidt, 1868 (= *Antho (Antho) morisca*), A, dry holotype (MNHN D.T. 2170), from Algeria (scale bar = 1 cm), B, light microscopic image of spicule slide (BMNH 1868.3.2.21), showing a.o. tox with spined ending (arrow) (scale bar = 50 µm), C-H, SEM images of spicules of the holotype (MNHN D.T. 2170), C-C1, long ectosomal smooth style and detail of head and pointed end, D-D1, small choanosomal smooth style with detail of head and pointed end, E-E1, ectosomal subtylostyle with detail of head and pointed end, F, acanthostyle from the choanosomal reticulation, G, palmate isochela, H-H1, wing-shaped tox and detail of spined ending.

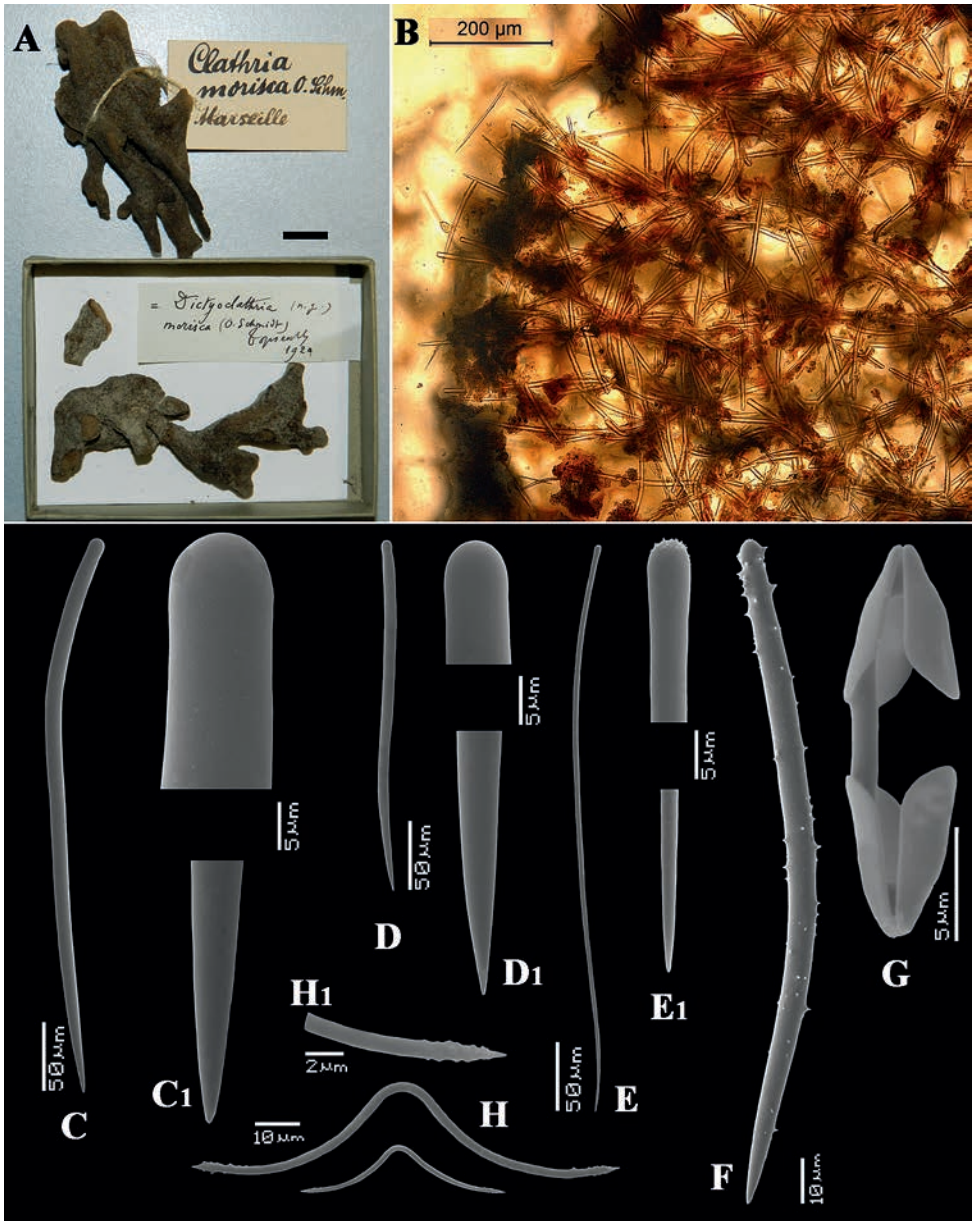

Fig. 42. *Dictyoclathria morisca* (= *Antho (Antho) morisca*), MZUS material from Marseille, described by Topsent (1920), A, dry fragments (scale bar = 1 cm), B, light microscopic image of cross section of peripheral region showing skeletal reticulation (scale bar = 200 µm), C-H, SEM images of spicules, C-C1, long ectosomal smooth style and detail of head and pointed end, D-D1, small choanosomal smooth style with detail of head and pointed end, E-E1, ectosomal subtylostyle with detail of head and pointed end, F, acanthostyle from the choanosomal reticulation, G, palmate isochela, H-H1, wing-shaped toxas and detail of spined ending.

We reexamined a type slide from BMNH (fig. 41B) and the holotype from MNHN (fig. 41A), presumed to be both from the same specimen, and several other original slides from MNHN and specimens from MZUS (see fig. 42 and below) conforming to the type of *Clathria morisca*, all from the Western Mediterranean. We present images of the spicules of the type (see figs 41C-H, 42C-H). We summarize here collective spicule data of these specimens: subtylostyles with microspined heads 153-447 × 2-4.5 μm; long (ectosomal) smooth styles, 216-648 × 6-14 μm; short styles, often with a few spines on the head and less often with a few spines on the shaft (then grading into acanthostyles), 148-298 × 6-11 μm; acanthostyles, entirely but rather lightly spined, with tapering ends, 81-189 × 4-12 μm; wing-shaped, with a deep curvature, and apices invariably spined or rugose, 29-225 μm; typical shaped palmate isochelae, 16-23 μm.

Clathria vicina, a manuscript name of Schmidt based on a specimen from Naples, was mentioned by Topsent (1920), assigning it to *Dictyoclathria morisca* without description. This means that the name *Clathria vicina* is technically a nomen nudum. However, we were able to study a slide from MNHN (LBIM D.T. 2169) labeled with this name and can confirm that it belongs to *Antho (Antho) morisca*: subtylostyles with microspined heads, 204-447 × 2.5-4.5 μm, long styles 339-489 × 8-11 μm, short styles, 162-231 × 7-9 μm, acanthostyles 138-149 × 7-9 μm, toxas with spined apices 33-225 μm and palmate isochelae 19-23 μm.

The material from Marseille described by Topsent (1920) as *Dictyoclathria morisca* is still preserved (dry) in the Zoological Museum of Strasbourg (with a spicule slide in the Paris Museum), and through the courtesy of Dr Marie Meister of the museum we were able to examine it. We present here images of the habit, skeleton and spicules (figs 42A-H) to show their correspondence with our Canary Island material. A spicule difference is the slightly larger size of the ectosomal subtylostyles, which in the Marseille material may reach 430 × 5 μm. The short styles of the choanosomal reticulation are entirely smooth in the Marseille material (as in our Canary Island specimen), whereas the holotype (MNHN D.T.2170) and the slide of *Clathria vicina* have often a few spines. Apparently these spicule characters are variable. No such variability is apparent in the spination of the toxas: all above discussed specimens possess them.

Myxilla banyulensis Topsent, 1892 was synonymized by Topsent himelf (1920: 18) with *Clathria (=Antho) morisca*. Topsent 's description (1892: xxiii) clearly mentions that his arborescent specimen had spined toxa apices.

Dictyoclathria morisca sensu Lévi, 1959 conforms to *Clathria (Clathria) hjorti* comb. nov. as pointed out above.

Hooper (2002: 456) incorrectly quoted 1864 as the year of description of *Clathria morisca*. It is definitely 1868.

Antho (Antho) nuda n. spec.
(figs 43A-G)

Material.— Holotype (ZMA Por. 06911), Cape Verde Islands, São Tiago, SW coast near Ponta da Cidade, Ciudad Velha, 14.9°N 23.6333°W, 5-15 m, sandy bottom with stones and sabellariid reefs, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D01/09, 20.viii.1986; paratype (ZMA Por. 06931), Cape Verde Islands, São Tiago, SW coast near Ponta da Cidade, Ciudad Velha, 14.9°N 23.6333°W, 4-8 m, steep cliff ending in exposed sandy bottom with stones and sabellariid reefs, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D01A/07, 21.viii.1986; paratype (ZMA Por. 06992a), Cape Verde Islands,

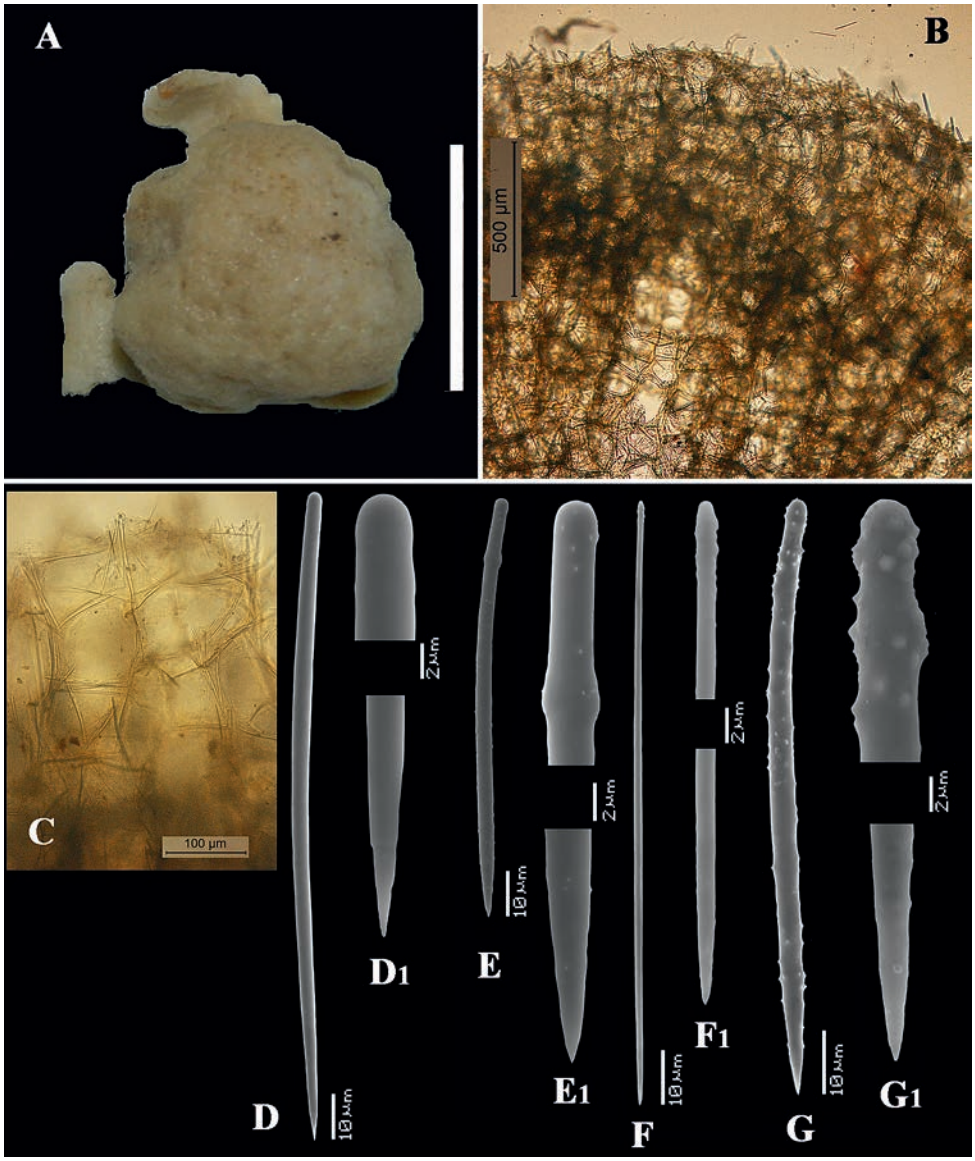

Fig. 43. *Antho (Antho) nuda* spec. nov., A, holotype (ZMA Por. 06911) from the Cape Verde Islands (scale bar = 1 cm), B, cross section of skeleton (scale bar = 500 µm), C, detail of skeleton (scale bar = 100 µm), D-G, SEM images of spicules, D-D1, long ectosomal smooth style and detail of head and pointed end, E-E1, small choanosomal smooth style with detail of head and pointed end, F-F1, ectosomal subtylostyle with detail of head and pointed end, G-G1, acanthostyle from the choanosomal reticulation and detail of head and pointed end.

Maio, SW coast off Punta Preta, 15.1167°N 23.3°W, 5-8 m, exposed sandy bottom with rocks, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D05A/09, 26.viii.1986.

Description.— Small globular sponge (fig. 43A), 1.5 × 1.5 × 1 cm, with somewhat bumpy-pitted surface, no apparent oscules. Paratype specimens are thinly encrusting. Colour dark red-brown in life, turning pale beige in ethanol. Consistency firm, compressible.

Skeleton.— (figs 43B-C) A neatly rectangular anisotropic renieroid reticulation of spongin fibers cored by smooth styles and acanthostyles, with a tangential surface cover of subtylostyles. Ascending fibers 25-35 μm in diameter, cored by 2-4 spicules, connecting fibers 12-36 μm cored by 2-3 spicules. Ascending fibers predominantly cored by smooth styles, but acanthostyles are frequently mixed in, whereas connecting fibers are usually but not exclusively cored by acanthostyles. At the surface smooth styles are fanning out from the endings of the ascending fibers, and mix with the ectosomal subtylostyles.

Spicules.— (figs 43D-G) Ectosomal subtylostyles, ectosomal and choanosomal styles, acanthostyles. No microscleres, although one small toxa (24 μm) was observed. Presumably, this is a contamination.

Subtylostyles (fig. 43F), extremely thin, thread-like, in majority not thicker than 0.5 μm, with swollen irregular heads without clear spines, 136-*175.1*-276 × >0.5-1.5 μm.

Styles (figs 43D-E) consist of ectosomal longer styles (fig. 43D), smooth, straight or slightly curved, head barely developed, and somewhat shorter choanosomal styles (fig. 43E) which show occasional spines, but these styles grade into each other, without clear distinction in size, overall measurements 126-*153.9*-192 × 3-*4.5*-5.5 μm.

Acanthostyles (fig. 43G), straight or slightly curved, entirely but lightly spined, (resembling the shorter or larger smooth styles), 78-*96.1*-102 × 2.5-*3.2*-4 μm.

Etymology.— Nudus (L.) = naked, to indicate the lack of microscleres.

Ecology.— In exposed sandy environment at the bottom of a steep cliff, depth 4-15 m.

Distribution.— So far known only from the islands of São Tiago and Maio, Cape Verde Islands.

Remarks.— It is unusual for species of *Antho* to lack microscleres entirely, so this is a distinctive feature of the new species. The neat renieroid structure of the skeleton resembles that of the arborescent and microsclere-bearing *Antho (Antho) paradoxa* described below, but coring is sparser in the new species.

Antho (Antho) paradoxa (Babiç, 1922)

(figs 44A-C, 45A-G

Artemisina (?) paradoxa Babiç, 1922: 260, pl. 8 fig. 6, text-fig. C.
Not: Lévi, 1960a: 85, fig. 25 = *Antho (Antho) granditoxa* Picton & Goodwin, 2007.

Material.— Neotype (here designated: RMNH Por. 3853), Madeira Archipelago, S of Porto Santo, 33.0333°N 16.35°W, 65-135 m, triangular dredge, CANCAP 3 Expedition stat. 30, 16.x.1978; (RMNH Por. 7697), Madeira Archipelago, S of Porto Santo, 33.0167°N 16.3333°W, 75-125 m, sandy bottom, triangular dredge, CANCAP 4 Expedition stat. 175, 2.vi.1980.

Description.— A tangled mass of dividing and anastomosing thin branches (fig. 44A), up to approximately 30 cm long, individual branches 0.5 cm in diameter. Optically smooth, but microhispid. Occasional oscules of less than 1 mm diameter are scattered over the branches. Consistency firm. Colour (alcohol) pale rose-brown, reddish inside.

Fig. 44. *Antho (Antho) paradoxa* (Babiç, 1922), specimen (RMNH Por. 3853) from Madeira, assigned neotype status herein, A, habit (scale bar = 1 cm), B, cross section of branch to show reticulation of tracts and protruding long styles (scale bar = 500 µm), C, detail of skeleton (scale bar = 100 µm).

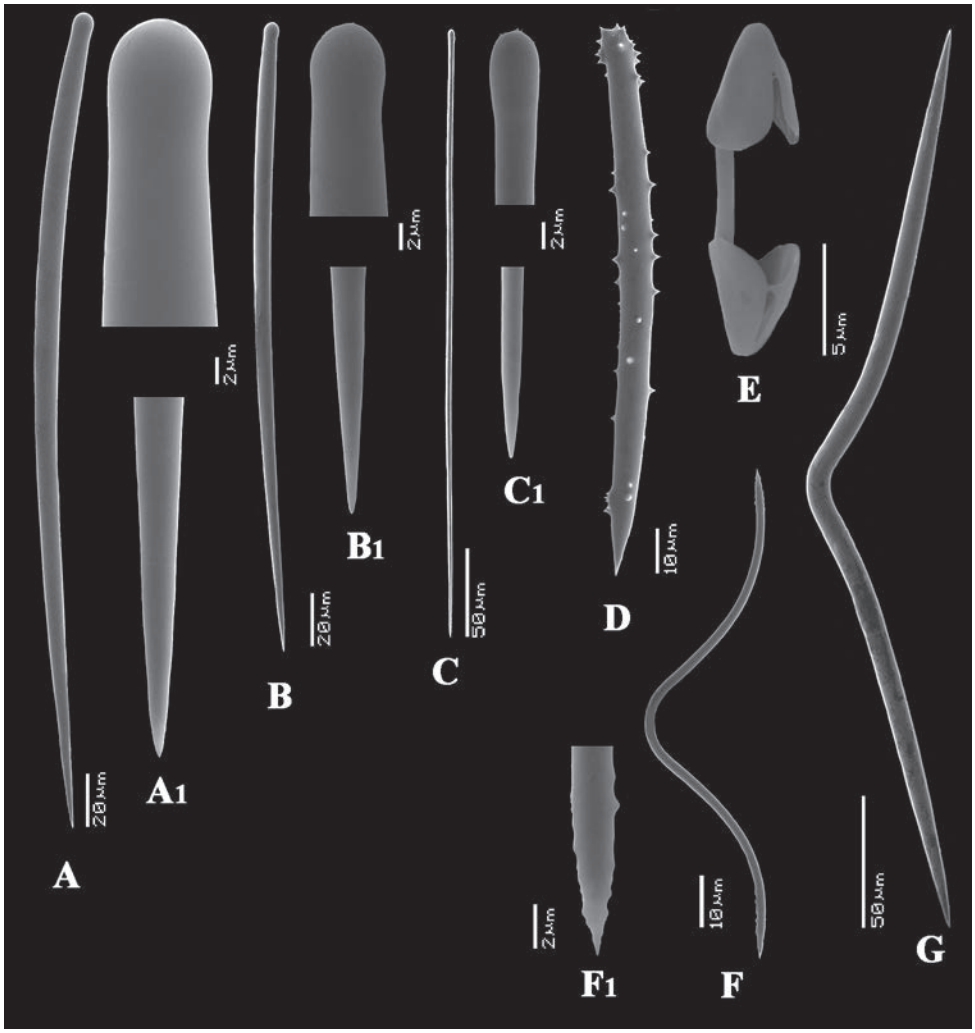

Fig. 45. *Antho (Antho) paradoxa* (Babiç, 1922), specimen (RMNH Por. 3853) from Madeira, assigned neotype status herein, SEM images of spicules, A-A1, long ectosomal smooth style and detail of head and pointed end, B-B1, small choanosomal smooth style with detail of head and pointed end, C-C1, ectosomal subtylostyle with detail of head and pointed end, D, acanthostyle from the choanosomal reticulation, E, palmate isochela, F-F1, wing-shaped toxas and detail of spined ending, G, giant oxeote tox.

Skeleton.— (figs 44B-C) A rectangular anisotropic reticulation of spongin-encased styles. The ascending tracts are cored by predominantly smooth styles, 6-7 in cross section, the interconnecting tracts by 1-3 acanthostyles in cross section (Fig. 44C). Ascending tracts are 40-50 μm in diameter, interconnecting tracts 20 μm. Meshes of the skeleton are 150-200 μm in diameter. Where the ascending tracts reach the surface, long smooth styles protrude individually beyond the dermis (Fig. 44B), surrounded tangentially or obliquely by subtylostyles.

Spicules.— (figs 45A-G) Subtylostyles, ectosomal and choanosomal styles, acanthostyles, two categories of toxas, palmate isochelae.

Subtylostyles (fig. 45C), thin, straight, with only faint spination on the heads (visible only with SEM), 192-*276.5*-438 × 1.5-*2.3*-3 μm.

Styles (figs 45A-B), curved, subterminally constricted, virtually smooth, but some have a few spines on the head, ectosomal longer styles (fig. 45A) measure 321-*391.6*-572 × 4-*9.8*-13 μm, the smaller (fig. 45B) from the basal skeleton 195-*238.6*-276 × 6-*8.1*-12 μm.

Acanthostyles (fig. 45D), curved, relatively lightly spined, occasionally acanthoxea-like modifications occur, 114-*138.8*-174 × 6-*7.4*-9 μm.

Wing-shaped toxas (fig. 45F), curved gradually and deeply, with faintly spined apices, 66-*84.8*-129 μm.

Oxeote toxas (fig. 45G), with thick legs and small shallow curvature, with straight smooth apices, 276-*324.8*-438 × 6-*7.2*-9 μm (only seven such toxas were detected in the spicule slides).

Palmate isochelae (fig. 45E), typical-shaped, relatively small, 12-*14.6*-16 μm.

Ecology.— Circalittoral to deep water distribution, 65-135 m.

Distribution.— Porto Santo (present material), Adriatic Sea (Babiç, 1922).

Remarks.— Arborescent *Antho* species are all quite similar in shape, differing in minor aspects like branch length and diameter. *A. (A.) paradoxa* differs from other arboresecnt species of the region by the possession of the large oxeote toxas. From *A. (A.) morisca*, which is otherwise quite similar (and has been considered a senior synonym by past authors), it also differs in the more robust structural longer and shorter styles and the heavier spination of the acanthostyles. *A. (A.) atlantidae* spec. nov. has shorter and thinner megascleres and the branches are short, thin and more crowded. *Antho (Acarnia) elegans* has both acanthostyles and acanthostrongyles (see below). *Antho (Plocamia) erecta* and *A. (P.) hallezi* possess dumbbell spicules (see below).

Although Babiç' (1923) specimen was collected at a considerable distance from Porto Santo, the correspondence with our material is convincingly large: anastomosing branches, paucity of oscules, sizes of the spicules, and the occurrence of two toxa categories of which the larger are distinctive and peculiar. Babiç gives 378 μm as upper length of the acanthostyles, but it is here assumed that he mixed small acanthostyles with larger structural styles, which may have spines as well. Babiç' type material was destroyed during the 1956 Hungarian uprising (Boros, 1957), so a neotype is necessary to establish the identity of the species. We propose RMNH Por. 3853 as the nearest specimen of the species available to us. The geographic distance between Babiç' type locality and the present Madeiran locality may be small enough to be acceptable as regional Atlanto-Mediterranean topotypical localities. A second smaller specimen, RMNH Por. 7697, was obtained two years later from a nearby locality.

A species which appears closely related, is the encrusting *Antho (Antho) granditoxa* Picton & Goodwin, 2007, described from Northern Ireland, with comparable spiculation including the characteristic large thick toxas. Lévi (1960a) previously described an encrusting sponge with similar characteristics from the NW coast of France under the name *Artemisina ? paradoxa*. Picton & Goodwin (l.c.) suspected that this specimen could very well be conspecific with their *A. granditoxa*, but rejected the possibility that Babiç' species was also conspecific. In view of the similarities, it is debatable whether *A. paradoxa* and *A. granditoxa* are arborescent and encrusting growth forms of the same species,

like in *Antho (Antho) involvens* and *Antho (Antho) morisca*, where this phenomenon was widely accepted previously. Perhaps, the general larger size of most spicules could indicate close relationship but specific distinctness. See above for a more general discussion.

Subgenus *Antho (Acarnia)* Gray, 1867

***Antho (Acarnia) elegans* (Ridley & Dendy, 1886)**
(figs 46A-I, 47A-I)

Plocamia coriacea var. Ridley & Dendy, 1886: 475.
Plocamia coriacea var. *elegans* Ridley & Dendy, 1887: 158, pl. 29 fig. 9, pl. 31 fig. 1; Topsent, 1892: 117, pl. 6 fig. 11; Topsent, 1904a: 155.
Plocamia elegans; Topsent, 1928: 64.
Plocamilla elegans; Pulitzer-Finali, 1973: 35, figs 1-3.
Not: *Plocamia elegans* sensu Dendy, 1922: 77 (Cargados Carajos, Indian Ocean).
Nec: *Plocamilla coriacea* var. *elegans* sensu Lévi, 1960b: 760, fig. 13.

Material.— (RMNH Por. 3848), Azores, W of Pico, 38.5833°N 28.55°W, rectangular dredge, *Chama*-bed, 108-118 m, coll. CANCAP 5 Expedition stat. 142, June 7, 1981.
Examined for comparison.— Holotype of *Plocamia coriacea* var. *elegans*, (BMNH 1887.5.2.109), Azores, 38.6333°N 28.475°W, 810 m, bottom mud, Challenger Expedition stat. 75, 2.vii.1873.

Description.— The CANCAP material is a dichotomously branched erect bush (fig. 46A) of 10 cm high. Individual branches 3-6 cm long, 0.3-0.5 cm in diameter. Branches hispid from protruding spicules, slightly undulating in outline. Small oscules, less than 1 mm diameter, regularly distributed over the branches. Consistency firm. Colour (alcohol) pale beige. The holotype (fig. 47A) is identical in shape, though distinctly smaller (4 cm high).

Skeleton.— (figs 46B, 47B) Reticulate, with ascending tracts of 4-5 smooth styles in cross section, cemented by little spongin, interconnected by single acanthostrongyles at right angles, echinated at the nodes by single 'smooth' acanthostyles. Meshes approximately 100-120 μm in diameter. At the periphery, smooth styles, protruding beyond the dermis, are supported by partially tangentially arranged subtylostyles.

Spicules.— (figs 46C-I, 47C-I) Subtylostyles, styles, acanthostrongyles, acanthostyles, toxas, palmate isochelae.

Subtylostyles (fig. 46E) thin, straight, with distinctly spined head, 195-*246.3*-336 × 1.5-*2.6*-3.5 μm (holotype (fig. 47E), 219-388 × 3-5 μm).

Structural styles (figs 46C-D), curved, fusiform, subterminally constricted, predominantly smooth, but a good proportion have microspined heads, with a large size variation, depending of the position at the surface (longer (fig. 46C), 381-*460.7*-612 × 10-*13.4*-16 μm) (holotype (fig. 47C), 426-666 × 8-12 μm), or in the tracts (shorter (fig. 46D), 216-*236.5*-258 × 7-*10.8*-15 μm) (holotype (fig. 47D), 207-306 × 7-11 μm); overall size 216-*396.6*-612 × 7-*12.6*-16 μm (holotype, 207-666 × 7-12 μm).

Acanthostrongyles (fig. 46F), curved, usually clearly 'monactinal', i.e. with one end narrower than the other, spines concentrated at the apices, with relatively few on the shaft, 102-*117.2*-138 × 7-*8.4*-10 μm (holotype (fig. 47F), 99-116 × 8-11 μm).

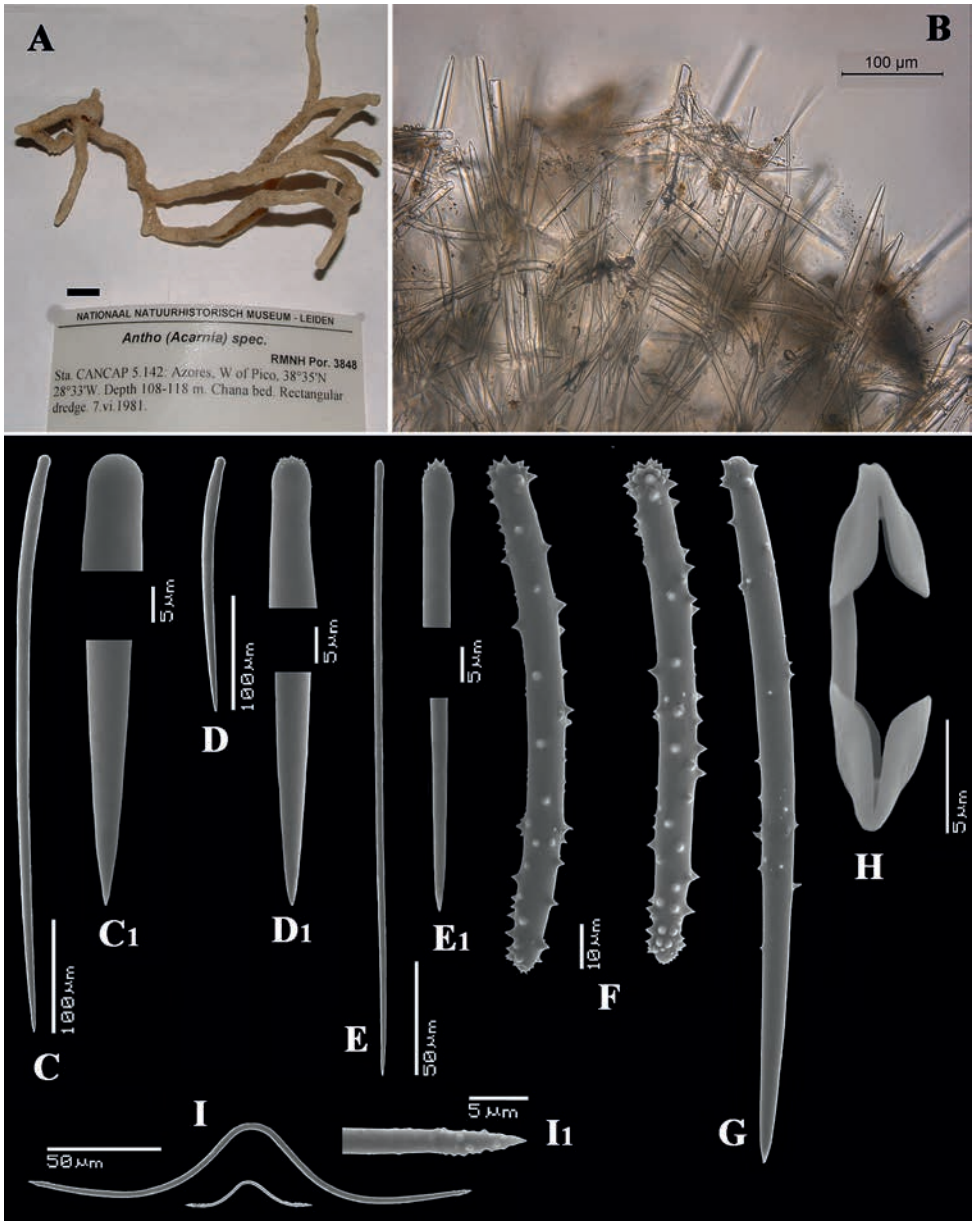

Fig. 46. *Antho (Acarnia) elegans* (Ridley & Dendy, 1886), specimen (RMNH Por. 3848) from the Azores, A, habit (scale bar = 1 cm), B, light microscopic image of cross section of peripheral skeleton (scale bar = 100 µm), C-I, SEM images of spicules, C-C1, long ectosomal smooth style and detail of head and pointed end, D-D1, small choanosomal smooth style with detail of head and pointed end, E-E1, ectosomal subtylostyle with detail of head and pointed end, F, acanthostrongyles from the choanosomal reticulation, G, echinating acanthostyle, H, palmate isochela, I-I1, wing-shaped toxas and detail of spined ending.

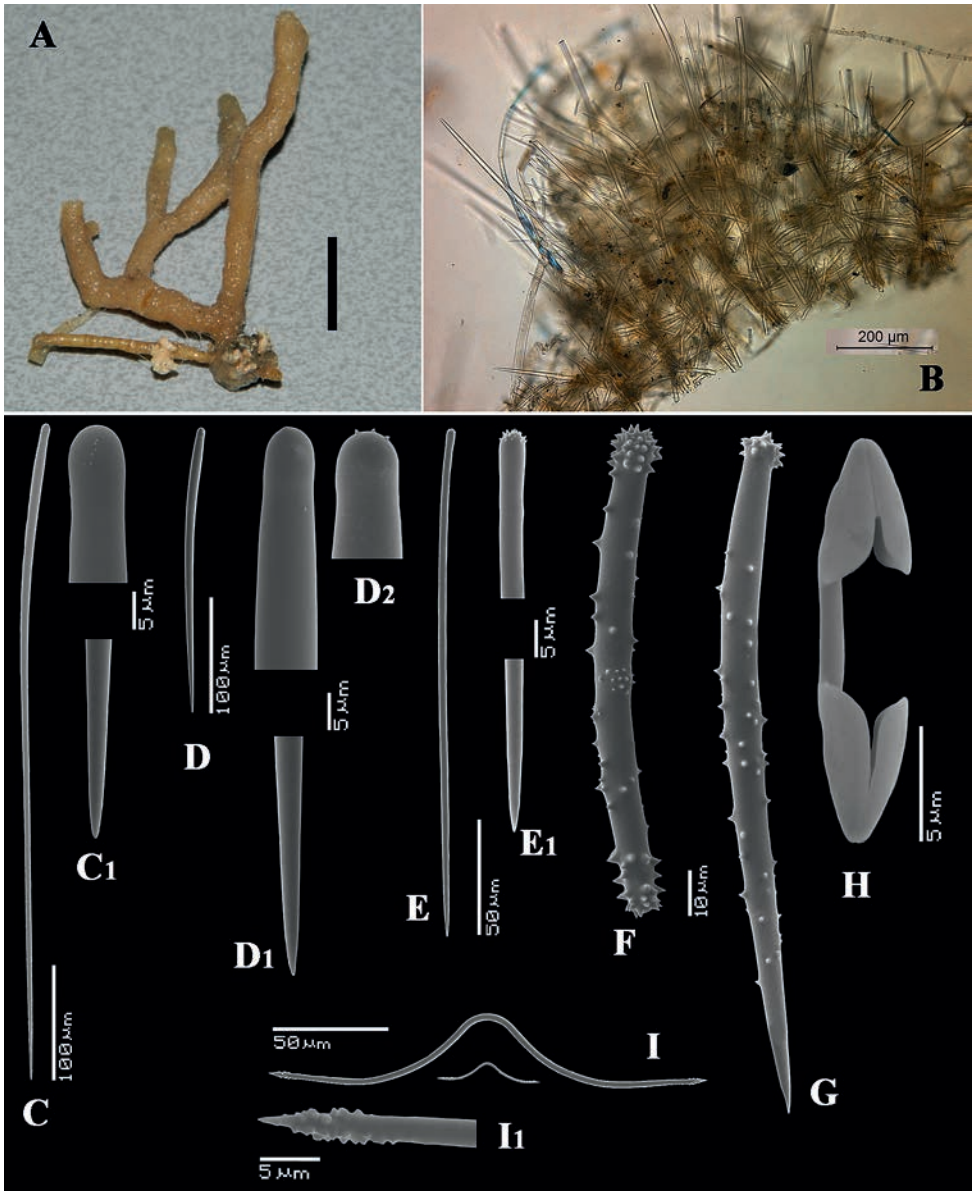

Fig. 47. Holotype (BMNH 1887.5.2.109) of *Plocamia coriacea* var. *elegans* Ridley & Dendy, 1886 (= *Antho (Acarnia) elegans*) from the Azores, A, habit (scale bar = 1 cm), B, light microscopic image of cross section of peripheral skeleton (scale bar = 200 µm), C-I, SEM images of spicules, C-C1, long ectosomal smooth style and detail of head and pointed end, D-D1,2, small choanosomal smooth style with details of heads and pointed end, E-E1, ectosomal subtylostyle with detail of head and pointed end, F, acanthostrongyle from the choanosomal reticulation, G, echinating acanthostyle, H, palmate isochela, I-I1, wing-shaped toxas and detail of spined ending.

Acanthostyles (fig. 46G), similar to the acanthostrongyles but longer, and with the pointed end with relatively few spines or entirely smooth, 117-*148.5*-171 × 9-*10.6*-13 μm (holotype (fig. 47G), 111-169 × 7-9 μm).

Toxas (fig. 46I), wing-shaped, with gradual deep curve, with rugose apices, variable in size, possibly in two size categories, 123-234 μm and 31-75 μm; overall 31-*88.4*-234 μm (holotype (fig. 47I) respectively 138-210 μm and 29-98 μm; overall average 83.6 μm). Palmate isochelae (fig. 46H), typical-shaped, relatively long and narrow, 16-*18.4*-21 μm (holotype (fig. 47H), 17-20 μm).

Ecology.— Growing in a bed of the bivalve mollusc *Chama*, dredged from deep water (98-810 m).

Distribution.— Azores.

Remarks.— The species has been described originally from the Azores, close to the locality of our material (NW of Pico), at a depth of 810 m. The spicule measurements provided by Ridley & Dendy (1887) are closely similar to ours (only the toxas were considered by them to occur in a single category, but reexamination of the type showed both smaller and larger toxas similar to ours). Topsent (1892, 1904a) also recorded the species, again from locations very near to that of the type and our material, in the narrow strait between Pico and Faial, at depths of 130 and 98 m. Although, Topsent (l.c.) did not provide precise spicule measurements, his habit figure and his remarks as well as the closeness of the localities make it likely that his specimens were conspecific. Pulitzer-Finali (1973) found a fresh specimen of this species on the quay of the fishing harbor at Ponta dos Mosteiros, São Miguel, Azores. This conforms in all its details to the present material. The fishermen assured Dr Pulitzer-Finali that it was of common occurrence in waters surrounding São Miguel.

Plocamilla coriacea var. *elegans* recorded by Lévi, 1960b from an unknown Northwest African locality, depth 100 m, differs from our and Ridley & Dendy's specimens in the encrusting habit and absence of toxas. It belongs probably to an undescribed species.

Dendy (1922) reported this species from the Western Indian Ocean (as *Plocamia*). The geographic distance aside, his description shows considerable differences in habit and spicule sizes, so specific distinctness is certain.

Antho (Acarnia) signata (Topsent, 1904a)

(figs 48A-I)

Plocamiopsis signata Topsent, 1904a: 155, pl. XIV fig. 1; Longo et al. 2005: 1348, fig. 3.
Plocamiopsis signata var. *mitis* Topsent, 1904a: 156; Topsent, 1928: 306, pl. 10 fig. 20.
?Plocamiopsis signata var. *paupera* Topsent, 1928: 307.
Antho (Plocamia) signata; Hooper, 1996: 433, fig. 21 G-H.
Antho (Acarnia) signata; Xavier & Van Soest, 2007: 1646.

Material.— (ZMA Por. 18064), Gulf of Cadiz, 36.18137°N 7.30637°W, 668 m, sandy sediment with stones and dead coral fragments, from boxcore, R.W.M. van Soest, Moundforce 2004 Exped. Stat. 21/02, 24. viii.2004.
Examined for comparison.— Type slide (MNHN D.T.947), Azores, 1360 m, 39.3556°N 31.0981°W, fishing net, Prince Albert I of Monaco, stat. 702, nr. 176, 19-20.vii.1896.

Description.— Thin transparent white-grey encrustation (fig. 48A, arrow) on a small rock, approximately 1 cm in diameter, 2 mm in thickness.

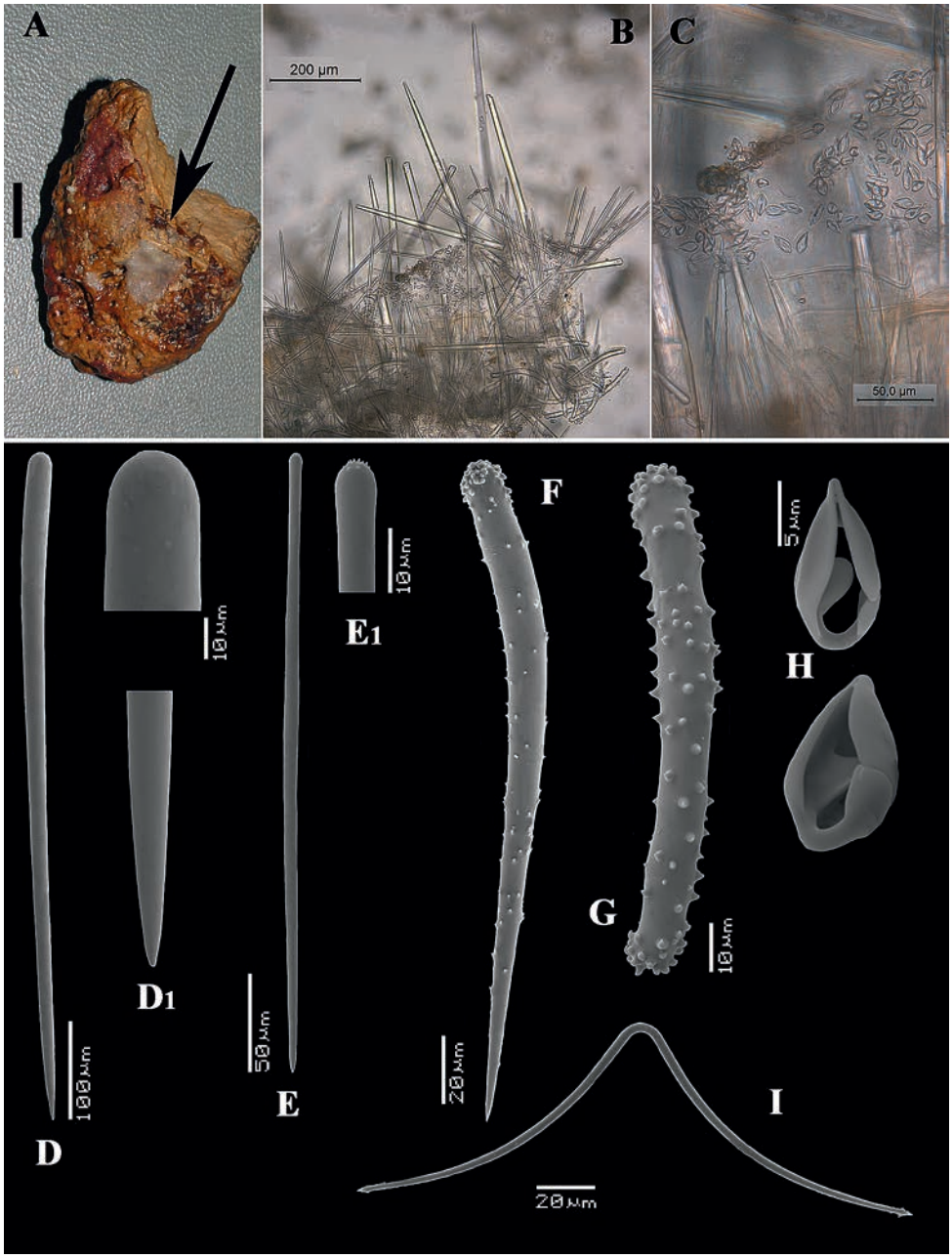

Fig. 48. *Antho (Acarnia) signata* (Topsent, 1904a), specimen (ZMA Por. 18064) from Morocco, A, habit (arrow) (scale bar = 1 cm), B, light microscopic image of cross section of skeleton (scale bar = 200 µm), C, detail of skeleton showing crowded microscleres (scale bar = 50 µm), D-I, SEM images of spicules, D-D1, smooth style and detail of head and pointed end, E-E1, ectosomal subtylostyle with detail of head, F, echinating acanthostyle, G, acanthostrongyle from the choanosomal reticulation, H, anisocleistochelae, I, wing-shaped tox with spined ending.

Skeleton.— (figs 48B-C) Plocamiform, with basal renieroid reticulation of acanthostrongyles, echinated at the nodes by acanthostyles; long structural styles are erected singly on the basal reticulation and protrude beyond the surface. Bouquets of subtylostyles and masses of microscleres make up the ectosomal skeleton.

Spicules.— (figs 48D-I) Subtylostyles, styles, acanthostyles, acanthostrongyles, toxas, aniso-cleistochelae

Subtylostyles (fig. 48E), straight, with microspined heads, 247-*293.6*-324 × 5-*6.5*-8 μm.

Styles (fig. 48C), long, lightly curved, mostly smooth all over or a few spines, including the rounded end, head not clearly demarcated, variable in size, occasionally with more elaborate spines, and then appearing to intergrade in shape with the echinating acanthostyles, 393-*533.4*-738 × 19-*22.4*-27 μm.

Acanthostrongyles (fig. 48G) of the basal reticulation, curved, with spines often swollen to rounded protrusions, especially on the apices, which are more or less equal, but one end may be subtly swollen, 105-*109.5*-118 × 11-*12.75*-13 μm.

Echinating acanthostyles (fig. 48F), strongly curved, spined heavily on the rounded end, but rather sparingly over the shaft, spines on the head often swollen to protrusions, but on the shaft they are small and sharply pointed, 183-*200.4*-239 × 10-*13.2*-17 μm.

Toxas (fig. 48I), wing-shaped, strongly curved, sharply angled in the middle, with swollen or spined apices, size variable, so average has little meaning, 54-222 μm.

Aniso-cleistochelae (fig. 48H), probably derived from palmate chelae, shaft strongly and asymmetrically curved and provided with proliferated ridge, with cleistochelate condition (lower and upper central alae fused), 14-*16.2*-18 μm.

Ecology.— Bathyal, on volcanic stones and coldwater coral reefs, 668-1360 m (Longo's material originated from 780-807 m).

Distribution.— Azores, Gorringe Bank, Gulf of Cadiz, Italian Mediterranean.

Remarks.— The specimens of which spicule sizes were recorded so far show some smaller discrepancies in the size and spination of the spicules: structural styles may be lightly spined all over, only spined on the head or entirely smooth, and they range in length from 390 to 800 μm. Subtylostyles may be polytylote or not, microspined or smooth, and vary in length between 240 and 400 μm. Acanthostrongyles have been reported to be occasionally entirely smooth ('var. *mitis*') and vary in length between 105 and 145 μm. Echinating acanthostyles may also be variably spined (smooth in 'var. *mitis*'). Toxas may have smooth or spined apices. Only the peculiar 'anisocleistochelae' appear to be uniform in shape and size, but according to Topsent (1928) these may be missing in some specimens (var. *paupera*). The variation observed so far is limited and considered of infraspecific nature. The localities from which the species is reported - although far apart - are situated in adjacent marine regions (Azores, Eastern Atlantic and Mediterranean).

Longo et al. (2005) reject Hooper's (1996, 2002) assignment of this species to the large genus *Antho* Gray, 1867, and retain the original genus *Plocamiopsis* Topsent (1904a) for microcionid species with palmate anisochelae. The genus *Plocamiopsis* remains monospecific so far, and the present (type) species shares most of the characters of the genus *Antho*, subgenus *Acarnia*, (renieroid basal reticulation of acanthostrongyles, echinating acanthostyles, single erect structural styles and ectosomal subtylostyles), which makes it likely that it is congeneric. The peculiar condition of the palmate chelae (anisochelate, cleistochelate) is easiest interpreted as a species character, not a genus character. If more

species would be found with similar anisochelae, *Plocamiopsis* could be revived, for instance as a separate subgenus.

Subgenus *Plocamia* Schmidt, 1870

Definition.— *Antho* species possessing dumbbell spicules making up the framework of the renieroid basal or axial choanosomal skeleton.

Type species.— *Plocamia gymnazusa* Schmidt, 1870: 62 (by subsequent designation in Burton, 1935). Hooper (1996: 66, fig. 21A-B; 2002: 459, fig. 17) described and illustrated the type species.

Remarks.— It is proposed here to revive *Plocamia* Schmidt, 1870 as a fourth subgenus of *Antho* to acknowledge the peculiar and likely homologous nature of the dumbbell spicules (figs 50C, 51F) making up the basal reticulation of a complement of *Antho* species currently divided over the subgenera *Antho (Antho)* and *Antho (Acarnia)*. Dumbbell spicules are not exclusive to *Antho*, as they occur in some form also in raspailiid (*Plocamione*) and myxilline (e.g. *Plocamiancora*, *Rotuloplocamia*) genera. However, in *Antho* they replace the acanthostyles and/or acanthostrongyles in the basal reticulation and show similar ornamentation among the various species making it likely they are a monophyletic group.

The following species are here reassigned to the subgenus *Antho (Plocamia)*:

Antho (Plocamia) arbuscula (Burton, 1959b as *Echinoplocamia*): Somalia, Gulf of Aden

Antho (Plocamia) erecta (Ferrer Hernandez, 1923): East Atlantic (see below).

Antho (Plocamia) gymnazusa (Schmidt, 1870 as *Plocamia*): Florida.

Antho (Plocamia) hallezi (Topsent, 1904b): Northwest Africa (see below).

Antho (Plocamia) karykina (De Laubenfels, 1927 as *Plocamia karykina*): California.

Antho (Plocamia) karyoka (Dickinson, 1945 as *Plocamia*): Mexican Pacific

Antho (Plocamia) lambei (Burton, 1935 as *Heteroclathria*): NE Pacific.

Antho (Plocamia) manaarensis (Carter, 1880 as Dictyocylindrus): India.

Antho (Plocamia) novizelanica (Ridley & Duncan, 1881 as *Dirrhopalum novizelanicum*): New Zealand.

Antho (Plocamia) prima (Brøndsted, 1924 as *Lissoplocamia*): New Zealand.

Antho (Plocamia) spinulosa (Tanita, 1968 as *Lissodendoryx*): Japan

Possible additional species:

Antho (Plocamia?) circonflexa (Lévi, 1960a as *Plocamilla*): W coast of France.

Antho (Plocamia?) inconspicua (Desqueyroux, 1972 as Plocamia): Chile.

Antho (Plocamia?) planoramosa Koltun, 1962: NW Pacific.

Antho (Plocamia) erecta (Ferrer Hernandez, 1923)
(figs 49A-D, 50A-E)

Plocamia erecta Ferrer Hernandez, 1923: 2, unnumbered photo, text-figs 1-4.

Material.— (ZMA Por. 06654), Mauritania, off Banc d'Arguin, 18.85°N 16.8833°W, 500 m, 3.5 m Agassiz trawl, bottom fossil coral debris, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 40/06, 10.vi. 1988; (RMNH Por. 7484), Mauritania, 19.3667°N 16.85°W, 85 m, 2.4 m Agassiz trawl, hard bottom with sponges and brown algae, CANCAP 3 Expedition stat. 158, 31.x.1978; (RMNH Por. 7617), Maurita-

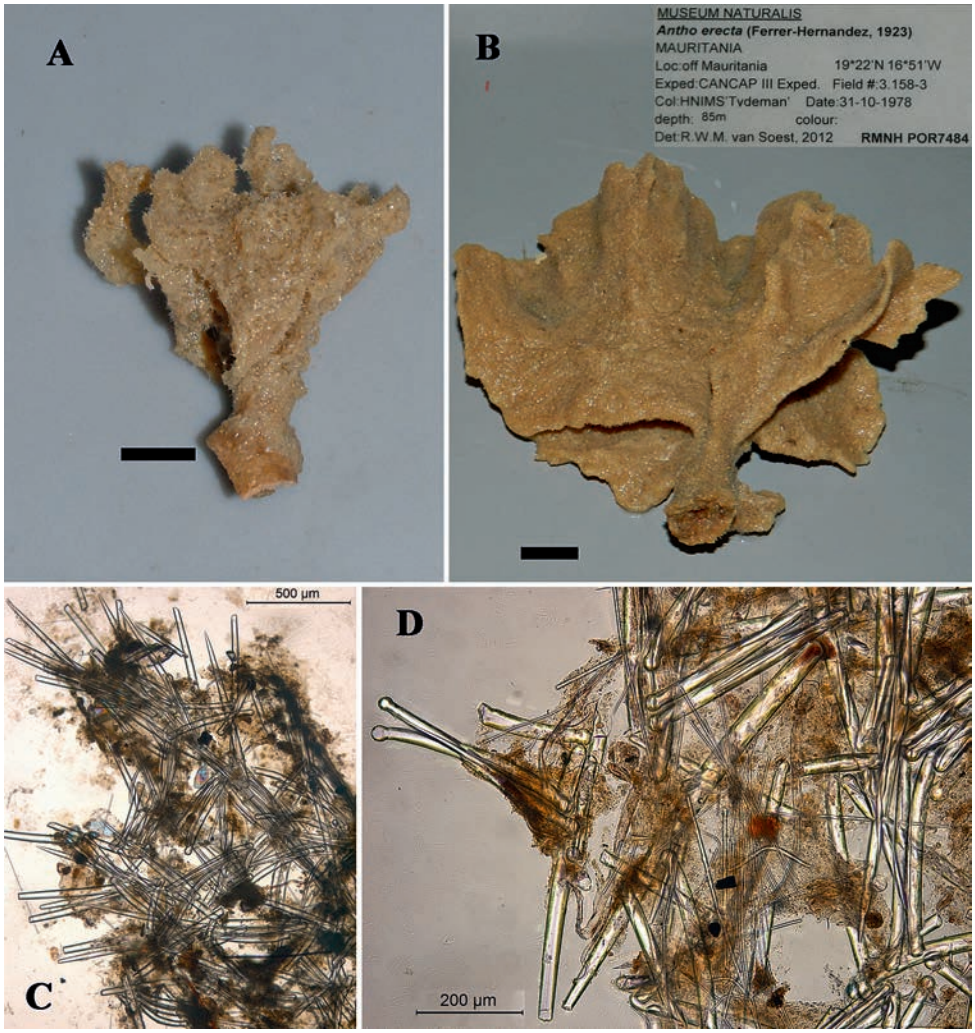

Fig. 49. *Antho (Plocamia) erecta* (Ferrer Hernandez, 1923), A, habit of branching-foliate specimen (ZMA Por. 06654) from Mauritania (scale bar = 1 cm), B, habit of lamellate specimen (RMNH Por. 7484) from Mauritania (scale bar = 1 cm), C, light microscopic image of cross section of peripheral skeleton of specimen (ZMA Por. 06654) (scale bar = 500 µm), D, detail of skeleton of the same (scale bar = 200 µm).

nia, 19.3333°N 16.9°W, 280-320 m, 2.4 m Van Veen grab, bottom calcareous stones, CANCAP 3 Expedition stat. 151, 31.x.1978
Examined for comparison.— (MNCN 1.01/24), unknown locality, labeled 'Antho erecta', slide prepared by Dirk Erpenbeck.

Description.— Foliate (fig. 49B) or branching bush (fig. 49A) on short peduncle, branches with pointed endings with tendency to curl inward and form lamellate shape or more definitely forming lamellae at right angles to each other. Size up to 10 cm high,

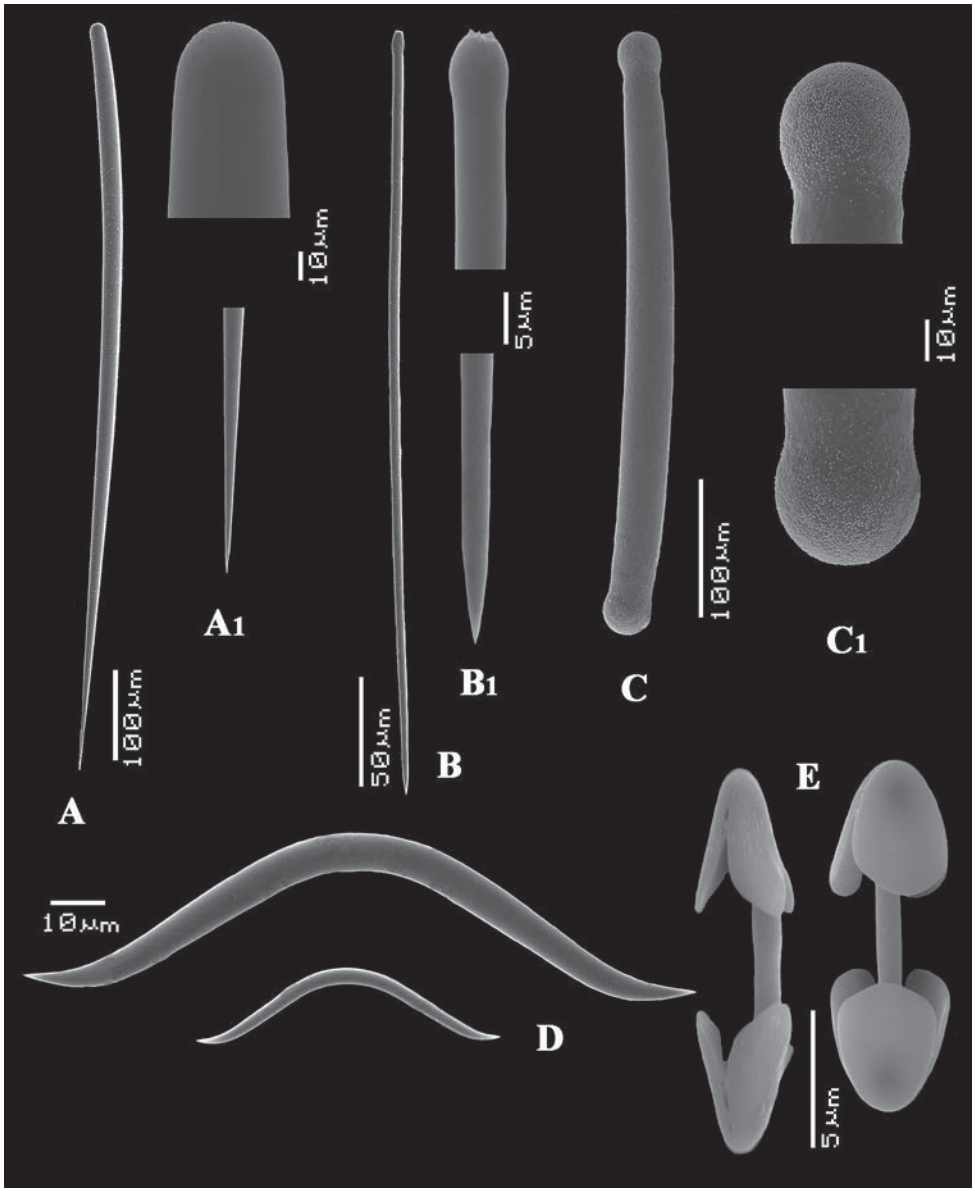

Fig. 50. *Antho (Plocamia) erecta* (Ferrer Hernandez, 1923), SEM images of specimen (ZMA Por. 06654) from Mauritania, A-A1, ectosomal smooth style and detail of head and pointed end, B-B1, ectosomal subtylostyle with detail of head and pointed end, C-C1, dumbbell spicule with details of opposite heads, D, oxhorn toxas, E, palmate isochelae.

10 cm wide, individual branches 0.5 cm diameter, lamellae less than 0.5 cm thick. Consistency firm. Surface irregular, strongly hispid, no visible oscules, punctate in preserved condition. Colour light-reddish brown, pale beige in preservation.

Skeleton.— (figs 49C-D) Reticulate, tight-meshed, rather irregular arrangement of acanthotylotes, with little visible spongin. Meshes usually made up of two or three acanthotylotes at a side, occasionally singly, mesh size approximately 500 μm wide and high. Towards the surface thick styles penetrate the skeleton, singly or with two or three only in the ascending tracts, which end at the surface in brushes; individual erect thick styles protrude beyond the surface. No size differences were observed between styles embedded subectosomally and those protruding beyond the surface. Apart from these, the ectosomal skeleton is poorly developed, consisting of scattered individual subtylostyles, here and there forming subectosomal bundles of up to 80 μm at right angles to the surface.

Spicules.— (figs 50A-E) Ectosomal subtylostyles, large ectosomal/choanosomal styles, dumbbell-shaped choanosomal basal spicules, toxas, palmate isochelae.

Ectosomal subtylostyles (fig. 50B) with a few apical spines on the faintly swollen heads, many are faintly polytylote, 276-*486.1*-642 × 2.5-*4.9*-7 μm.

Structural styles (fig. 50A), thickest in the middle, rounded microspined heads or heads with a few spines, but otherwise smooth, sharply pointed, 509-*712.4*-852 × 19-*41.3*-61 μm.

Dumbbell-shaped, fat, diactinal spicules (fig. 50C) of the basal reticulation, slightly anisotylote, smooth with the exception of small spines on either or both tyles, 272-*399.5*-516 × 25-*33.3*-40 μm.

Toxas (fig. 50D), oxhorn-shaped, relatively fat, in a large size range (possibly in a smaller and a larger category), 51-*112.1*-211 × 1.5-*5.4*-10 μm.

Palmate isochelae (fig. 50E), typical-shaped, but with tendency to have a slight torsion and lateral alae slightly detached from the shaft, 13-*14.4*-16 μm.

Ecology.— On fossil *Lophelia* branches at greater depth, 85-500 m.

Distribution.— Mauritania; elsewhere from Santander on the north coast of Spain (Ferrer Hernandez, 1923).

Remarks.— Differences with Ferrer Hernandez' description are the shape of the basal spicules, which are drawn by him as asymmetrical and with irregular outline. They are also distinctly smaller and thinner: 280-340 × 18-20 μm. However, thickness and length of both styles and dumbbell spicules vary considerably among the specimens reported here. Styles in FH's specimen apparently had entirely smooth heads, which also appears variable. The chelae are only 10 μm compared to our 14 μm. Sizes of toxas and ectosomal subtylostyles are not provided by Ferrer Hernandez. We assume here that his description is deficient and his material is conspecific with our material, but there is some room for doubt. We tried to obtain certainty from the type material, but despite the fact that material labeled "Antho erecta' still resides in the collections of the Museo Nacional de Ciencias Naturales at Madrid, MNCN 1.01/24, we must conclude that for the time being the original material of *A. erecta* has not been discovered. The Madrid material is likely a specimen of *Antho (Antho) dichotoma* (Linnaeus, 1767). We were able to study a slide made from this specimen, which shows a skeleton with spicules different from Ferrer Hernandez' description. The skeleton is an axially condensed reticulation of spongin fibres cored by predominantly smooth styles, longer styles averaging 650 × 12-15 μm in the longitudinal fibres and protruding from the surface, shorter styles, 170-190 × 10-12 μm in the connecting fibres. These shorter styles are predominantly smooth but spines along the shaft are not uncommon in a minority.

Toxas with a deep curve, averaging 170 μm, chelae relatively large, 25 μm. The properties observed in this slide differ substantially from Ferrer Hernandez' description, e.g. in lacking dumbbell spicules, and approach the description of *Antho (Antho) dichotoma*.

Antho (Plocamia) hallezi (Topsent, 1904c) is also a species from the region with dumbbell-shaped basal megascleres and it shares a number of further characteristics, such as erect, ramose shape (see below). Differences are the much stronger developed spongin skeleton, the presence of an extra category of styles echinating the fibres, and overall distinctly smaller spicules.

Antho (Plocamia) hallezi (Topsent, 1904b)

(figs 51A-H)

Heteroclathria hallezi Topsent, 1904c: xxx; Burton, 1935: 403; Lévi, 1952: 49.
Antho (Antho) hallezi; Hooper, 1996: 421, fig. 16 A-B,

Material.— (ZMA Por. 09963), Mauritania, off Cap Blanc, 11-35 m, 20.7°N 16.6667°W, F.P. Vermeulen, 1906.
Examined for comparison.— Holotype slide (MNHN LBIM D.T.1884), *Heteroclathria hallezi* Topsent, ex Musée de Lille, unknown locality.

Description.— Tree-shaped (fig. 51A), with a long thick stalk, which branches off dichotomously into six secondary branches. Total length 25 cm, stalk 9.5 cm long, 2 cm in diameter, with 4 cm diameter holdfast, secondary branches 3-11 cm long 0.5-1.2 cm in diameter, with annular growth patterns and blunt endings. Surface finely hispid, with vague venal inprints, clearly punctate. Consistency firmly compressible. Colour pale reddish brown (alcohol).

Skeleton.— (fig. 51B) The choanosome shows a neatly reticulated system of spongin fibres cored by styles and dumbbell-shaped diactines and echinated by short styles, with thicker main fibres cored predominantly by 2-4 styles and interconnecting fibres cored by dumbbell spicules, one spicule in length but usually two spicules thick. Meshes 150-250 μm in diameter. There is no clearly developed ectosomal skeleton, spicules from the choanosomal fibers are merely fanning out at the surface where they are joined with loose subtylostyles, which are few in number.

Spicules.— (figs 51C-H) Subtylostyles, coring styles, echinating styles, dumbbells, toxas, isochelae.

Subtylostyles (fig. 51E), slightly curved, with swollen pointed ends, and prominent, relatively strongly spined, heads, 165-*213.1*-252 × 2-*3.3*-4 μm.

Coring styles (fig. 51C), curved, fusiform, with subterminal narrowing, and finely spined head, 228-*281.9*-330 × 16-*18.1*-20 μm.

Echinating styles (fig. 51D), similar in shape to the coring styles, smooth, fusiform and with constricted neck, heads more sparingly spined, but smaller in size, 99-*140.3*-183 × 9-*11.4*-13 μm.

Dumbbell spicules (fig. 51F), anisotylote, with smooth shafts and spined heads one of which is slightly thicker than the other, 168-*183.5*-204 × 14-*17.1*-20 μm.

Toxas (fig. 51G), technically probably wing-shaped, but with very shallow curve, sharply pointed smooth apices, variable in length, 33-*58.6*-75 μm.

Palmate isochelae (fig. 51H), slightly contorted, with upper and lower alae facing a 30-90° different angle, 12-*15.2*-18 μm.

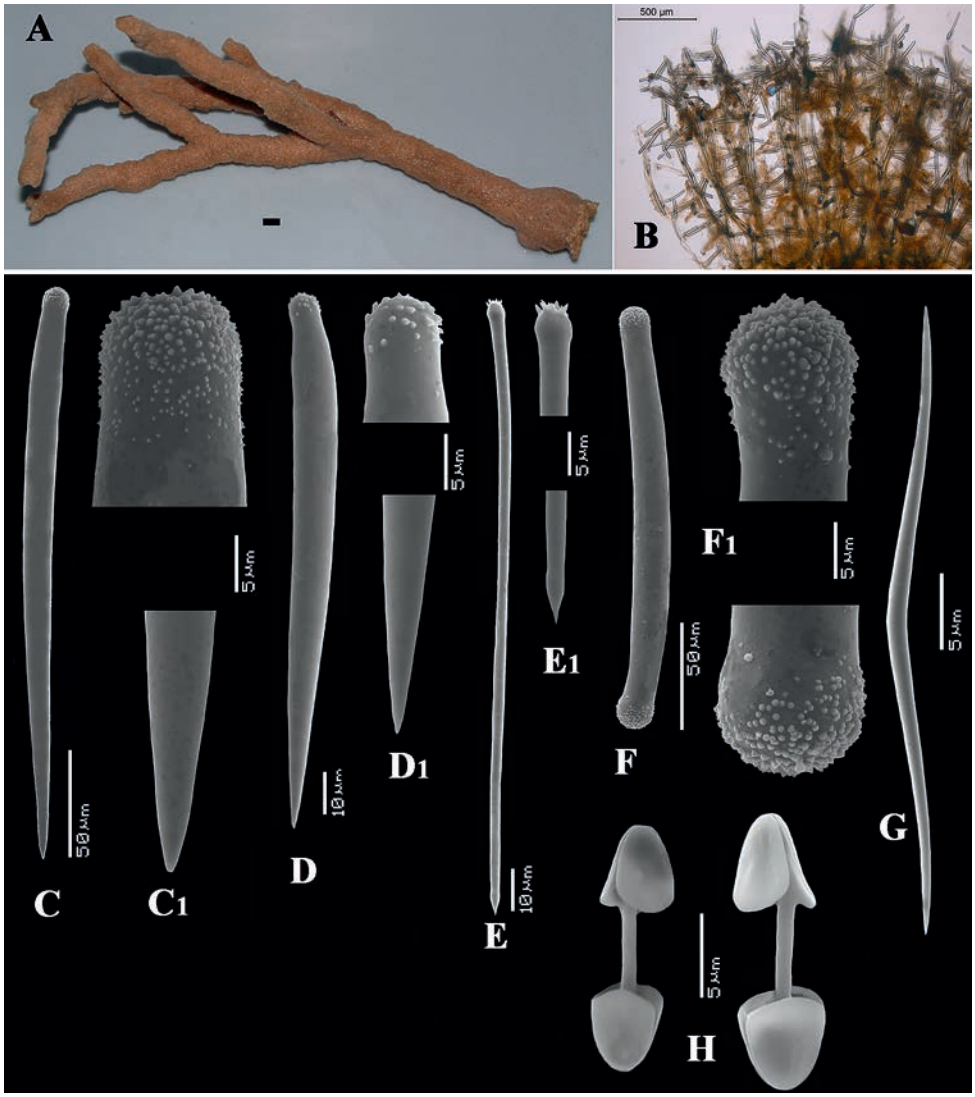

Fig. 51. *Antho (Plocamia) hallezi* (Topsent, 1904b), specimen (ZMA Por. 09963) from Mauritania, A, habit (scale bar = 1 cm), B, light microscopic image of cross section of peripheral skeleton (scale bar = 500 µm), C-H, SEM images of spicules, C-C1, ectosomal smooth style and detail of head and pointed end, D-D1, short style of the choanosomal skeleton echinating the fibers, E-E1, ectosomal subtylostyle with detail of head and pointed end, F-F1, dumbbell spicule with details of opposite heads, G, tox, H, contorted palmate isochelae.

Ecology.— Sandy shelf waters, down to 35 m.

Distribution.— Mauritania; Senegal (Lévi, 1952). Topsent's (1904c) material was without distribution data.

Remarks.— The shape, skeletal structure and spicule complement are largely similar to the type specimen. There are a few discrepancies with Topsent's (1904c) description:

although he made no mention of echinating styles, his drawing of the skeleton (his fig. 2d) clearly shows at least two styles in an echinating position, next to the coring styles in the ascending fibers. He gives only a single size of the styles (140-178), which is similar to our echinating styles, but clearly inferior to the size of our coring styles. We examined a slide of the holotype containing several fragments of the ladder-like skeleton. Spicules encountered were subtylostyles with prominent heads, 91-149 × 1.5-3 μm, styles with finley rugose heads, 181-284 × 11-13 μm, echinating styles, similar in shape but distinctly shorter and the heads provided with warts and spines, 101-159 × 8-13 μm, dumbbell spicules with smooth shafts and rugose heads, 138-177 × 11-15 μm, toxas with shallow, relatively thick curvature, 24-99 μm, palmate isochelae, contorted, 12-15 μm. Sizes of most of the spicules were smaller than in our specimen, nevertheless, overall similarity is great and conspecificity highly likely.

Lévi (1952) reported *Heteroclathria hallezi* from a wreck on the beach of Yoff, Senegal, establishing the area of occurrence of the species because Topsent's type was of unknown occurrence. His description is convincingly similar to that of Topsent, with only the dumbbell spicules slightly smaller in length.

Lévi's (1960b) description of *Dictyoclathria morisca* var. *anisotyla* differs only in minor detail from the type of *Heteroclathria hallezi* and his own Senegal (1952) record. The subtylostyles of that specimen are apparently deviating by showing excessive polytylote swellings, and he reports 'raphides' of 60 μm, which are not described or figured. It is likely these constitute thin toxas. Coring styles are not mentioned, but since these are similar in shape to the echinating styles (see above) they might have been included in the range given for the latter. Curiously, Lévi did not discuss the similarity with *Heteroclathria hallezi*.

Hooper (1996) assigned *Heteroclathria hallezi* to *Antho (Plocamia)* (= *Antho (Acarnia)* sensu Hooper, 2002) on his p. 47, and to *Antho (Antho)* on p. 421, thereby demonstrating his uncertainty over the echinating nature of the smaller styles. Later on (Hooper, 2002), he definitely chose *Antho (Acarnia)* as the affiliation of *H. hallezi*, thus acknowledging the presence of a separate echinating style type in this species.

Genus *Artemisina* Vosmaer, 1885

***Artemisina incrustans* spec. nov.**
(figs 52A-F)

Material.— Holotype (ZMA Por. 06589), Mauritania, 18.8333°N 16.3°W, 15 m, hard bottom with brownish yellow sand, Van Veen grab, R.W.M. van Soest & J.J. Vermeulen, Mauritania II Expedition stat. 011/13, 8.vi.1988.

Description.— Thin reddish or yellowish patches on barnacles (fig. 52A), largest patch several mm^2. No oscules or other surface characteristics discernible. Consistency soft.

Skeleton.— (fig. 52B) Plumose-spicate tracts of spicules, reaching from the substrate to the surface, but not interconnecting. At the substrate there is some visible spongin, but generally the spicules are not bound and protrude from the tracts at all angles. The two size classes of subtylostyles are intermingled in the tracts, and do not seem to be localized.

Spicules.— (figs 52C-F) Subtylostyles, palmate isochelae. No further spicule types present.

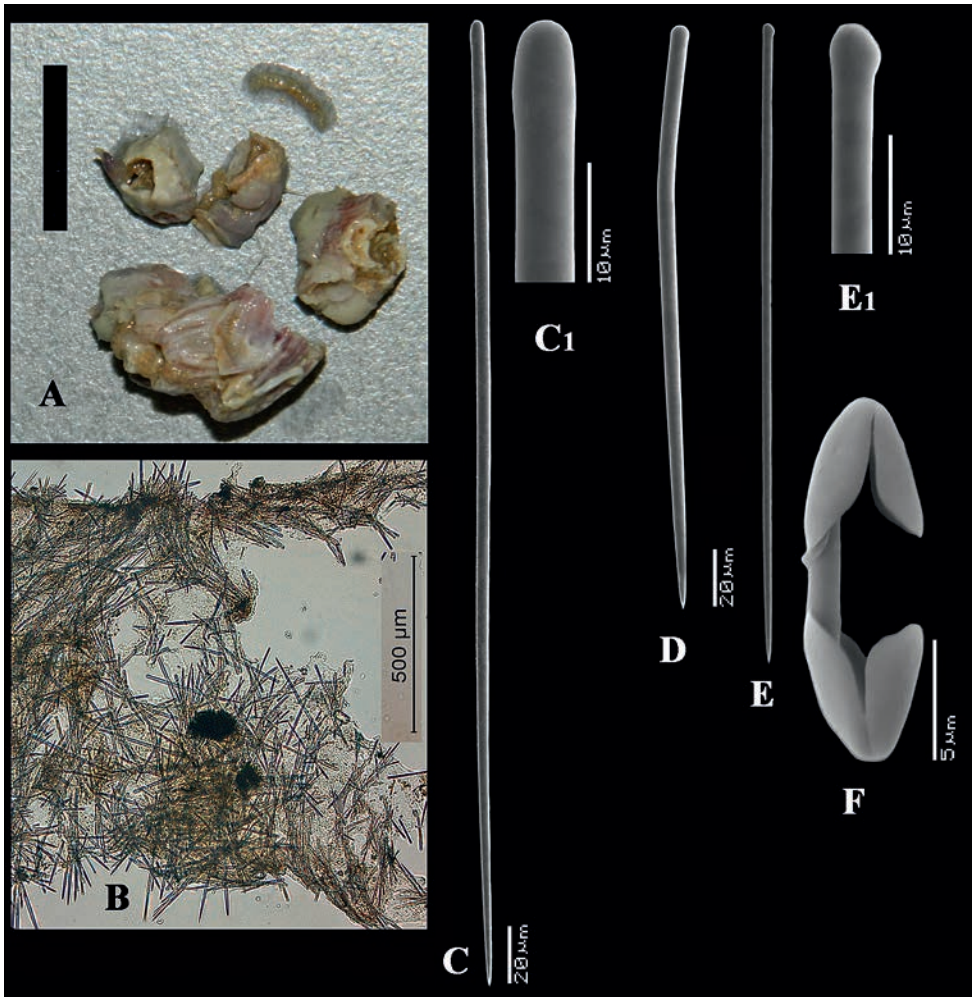

Fig. 52. *Artemisina incrustans* spec. nov., A, habit of holotype (ZMA Por. 06589) from Mauritania, encrusting barnacles (scale bar = 1 cm), B, light microscopic image of cross section of skeleton (scale bar = 500 µm), C-F, SEM images of spicules, C-C1, smooth long subtylostyle and detail of head, D, short style, E-E1, ectosomal subtylostyle with detail of head, F, palmate isochela.

Subtylostyles (figs 52C-E), with slightly swollen elongate heads, smooth, generally straight, in two size categories, (1) smaller (fig. 52D-E), with more pronounced swollen heads, 117-*158.1*-197 × 2.5-*2.8*-3.5 µm, (2) larger (fig. 52C), with heads less pronounced, style-like, 237-*307.3*-366 × 4-*6.5*-8 µm.

Palmate isochelae (fig. 52F), typical-shaped, 16-*17.4*-20 µm.

Etymology.— The name refers to the encrusting habit, which is unusual in the genus.

Ecology.— Inshore sandy bottom flats, depth 4-15 m; so far only known to encrust barnacles.

Distribution.— Mauritania.

Remarks.— Assignment of this material and that of the next species to the genus *Artemisina* is tentative, because the type species and most other species are elaborate massive or globular sponges. Topsent (1892) characterized the genus as 'massive sponges with the structure of *Suberites*', which hardly describes the condition of the present specimen. Until now there is only one thinly encrusting species, Caribbean *Artemisina melana* Van Soest, 1984 (see also below), and this is indeed close in skeletal structure and megascleres to *A. incrustans* spec. nov. but it has toxas as additional microscleres and is coloured black.

Artemisina melanoides spec. nov.
(figs 53A-E)

Artemisina melana; Van Soest, 1993b: table 3.
Not: Van Soest, 1984: 122, pl. VIII figs 7-8, text-fig. 49.

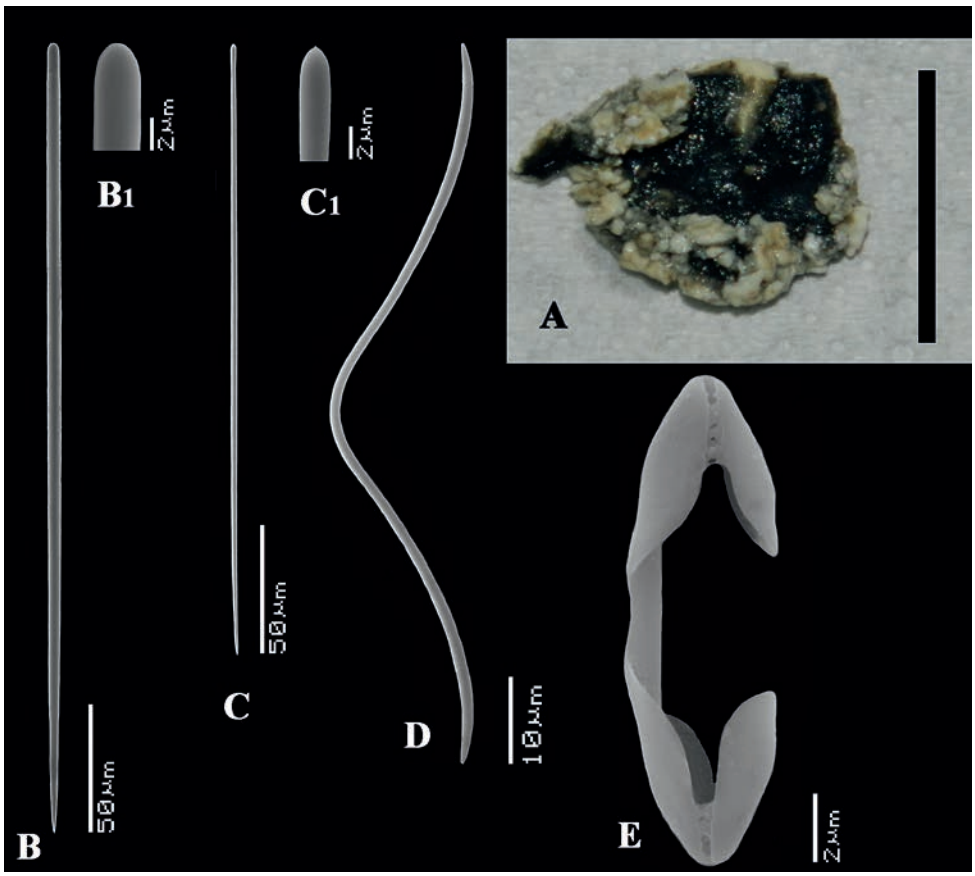

Fig. 53. *Artemisina melanoides* spec. nov., A, holotype (ZMA Por. 06910) from the Cape Verde Islands, encrusting limestone substratum (scale bar = 1 cm), B-E, SEM images of spicules, B-B1, smooth long subtylostyle and detail of head, C-C1, ectosomal subtylostyle with detail of head, D, wing-shaped tox, E, palmate isochela.

Material.— ZMA Por. 06910, Cape Verde Islands, São Tiago, SW coast near Ponta da Cidade, Ciudad Velha, 14.9°N 23.6333°W, 10-17 m, steep cliff ending in exposed sandy bottom with stones and sabellariid reefs, SCUBA diving, R.W.M. van Soest, CANCAP 7 Exped. stat. D01/08, 20.viii.1986.
Examined for comparison.— Holotype (ZMA Por. 04881), *Artemisina melana* Van Soest, 1984, Curaçao, Playa Kalki, 10-20 m, on dead corals, SCUBA diving, coll. R.W.M. van Soest, 30.xii.1980.

Description.— Black, thin, smooth encrustation (fig. 53A) on limestone substratum, size slightly less than 1 × 1 cm, thickness less than 1 mm.

Skeleton.— Confused bundles of spicules are ending in irregular surface bouquets. Choanosomal and ectosomal spicules not clearly distinguishable, other than those of the surface being slightly thinner and shorter.

Spicules.— (figs 53B-E) Ectosomal subtylostyles, choanosomal (subtylo-)styles, toxas, palmate isochelae.

Subtylostyles (fig. 53C), straight, thin, smooth, with mucronate heads, 194-*213.3*-230 × 1.5-*1.7*-2 μm.

Styles (fig. 53B), subtylostyle-like, straight, with elongate barely swollen heads, smooth, 292-*318.5*-360 × 2.5-*3.1*-4 μm.

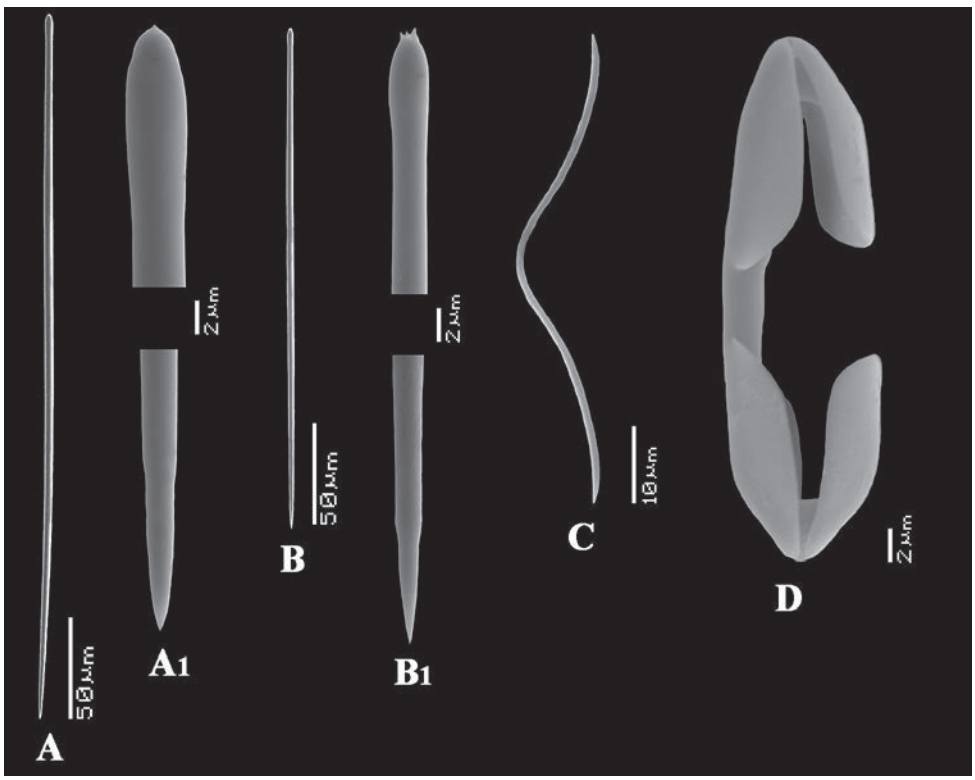

Fig. 54. SEM images of spicules of the holotype (ZMA Por. 04881) of *Artemisina melana* Van Soest, 1984 from Curaçao, A-A1, smooth choanosomal (subtylo-)style and detail of head with mucron, B-B1, ectosomal subtylostyle with detail of microspined head, C, wing-shaped tox, D, palmate isochela.

Toxas (fig. 53D), wing-shaped, thin, deeply curved, but with smooth endings, barely upturned, 36-*84.3*-117 μm.

Palmate isochelae (fig. 53E), typical-shaped, 14-*15.8*-17 μm.

Etymology.— The name means 'similar to melana', referring to the similarity with *Artemisina melana* Van Soest, 1984.

Ecology.— In sandy environment at diving depth.

Distribution.— Cape Verde Islands.

Remarks.— The Cape Verde Islands specimen is closely similar to Curaçao specimens of *Artemisina melana*, sharing the colour that persists in alcohol, and skeletal and spicular characters. We present here SEM images of the holotype of *A. melana* Van Soest, 1984 (figs 54A-D). The Curaçao specimen has somewhat thicker megascleres (subtylostyles up to 3.5 μm, styles up to 5.5 μm), and the toxas are somewhat smaller (up to 78 μm), the chelae somewhat larger (up to 20 μm), but all these measurements overlap with the Cape Verde Islands specimen. However, under SEM, the subtylostyles of *A. melana* are microspined (see figs 54B-B1) whereas these of *A. melanoides* spec. nov. have only a single mucron. Likewise under SEM the styles of our new species have smooth heads whereas those of *A. melana* bear a mucron (see figs 54A-A1). Such small differences support the geographic separation of the two on both sides of the Atlantic. Nevertheless, the similarity in shape, colour and spiculation indicate a close relationship between the two.

As discussed above, membership of the genus *Artemisina* of the two species reported here may be contested, as most *Artemisina* species have elaborate, massive or globular habitus. Examples occurring in the area and adjacent areas are the stalked *Artemisina transiens* Topsent, 1890 from the Iberian coasts and the small-branched *Artemisina erecta* Topsent, 1904a from the Azores.

Additional Ophlitaspongiinae species reported from Northwest Africa

We briefly characterize further Ophlitaspongiinae species from the region that we were unable to reexamine. The West African material of Lévi apparently could not be found in the collections of the Paris Museum and present whereabouts is unknown. The identities of the species recorded below all need verification (data are summarized along with above described species in Table 3).

Antho (Antho) burtoni (Lévi, 1952)

Plocamilla burtoni Lévi, 1952: 53, fig. 17

Description.— Brick-red, hispid crust on mollusks, barnacles and ascidians. Basal skeleton a renieroid reticulation of acanthostrongyles/acanthostyles, upon which long styles are erected. Spicules comprise ectosomal subtylostyles, straight, 190-260 × 2-3 μm; long styles, entirely smooth, with constricted heads, 350 × 5-7 μm; short 'auxiliary' styles, with spined heads, 100-150 × 5-7 μm; acanthostrongyles and acanthostyles, obviously the same spicule category with blunt or pointed endings, 75-100 × 7 μm; abundant toxas in three size categories, 85-130 μm with spined endings, 75 μm, and 15-40 μm; palmate isochelae 13-14 μm.

Distribution.— Senegal; 15 m.

Comment.— Maldonado's record (1992: 1154, fig. 11) of the New Zealand species *Antho novizelanica* (Ridly & Duncan, 1881) might belong to this species, as most of the spicules appear closely similar to Lévi's description. The same could apply for Uriz' (1988) Namibian record of *Plocamilla novicelanica* (sic). *Antho novizelanica* is a member of the subgenus *Antho (Plocamia),* as it possesses dumbbells, and as the name already reveals occurs in New Zealand.

Antho (Acarnia) elegans sensu (Lévi, 1960b)

Plocamilla coriacea var. *elegans*; Lévi, 1960b: 760, fig. 13 (not: Ridley & Dendy, 1886).

Description.— Encrusting on a hydroid, thickness 2 mm, with digitations of 1-2 mm. Surface hispid. Skeleton a unispicular reticulation of acanthostrongyles. Spicules comprise principal microspined styles of 190-380 × 15 μm, smaller styles with some spines on the shaft of 160-175 × 8-9 μm, ectosomal subtylostyles with microspined heads, 150-290 × 3 μm, acanthostrongyles 115 × 11 μm, typical shaped palmate isochelae of 14 μm. No toxas.

Distribution.— No data.

Comment.— The growth form and the lack of toxas precludes membership of *Antho (Acarnia) elegans*, which so far is known only from deeper water off the Azores. It is probably an undescribed species.

Antho (Plocamia) anisotyla (Lévi, 1960b)

Dictyoclathria morisca var. *anisotyla* Lévi, 1960b: 761, fig. 15.

Description.— Arborescent, dichotomously branching yellow sponge. Branches 26 mm in diameter. Irregular, hispid surface, without visible oscules. Skeleton a reticulation of spongin fibers, 25 μm in diameter, sparingly cored by styles and dumbbell spicules. Spicules comprise ectosomal subtylostyles, often polytylote or with swollen parts, 145-275 × 2 μm; longer and shorter structural styles, smooth, also often polytylote, overall 130-275 × 5-11 μm; dumbbell spicules ('tylotes'), somewhat anisodiametrical, with smooth shafts and spined heads, 125-185 × 7-8 μm; short, wing-shaped toxas, with shallow curvature, 30-70 μm (including 'raphides' of 60 μm); rare palmate isochelae, drawn as if they are could be contorted, 13 μm.

Distribution.— Senegal; 27-29 m.

Comment.— As discussed above, this description reminds rather strongly of *Antho (Plocamia) hallezi*, but without having reexamined the type material this cannot be decided here.

Artemisina erecta Topsent, 1904a

Artemisina erecta Topsent, 1904a: 214, pl V fig. 18, pl. XV fig. 10.

Description.— Small erect specimen, 1.1 cm high, 0.5 cm wide and 0.3 cm thick. Colour (alcohol) white. Surface hispid, no visible oscules. Skeleton confused. Spicules include ectosomal subtylostyles with microspined heads, averaging 390 × 7-8 μm; structural styles, entirely smooth, 825-880 × 20 μm; robust, deeply curved toxas with

Table 3. Data on morphology and spicule sizes of studied specimens and additional reported material of the subfamily Ophlitaspongiinae choanosomal, echinat. = echinating, strong. = strongyle, isoch. = isochelae, region. = regional, distrib. = distribution, msp. = microspined, sm.= occ. = occasionally, mucr. = mucronate,li. = lightly, s. = sensu, monact. = monactine, contort. =contorted, anisocleisto.= anisocleistochelae

genus	subgenus	species	subtylo. size(μm)	subtylo. morph.	ecto.style size(μm)	ecto.style morph.	choano.style size(μm)	choano.style morph.	echinat. style(μm)	echinat. st.morph.
Antho	*Antho*	*atantidae* sp. nov.	165–279 × 1.5–2.5	head msp.	186–396 × 3.5–6	sm. constr.	111–156 × 3.5–6	msp./sm.	63–81 × 3–6	sp.
Antho	*Antho*	*mediterranea*	135–375 × 2.5–3.5	head msp.	302–588 × 4–10	sm. few sp.	174–219 × 4–10	msp. /sm.	135–186 × 4–8	sm.
Antho	*Antho*	*morisca*	126–391 × 1–3	head msp.	312–516 × 5–9	sm. constr.	171–249 × 5–9	sm./ occ.sp.	105–138 × 4–7	sp.
Antho	*Antho*	*nuda* sp. nov.	136–276 × 0.5–1.5	head irreg.	126–191 × 3–5.5	sm.	126–191 × 3–5.5	sm./ occ.sp.	78–102 × 2.5–4	sp.
Antho	*Antho*	*paradoxa*	192–438 × 1.5–3	head msp.	321–572 × 4–13	sm. constr.	195–276 × 6–12	sm./ occ.sp.	114–174 × 6–9	li. sp.
Antho	*Antho*	*burtoni**	190–260 × 2–3	not given	350 × 5–7	sm. constr.	100–150 × 5–7	head sp.	75–100 × 7	entirely sp.
Antho	*Antho*	*elegans*	195–336 × 1.5–3.5	head msp.	381–612 × 10–16	sm.	216–258 × 7–15	sm./ sp.	117–171 × 9–13	few sp. at point
Antho	*Antho*	*elegans** s. Lévi, 1960	150–290 × 3	head msp.	190–380 × 15	head msp.	160–175 × 8–9	sp.	absent	
Antho	*Antho*	*signata*	247–324 × 5–8	head msp.	339–738 × 19–27	sm./ sp.	absent		183–239 × 10–17	heavy sp.
Antho	*Plocamia*	*anisotyla**	145–275 × 2	not given	130–275 × 5–11	head msp.	not given		130–275 × 5–11	head msp.
Antho	*Plocamia*	*erecta*	276–642 × 2.5–7	head msp.	509–852 × 19–61	sm./ msp.	absent		absent	
Antho	*Plocamia*	*hallezi*	165–252 × 2–4	head msp.	absent		228–330 × 16–20	head sp.	99–183 × 9–13	head sm. constr.
Ophlitaspongia		*papilla** s. Cruz 2002	172–260	not given	absent		52–324 × 6	sm. constr.	52–324	sm. constr.
Ophlitaspongia		*translata** s. Cruz 2002	184–312 × 2.4–3.2	head msp.	absent		120–400 × 8–19	sm.	120–400 × 8–19	sm.
Artemisina		*erecta**	390 × 7–8	head msp.	absent		825–880 × 20	sm.	absent	
Artemisina		*incrustans* sp. nov.	117–197 × 2.5–3.5	head sm.	absent		237–366 × 4–8	sm.	absent	
Artemisina		*melanoides* sp. nov.	194–230 × 1.5-2	head msp.	absent		292–360 × 2.5–4	sm. mucr.	absent	

spined endings, up to 250 μm; typical shaped palmate isochelae, 13 μm. Also a few sigmas were mentioned by Topsent, but these are obviously foreign.

Distribution.— Azores; bathyal depth (845 m).

Ophlitaspongia papilla sensu Cruz, 2002

Ophlitaspongia papilla; Cruz, 2002: 183 (not: Bowerbank, 1866: 14).

Description.— Smooth red encrustation, no visible oscules. Skeleton microcionid-plumose. Spicules comprise straight or sinuous subtylostyles, 172-260 μm; structural

in Northwest African and Macaronesian waters. Abbreviations.– subtylo = subtylostyle, morph. = morphology, ecto. = ectosomal, choano. = smooth, constr. = subterminally constricted, sp. = spined(spines), typic. = typical, arboresc. = arborescent, mass. = massive, encr. = encrusting, *literature data

acantho. strong.(µm)	acantho. str.morph.	toxas 1 size(µm)	toxas 1 morph.	toxas 2 size(µm)	toxa 2 morph.	isoch. size(µm)	isoch. morph.	habit	region. distrib.	depth (m)
absent		9–105	wing sp.ends	absent		10–13	typic.	arboresc.	Guinea	32
absent		36–114	wing sp.ends	absent		17–22	typic.	mass./ encr.	Madeira Canary I.	0–20
absent		33–138	wing sp.ends	absent		14–17	typic.	arboresc.	Madeira Canary I.	43–1425
absent		absent		absent		absent		encr.	Cape Verde Islands	4–15
absent		66–129	wing sp.ends	276–438 × 6–9	oxeote	12–16	typic.	arboresc.	Madeira	65–135
75–100 × 7	entirely sp.	75–130 × 1–3	wing sp.ends	15–40	wing sp.ends	13–14	typic.	encr.	Senegal	15
102–138 × 7–10	sp. monact.	123–234	wing sp.ends	31–75	wing sp.ends	16–21	typic.	arboresc.	Azores	108–810
115 × 11	entirely sp.	absent		absent		14	typic.	encr.	unknown	100
105–118 × 11–13	sp. curved	54–222	wing sp.ends	absent		14–18	aniso-cleisto	encr.	Azores Morocco	668–1360
125–185 × 7–8	not given	30–70	wing sm.ends?	60?	straight	13	typic.	arboresc.	Senegal	27–29
272–516 × 25–40	dumbbell rugose	51–211 × 1.5–10	oxh. sm.ends	absent		13–16	typic.	foliate	Mauritania Canary I.	85–500
168–204 × 14–20	dumbbell sp.	33–75	wing sm. shallow	absent		12–18	contort.	arboresc.	Mauritania Senegal	11–35
absent		20–122	wing sm.ends	absent		absent		encr.	Canary Islands	shallow water
absent		absent		absent		absent		encr.	Canary Islands	shallow water
absent		250	wing sp.ends	absent		13		arboresc.	Azores	650–914
absent		absent		absent		16–20	typic.	encr.	Mauritania	15
absent		36–117	wing sm.ends	absent		14–17	typic.	encr.	Cape Verde Islands	10–17

styles, smooth, fusiform, constricted below the heads, 52-324 × 6 µm; wing-shaped toxas, shallow-curved, 20-112 µm.

Distribution.— Canary Islands.

Comment.— The present description differs substantially from that of the type (see Hooper, 2002: 465, fig. 21). The skeleton of *O. papilla* is reticulate, whereas Cruz does not describe and picture connecting fibers. Styles in the type do not exceed 167 µm, whereas those of Cruz are up to 324 µm. The conclusion is that Cruz' material is not likely to be conspecific with *O. papilla*, and probably does not belong to *Ophlitaspongia*. It should be compared with *Clathria coralloides* sensu Boury-Esnault & Lopes, 1985 (see above).

Ophlitaspongia translata sensu Cruz, 2002

Ophlitaspongia translata Pulitzer-Finali, 1978: 63, figs 20-21; Cruz, 2002: 184.

Description.— Orange encrustation with hispid surface, without visible oscules. Skeleton microcionid. Spicules limited to subtylostyles with microspined heads, 184-312 × 2.4-3.2 μm, and straight smooth styles in a large size range, 120-400 × 8-19 μm.

Distribution.—Canary Islands; deeper water.

Comment.— Measurements of the spicules provided by Cruz are closely similar to the type from the Bay of Naples, but that is thickly lobate and the skeleton is described as reticulate, not microcionid. If Cruz' material is conspecific, it is likely an incipient specimen.

Key to the species of Microcionidae occurring in Northwest Africa and the Macaronesian Islands

The key covers the Northwest African parts of the Atlantic Ocean from the Gulf of Cadiz down to the Gulf of Guinea, including the offshore Atlantic archipelagoes and Ascension Island. It is necessary to start at the beginning of the Key and work yourself down, because discriminating characters (e.g. growth form, presence or absence of spicules and structure of the skeleton) are recurrent features in various parts of the Key.

1. Erect, arborescent or foliate 2
- Encrusting or massive growth form 10
2. Skeleton plumoreticulate, with spongin fibers cored by styles and echinated by shorter (acantho-)styles; ectosomal skeleton consists of partially erect and partially tangential subtylostyles ..... (*Clathria*) 3
- Axial skeleton renieroid (equal-sized quadrangular meshes), built by acanthostyles/strongyles and short styles; subectosomal skeleton hispid from protruding long styles standing erect on the axial skeleton ..... (*Antho*) 4
- Sponge without organized skeleton; at the surface bouquets of styles carry a tangential ectosome of subtylostyles ..... *Artemisina erecta*
3. Echinating acanthostyles entirely spined, chelae typical shaped ..... *Clathria (Clathria) compressa*
- Echinating styles smooth or with spines or warts only on the head, cleisto- or ctenichelae ..... *Clathria (Clathria) hjorti*
4. Spicules include 'dumbbells', i.e. tylote-shaped spicules with spined or rugose globular endings 5
- No dumbbell spicules, although there may be acanthostrongyles with slightly swollen endings 7
5. Growth form foliate (branches are merged). Dumbbell size exceeds 250 × 25 μm; toxas oxhorn-shaped and up to 200 μm or more. ..... *Antho (Plocamia) erecta*
- Growth form arborescent. Dumbbell length less than 200 × 20 μm; toxas wing-shaped 6
6. Among the subtylostyles and /or styles there are polytylote modifications ..... *Antho (Plocamia) anisotylota*
- No polytylote styles ..... *Antho (Plocamia) hallezi*

7. The axial reticulation is built primarily by acanthostrongyles; acanthostyles are exclusively in an echinating position ..... *Antho (Acarnia) elegans*
- The axial reticulation is built primarily by (acantho)styles; there are no acanthostrongyles, although some of the acanthostyles may be blunt-ending 8
8. Small bushes, with thin, frequently dividing branches; spiculation overall delicate, with acanthostyles not exceeding 80 μm in length. ..... *Antho (Antho) atlantidae* spec. nov.
- Larger sponges; acanthostyles longer than 80 μm 9
9. Next to normal small wing-shaped toxas there are long oxeote toxas present (these may be quite rare and a careful search is necessary) ..... *Antho (Antho) paradoxa*
- No oxeote toxas ..... *Antho (Antho) morisca*
10. Microscleres (toxas and chelae) absent 11
- Microscleres (either toxas or chelae or both) present 12
11. Thin crusts; choanosomal skeleton hymedesmioid, with low specular density; two distinct size classes of ectosomal subtylostyles, the smaller forming bouquets at the surface ..... *Clathria (Thalysias) vacata* spec. nov.
- Small semiglobular sponge; choanosomal skeleton renerioid; no distinct size classes of subtylostyles ..... *Antho (Antho) nuda* spec. nov.
- Crusts with rugose surface; choanosomal skeleton microcionid; no distinct sizes of subtylostyles ..... *Ophlitaspongia translata* sensu Cruz, 2002
12. Chelae are anisochelate ..... *Antho (Acarnia) signata*
- Only isochelae present or chelae are absent 13
13. Chelae absent 14
- Chelae present 17
14. Largest styles > 1000 μm 15
- Largest styles < 700 μm 16
15. Two distinct classes of toxas (long thin accolada toxas and short thick wing-shaped or oxhorn-like toxas) ..... *Clathria (Microciona) bitoxa*
- Single class of wing-shaped toxas ..... *Clathria (Microciona) anancora*
16. Long thin strepsitoxas ..... *Clathria (Microciona) aurea* spec. nov.
- Short thin wing-shaped toxas ..... *Clathria (Microciona) boavistae* spec. nov.
17. Chelae include cleistochelae or ctenichelae (typical chelae may be present) 18
- No cleisto- or ctenichelae 21
18. Next to cleistochelae there are also typical palmate isochelae 19
- All chelae are cleisto- or ctenichelae 20
19. Acanthostyles and toxas absent; cleistochelae in two size categories; skeleton plumoreticulate or microcionid ..... *Clathria (Microciona) bicleistochelifera* spec. nov.
- Acanthostyles and toxas present; only a single category of cleistochelae; skeleton hymedesmioid; quasitylotes present. . *Clathria (Microciona) cancapseptima* spec. nov.
20. Two size classes of wing-shaped toxas; acanthostyles up to 280 μm ..... *Clathria (Microciona) cleistochela* sensu Boury-Esnault & Lopes, 1985
- A single size class of toxas; acanthostyles < 100 μm ..... *Clathria (Microciona) cleistochela* sensu Cruz, 2002
21. Choanosomal skeleton renieroid 22
- Choanosomal skeleton hymedesmioid, microcionid, plumose or unstructured, not renieroid 23

22. Three size classes of styles which are smooth or have only a few spines; no acanthostrongyles ..... *Antho (Antho) mediterranea*
- Acanthostrongyles, acanthostyles and toxas present ..... *Antho (Acarnia) burtoni*
- Only acanthostrongyles, no acanthostyles, no toxas . *Antho elegans* sensu Lévi, 1960
23. No echinating styles; styles or subtylostyles smooth (but may have a microspined or mucronate head) 24
- Echinating (acantho-)styles present (these are smaller styles arranged in a perpendicular position sticking out from spongin fibers or from the basal spongin plate; when they resemble structural styles they are usually recognizable as smaller versions with spines on the shaft) 27
24. Toxas absent 25
- Toxas present 26
25. Papillate sponge with axially condensed skeletons in the papillae; ectosomal subtylostyles with microspined heads .....*Clathria (Axosuberites) papillata* spec. nov.
- Thin crust with unstructured skeleton; no microspined heads on any of the megascleres ..... *Artemisina incrustans* spec. nov.
26. Massive sponge with lamellate grooves; skeleton axially condensed .... *Clathria (Axosuberites) pachyaxia*
- Thin black crust (black colour persists in alcohol) .. *Artemisina melanoides* spec. nov.
- Smooth red crust ..... *Ophlitaspongia papilla* sensu Cruz, 2002
27. Chelae arranged in whorls or rosettes; sponge thickly encrusting to massive .... *Clathria (Cornulotrocha) cheliglomerata* spec. nov.
- No such arrangement of chelae 28
28. Toxas absent (search carefully as they may be rare or localized) 29
- Toxas present 30
29. Largest structural styles > 1000 μm; largest chelae > 30 μm .... *Clathria (Paresperia) anchorata*
- Styles < 700 μm; largest chelae < 20 μm ..... *Clathria (Microciona) atoxa*
30. Two types of toxas 31
- Only a single type, although sizes may be quite variable 33
31. Long toxas accolada type; shorter toxas oxhorn-like, thickness 3 μm .... *Clathria (Microciona) africana*
- Long toxas strepsitoxas; shorter toxas wing-shaped, thin (< 1.5 μm) 32
32. Skeleton hymedesmioid; largest styles > 500 μm .... *Clathria (Microciona) strepsitoxa* sensu Cruz, 2002
- Skeleton microcionid; largest styles < 400 μm .... *Clathria (Microciona) strepsitoxa* sensu Boury-Esnault & Lopes, 1985
33. Two size classes of chelae 34
- Only a single size class of chelae 35
34. Smaller chela category contorted; sponge thinly encrusting; skeleton hymedesmioid ..... *Clathria (Microciona) gorgadensis* spec. nov.
- Smaller chela category typical shaped; sponge cushion-shaped; skeleton plumoreticulate ..... *Clathria (Microciona) capverdensis* spec. nov.
35. Structural styles entirely smooth 36
- Structural styles have spines or warts on the head, or are rugose, and/or are spined on the shaft 38

36. Echinating styles are entirely smooth, a short version of the structural styles; skeleton plumoreticulate with enhanced spongin 37
- Echinating styles have spines on the head and the shaft ..... *Clathria (Thalysias) jolicoeuri* sensu Lévi, 1959
37. Echinating styles up to 180 μm; thickest toxas > 5 μm ..... *Clathria (Microciona) coralloides* sensu Boury-Esnault & Lopes, 1985
- Echinating styles up to 85 μm; thickest toxas < 3 μm ..... *Clathria (Microciona) calloides* spec. nov.
38. Long thin accolada- or rhaphidiform toxas 39
- Wing-shaped toxas 41
39. Chelae 5-6 μm ..... *Clathria (Microciona) ascensionis* spec. nov.
- Chelae >10 μm 40
40. Structural styles with warty heads; short quasitylote modifications of the subtylostyles present ..... *Clathria (Microciona) conchicola* spec. nov.
- Structural styles with lightly spined heads; no quasitylotes modifications ..... *Clathria (Microciona) toxitenuis* sensu Cruz, 2002
41. Largest structural styles > 1000 μm *Clathria (Microciona) affinis* sensu Topsent, 1904
- Largest structural styles < 700 μm 42
42. Largest toxas < 50 μm 43
- Largest toxas > 50 μm 44
43. Ectosomal subtylostyles strongylote; echinating acanthostyles only up to 80 μm long ..... *Clathria (Microciona) haplotoxa*
- Ectosomal subtylostyles normal stylote; echinating acanthostyles up to 120 μm ..... *Clathria (Microciona) haplotoxa* sensu Lévi, 1956
44. Largest structural styles < 500 μm; tips of toxas spined or roughened (often difficult to see in light microscopy) 45
- Largest structural styles > 500 μm; tips of toxas smooth ..... *Clathria (Microciona) gradalis* sensu Cruz, 2002
45. Deeply curved toxas with clearly visible spines; largest echinating acanthostyles > 200 μm ..... *Clathria (Microciona) spinarcus*
- Toxas more shallow-curved wioth faint spination; echinating styles < 200 μm 46
46. Skeleton microcionid (columns of styles echinated by acanthostyles); a single size category of subtylostyles ..... *Clathria (Microciona) armata*
- Skeleton hymedesmioid (single styles and acanthostyles erect on the substrate; two clearly separated sizes of subtylostyles, the smaller forming bouquets at the surface ..... *Clathria (Thalysias) minutoides* spec. nov.

Discussion

Taxonomic significance of morphological characters

Our monographic report of Microcionidae of Northwest Africa and the Macaronesian islands followed in the footsteps of Hooper's (1996) Australian monograph, employing similar characters to distinguish between the species and (sub-)genera. We are generally in accordance with Hooper's classification of the (sub-)genera, but proposed to extend these with *Clathria (Paresperia)* and *Antho (Plocamia)* for reasons given above.

We are satisfied with the subgeneric status of these and the remaining subgenera and do not consider it wise in view of forthcoming molecular revisions to change their status to full genera.

We discuss here the characters we found useful to distinguish species (in addition to Hooper's overview of characters and character states (1996: 6-18):

Habit.— In our experience growth form is usually fairly consistent among individuals of the same species, thinly encrusting, massively encrusting, lobate and arborescent forms being similar in species where we could study more than a single individual. Obviously, arborescent forms have to start out as small patches, and theoretically might be mistaken for an encrusting species, but in practice this was not observed by us. We reject the suggestion of arborescent species occurring also as thin encrustation (e.g. *Antho (Antho) morisca* and *A. (A.) involvens*) other than as an incipient individual, which would invariably show shorter branches.

Skeletal structure.— In our experience with Mediterranean-Atlantic representatives, skeletal structures appear less diverse than demonstrated for Australian species, and accordingly we mostly followed Lévi's (1960a) earlier scheme rather than Hooper's, to describe the skeletal structure. We employed the terms plumoreticulate, axially condensed, microcionid, hymedesmioid skeleton (*Clathria* s.l.), renieroid (*Antho* s.l.) and unstructured (*Artemisina*). These terms are not describing an exact state of the skeleton and different terms may be employed for differently developed specimens of the same species or subgenus. However, we have not observed previously suggested intraspecific transitions from a hymedesmioid through a microcionid to a plumoreticulate state.

Subtylostyles.— These are rather uniform in shape, but among and within species they may be quite variable in length and thickness. This size variation is usually continuous in a given specimen, but in specimens of *Clathria (Thalysias)* there is a differentiation in size classes, with the smaller arranged in bouquets or a palisade at the surface. The heads of the subtylostyles, which are usually slightly swollen, bear faint or less often distinct spination in the majority of species, but in several (*Clathria (Microciona) bicleistochelifera* spec. nov., *Clathria (Microciona) boavistae* spec. nov., *Clathria (Microciona) calloides* spec. nov., *Clathria (Thalysias) vacata* spec. nov., *Antho (Antho) nuda* spec. nov., and *Artemisina melanoides* spec. nov.,) the heads were found to be entirely smooth. Several species of *Clathria (Microciona)*, possess a distinct modification of the subtylostyles, dubbed quasitylotes, where the pointed end is swollen and often provided with spines, mirroring the heads, but these spicules remain asymmetric and never become genuine tylotes. Species with quasitylotes in the present study area always also possess normal subtylostyles. Cases in point are *Clathria (Microciona) cancapseptima* spec. nov. and *Clathria (Microciona) conchicola* spec. nov. In *Clathria (Axosuberites)* and *Artemisina*, distinction between structural styles and ectosomal subtylostyles may become obscured.

Structural styles.— These come in a three recurrent types, (1) entirely smooth, often then fusiform and with a faint constriction just below the head, (2) with a smooth shaft and swollen, rugose or warty heads, (3) with swollen, heavily spined heads and lightly spined shaft, usually leaving the pointed end free of spines. The second type is most often encountered in the study area. Larger styles tend to become curved. In *Antho*, structural styles may come in two distinct sizes, larger ones from the subectosomal skeleton causing the hispid surface, and smaller built into the basal reticulation coring the ascending fibers. The latter occasionally may have some spines and grade then into

the acanthostyles / acanthostrongyles of the basal reticulation.

Echinating styles.— These come into two rather distinct types, (1) similar in shape, and often also in thickness, to the structural styles, but smaller and spined (lightly) on the shaft; in fact these spicules are only recognizable by their position in the skeleton, echinating the spongin fibers or surrounding the structural styles embedded with their heads in the spongin plate, (2) distinctly different in shape, shorter and thinner than the structural styles, and usually entirely heavily spined; in a few species an area between the heavily spined head and point may be relatively smooth. Echinating styles are lacking in *Clathria (Axosuberites)*, *Antho (Antho)*, *Artemisina*, and *Ophlitaspongia*. Occasionally, they are also lacking in *Clathria (Microciona)*, e.g. *C. (M.) bicleistochelifera* spec. nov.

Toxas.— In addition to Hooper's extensive treatment of the toxas, the types and combinations of which are often species-specific, we distinguish strepsitoxas, accoladatype toxas (long and thin, with a small median curvature) in which the central curvature is twisted a half or whole turn. This is not always readily observed in spicule mounts or on SEM stubs, but it appears to be a distinct feature, of *Clathria (Microciona) strepsitox*a and *Clathria (Microciona) aurea* spec. nov.

Palmate isochelae.— Size and size categories are important characters. Contorted chelae are relatively rare in the study area, found only in *Clathria (Microciona) gorgadensis* spec. nov. and *Antho (Plocamia) hallezi*, and it was also observed in some chelae of *Antho (Plocamia) erecta*. Absence of chelae is considered significant at the species level, but this is a tricky issue as some specimens may have rare chelae, or very small chelae, easily overlooked. A special case are the cleistochelae. They were encountered surprisingly often (more so than apparently in Australian Microcionidae), and several states may be recognized, possibly comprising growth developments of the chelae, but this remains to be confirmed. In some cases, typical chelae and cleistochelae are found in the same specimens. A ctenichelate condition may be distinguished, where the shaft is provided with a ridge, but the alae are still some distance away from each other and from the ridge. Genuine cleistochelae, with the two alae touching and the space between the shaft and the alae entirely filled by an extended ridge, have been observed relatively seldom. Possibly, the cleistochelate condition could be employed further as a synapomorphy to distinguish groups of species. So far, we conclude that occurrence of cleistochelae at least transcends subgenus boundaries, e.g. *Clathria (Clathria)* and *Clathria (Microciona)*. They are not known from Ophlitaspongiinae. The contorted-cleistochelate-anisochelate condition of the chelae in *Antho (Acarnia) signata* are unique, and were the reason for the erection of *Plocamiopsis* Topsent, 1927. In the absence of species with similar chelae we concur with Hooper (2002) that these peculiar chelae are a species character, not a genus character.

Endemism in the region

Although parts of the area considered here have been studied only occasionally, and distributions are obviously only cursorily known, it may be useful to summarize our results as a first ever overview of the microcionids of this area. As a biologically meaningful subdivision of the area we take the Marine Ecoregions (MEOW) scheme of Spalding et al. (2006). In the seven MEOWs from which we have microcionid information we counted the number of microcionid species present and the number of species

Table 4. Numbers of species and endemism of microcionid sponges in Marine Ecoregions of Northwest Africa and Macaronesia.

Marine Ecoregion	N species	N endemics	% endemicity
Azores-Madeira-Canaries	16	6	37
Saharan	10	4	40
Sahelian	9	5	55
Cape Verde	14	10	71
Gulf of Guinea West	2	1	50
Gulf of Guinea Islands	1	1	100
Ascension Island	3	1	33

endemic to each MEOW, cf. Table 4. The species we record are unevenly divided over the ecoregions, due to difference in collection effort. Ascension Island, Gulf of Guinea Islands, and Gulf of Guinea West have been insufficiently studied to yield meaningful data. Among the remaining MEOWs, the number of species present is not very different, varying from 9 to 16. However, in the percentage endemism, there is a clear North-South trend, from 37% in the Azores-Madeira-Canaries region, 40 and 55 % along the continental coasts of West Africa, to 71% in Cape Verde Islands. The high endemicity in the Cape Verde Islands is striking compared to that of the much lower endemism in the Atlantic archipelagoes of the Azores-Madeira-Canaries region. Although the geological age of the Cape Verde Islands and that of Madeira and the Canary Islands is comparable (20-5 MYA, for the various individual islands, cf. Gillespie & Clague, 2009), the enhanced endemism is likely related to the tropical environment of the Cape Verde Islands, as compared to cooler waters of Madeira and the Canaries. These areas share a good proportion of their fauna with Mediterranean and Northeast Atlantic regions.

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