Systema Porifera: A Guide to the Classification of Sponges, Edited by John N.A. Hooper and Rob W.M. Van Soest

Family Ancorinidae Schmidt, 1870

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Ancorinidae Schmidt (Demospongiae, Astrophorida) is revised to contain 15 valid genera (of 37 nominal genera): *Stelletta, Cryptosyringa, Tethyopsis, Rhabdastrella, Jaspis, Ancorina, Disyringa, Stryphnus, Ecionemia, Psammastra, Penares, Asteropus, Melophlus, Tribrachium*, and *Holoxea*. Some of them (e.g., *Stelletta, Ecionemia*) have a large representation of species widespread around the world while some others are monotypic (e.g., *Cryptosyringa, Disyringa*). The main microsclere, which characterizes this family is the euaster, but it can be absent from several species (e.g., *Penares candidata, Holoxea furtiva*). The diagnostic characters traditionally used for separating genera within Ancorinidae are the type of microscleres (euasters *versus* microrhabds or sanidasters), the presence or absence (assumed by reduction) of triaenes and the presence/absence of particular inhalant and/or exhalant structures (tubes). Any possible combinations of these three types of characters outline the diagnosis of the different genera. Several of these genera are polyphyletic in a cladistic analysis based on the structural and morphological characters at hand but are maintained here with a practical purpose until new characters (e.g., genetic sequences) will allow a more reliable phylogenetic analysis. Ancorinid sponges live on soft, detritic, and hard (rocky) bottoms from shallow waters to bathyal depths.
Keywords: Porifera; Demospongiae; Astrophorida; Ancorinidae; *Stelletta*; *Tethyopsis*; *Cryptosyringa*; *Rhabdastrella*; *Jaspis*; *Ancorina*; *Disyringa*; *Stryphnus*; *Ecionemia*; *Psammastra*; *Penares*; *Melophlus*; *Asteropus*; *Tribrachium*; *Holoxea*.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

Ancorinidae Schmidt, 1870. Stellettidae Carter, 1875b: 67 (as Stellettina). Euastrosa Sollas, 1886a. Coppatiidae Topsent, 1898c. [Epipolasidae] Sollas, 1888 (*nomen nudum*). [Streptasteridae] Topsent, 1928c: 35 (*nomen nudum*). Jaspidae de Laubenfels, 1936a. Seiriolidae Hanitsch, 1889.

Definition

Astrophorida with long-rhabdome triaenes, which may be reduced or even absent, and oxeas. Microscleres are euasters, sanidasters or microrhabds.

Diagnosis

Encrusting, irregularly massive or clearly spherical sponges, in some cases with long inhalant and/or exhalant tubes. The megascleres are triaenes with long rhabdome and oxeas. Microscleres are euasters (oxyasters, spherasters, chiasters, tylasters), streptasters (sanidasters, amphiasters), and spiny or smooth microrhabds.

Scope

This family contains a large number (37) of nominal genera, of which 15 are recognized as valid here. The presence of triaenes is not a constant character in these sponges, and as such I include in Ancorinidae those genera previously referred to Coppatiidae bearing euasters, sanidasters or spiny, sanidaster-derived microrhabds such as *Jaspis, Holoxea, Melophlus* and *Asteropus*.

History and biology

Ancorinidae is a large complicated family, and several attempts have been made in the past to subdivide it into subfamilies (e.g., Sollas, 1888; Topsent, 1894d) using microsclere geometry and the presence/absence of a cortex as the main diagnostic characters. These proposed schemes are as follows:

– Subfamily Homasterina (with one aster category). *Myriastra* Sollas (without cortex); *Pilochrota* Sollas (with cortex).
– Subfamily Euasterina (with two euaster categories). *Anthastra* Sollas (without cortex, without tubes); *Stelletta* Schmidt, *Dragmastra* Sollas (with cortex, without tubes); *Tethyopsis* Stewart (with tubes).
– Subfamily Rhabdasterina (with a euaster and a microrhabd). *Ecionemia* Bowerbank, *Penares* Gray (without cortex), *Psammastra* Sollas (with cortex).
– Subfamily Sanidasterina (with a euaster and a streptaster (sanidaster or amphiaster)). *Ancorina* Schmidt, *Tribrachium* Weltner, *Disyringa* Sollas (with radial skeleton); *Stryphnus* (without radial skeleton).

However, not all the currently accepted genera of Ancorinidae can be unambiguously placed in a given subfamily, and consequently this subfamily classification has not been followed here.

Several members of Ancorinidae display characteristic growth habits, with particular aquiferous structures, which also involve a specific and distinct distribution of the different spicule types. Inhalant or exhalant orifices may be clustered in some areas and or be placed on long, more or less complex tubes.

The separation of genera based on the presence or absence of cortex, followed by some early authors (e.g., Sollas, 1888; Topsent, 1894d), has proven to be impractical given that the cortex may differ substantially in thickness in representatives of the same genus. Similarly, among the skeletal characters, the presence, abundance

and type of triaenes is particularly variable, even within a given genus or species. The same can be said of the confused/ radiate skeleton. Variability in all these characters provides no support to maintain those genera without triaenes and with a more-or-less confused skeleton separate from Ancorinidae, which have asters and spiny microrhabds as microscleres (usually included in the family Coppatiidae). Coppatiidae has been frequently maintained for practical reasons, although its polyphyletic nature has been recognized (Hajdu & Soest, 1992; Kennedy, 2000), and several reasons suggest they be included in Ancorinidae. These include the absence of triaenes in several genera otherwise considered 'true' Ancorinidae, with the presence of triaenes not a synapomorphic character. Consequently, we are including in Ancorinidae those genera of Coppatidae bearing euasters, sanidasters or spiny, sanidaster-derived microrhabds. Other coppatid genera have more dubious affinities and cannot be included at present in Ancorinidae (e.g., *Jasplakina* de Laubenfels, 1954 and *Lamellomorpha* Bergquist, 1968). Conversely, microsclere geometry appears to be a more consistent character to differentiate genera and species in this family, although differences between sanidasters and spiny microrhabds are not always clear. Our current knowledge on the phylogeny of these taxa has not progressed much since the early classic authors (e.g., Lendenfeld, Sollas, Dendy, Topsent etc.) because no new diagnostic characters are available since the time when the first descriptions were made. The only studies addressed to assess the homology of morphological characters in Astrophorid sponges based on molecular data (i.e., the 28S rNA gene) (Chombard, 1998; Chombard *et al*., 1998) indicated a close relation of *Penares* with *Erylus* and *Pachymatisma* which would suggest moving the genus *Penares* from Ancorinidae to Geodiidae. However, additional examples of 'true' Ancorinidae must be examined to allow a more complete phylogenetic assessment of this hypothesis before a decision can be taken

Remarks

The concept of Ancorinidae has been expanded here, according to Hooper *et al*. (2000) and Kennedy (2000), and as was previously suggested by Hajdu & Van Soest (1992), to include several genera traditionally allocated to the separate (although recognized as artificial) family Coppatiidae. Different members of this family, which lack triaenes as a presumed synapomorphy, appear to be related to members of Astrophorida due to the presence of large monaxons and some form of aster or aster-derived microsclere. Some genera of Ancorinidae (e.g., *Rhabdastrella*) have vestigial triaenes and support the contention that triaene-free genera may be members of Ancorinidae.

Previous reviews

Sollas, 1888; Lendenfeld, 1903, 1907; Dendy, 1916c; Lévi, 1973; Bergquist, 1978; Hartman, 1982; Wiedenmayer, 1989; Hooper & Wiedenmayer, 1994; Kennedy, 2000.

KEY TO GENERA

(1) Only euasters (and occasional trichodragmata) as microscleres 2
With other microscleres apart from trichodragmata (with or without euasters) 3
(2) With an ectosomal layer of paratangential oxeas (triaenes absent) ..... ***Jaspis***
Without an ectosomal layer of paratangential oxeas 4
(3) Euasters and streptasters or microrhabds 5
Only sanidaster-like microrhabds and (sometimes) trichodragmata 14
(4) Oxyasters, chiasters or tylasters (these two last types may have a marked centrum (small spherochiasters or spherotylasters) 6
Large oxyspheraster or sterrospheraster among the euasters (triaenes may be rare or absent) ..... ***Rhabdastrella***
(5) Euasters and streptasters (sanidasters or amphiasters) 8
Euasters and microrhabds 9
(6) With a tubular aquiferous structure with several ducts ..... ***Tethyopsis***
Without tubular structures 7
(7) Minute (less than 5 mm long) ovoid sponge with the exhalant (sieve) and inhalant areas at the opposite sides ..... ***Cryptosyringa***
Normal size, massive sponge, without polarisation of the inhalant and exhalant areas ..... ***Stelletta***
(8) Without triaenes ..... ***Asteropus***
With triaenes 12
(9) Smooth microrhabds ..... ***Penares***
Spiny microrhabds 10
(10) Without triaenes ..... ***Melophlus***
With triaenes 11
(11) Thick cortex ..... ***Psammastra***
Cortex thin or indistinguishable ..... ***Ecionemia***
(12) With short-shafted triaenes ..... ***Stryphnus***
With long-shafted triaenes 13
(13) With tubular structures ..... ***Disyringa***
Without tubular structures ..... ***Ancorina***
(14) With triaenes; only sanidasters as microscleres; simple tube ..... ***Tribrachium***
Without triaenes, sanidaster-like microrhabds; without tubes ..... ***Holoxea***

STELLETTA SCHMIDT, 1862

Synonymy

Stelletta Schmidt, 1862. *Myriastra* Sollas 1886a: 188. *Pilochrota* Sollas, 1886a: 189. *Anthastra* Sollas, 1886a: 191. *Dragmastra* Sollas, 1888: 187. *Dorypleres* Sollas, 1888: 426. *Astrella* Sollas, 1886a: 193. *Cryptotethya* Dendy, 1905: 110. Not [*Cryptotethya*] de Laubenfels, 1949. ? *Monotria* de Laubenfels, 1936a: 179 (*incertae sedis*).

Type species

Stelletta grubei Schmidt, 1862 (by subsequent designation; Burton & Rao, 1932).

Definition

Ancorinidae with euasters without a marked centrum (oxyasters, chiasters and tylasters) as the main microscleres.

Diagnosis

Massive sponges with a more-or-less collagenous rich cortex; triaenes often abundant, more rarely absent, oxeas, and from one to three types of euasters, one of them confined to the choanosome, the other(s) sparse thorough the sponge. Occasional accessory ortho- or trichodragmata.

Previous reviews

Sollas, 1888; Topsent, 1894d; Lendenfeld, 1903; Burton & Rao, 1932; Uriz, 1981; Hooper & Wiedenmayer, 1994; Kennedy, 2000.

Description of type species

Stelletta grubei Schmidt, 1862 (Fig. 1).

Synonymy. *Stelletta grubii* Schmidt, 1862: 46. *Stelletta boglicii* Schmidt, 1862: 47. *Tethya collingsii* Bowerbank 1866: 87; *Stelletta collingsii*; Sollas, 1888: 181. *Tethya schmidtii* Bowerbank, 1866: 89; *Collingsia schmidtii* Gray, 1867a: 541. *Collingsia sarniensis* Gray, 1867a: 544. *Stelletta anceps* Schmidt, 1868: 31; *Astrella anceps*; Sollas, 1888: 181. *Ecionemia coactura* Bowerbank, 1874: 269; *Stelletta coactura*; Sollas, 1888: 185.

Material examined. Syntypes (holotype not fixed): LMJG15702 – Quarnero; LMJG15272 – Zlarin, Adriatic. Other material. Specimens of *Stelletta grubei*: CEAB.POR.BIO.013a, 13b, 013c, 013d, 013e, 013f. Carter's material of *Pilochrota lactea*: BMNH 468-EK3. *Stelletta normani*: BMNH 10:1:1:571 – Norman Collection.

Description. Sponge subspherical or irregularly massive. Surface even or hispid according to the zones, with encrusted foreign debris. Color from white to gray. Cortex coriaceous, 15000–3000 μm thick. Small oscula sparse. Ostia cribriporal. Megascleres: oxeas straight, fusiform, sharply pointed, 1600–2700 × 40–50 μm in size; orthotriaenes with straight or slightly curved rhabdome, 1000–2000 × 40–60 μm in size; clads rather thin, 30–40 μm in thickness, abruptly curved at a distance of about 70 μm from the origin and with a total length up to 150 μm. Microscleres: somal chiasters with 8–10 actines, 6–8 μm in length, cylindrical, ending in a swelling, and a total diameter of 11–18 μm; choanosomal oxyasters with 6–12 actines smooth, conical, sharply pointed, 6–25 μm in length. Skeletal arrangement. Orthotriaenes and oxeas radiate at the sponge periphery, with the clads tangential to the sponge surface. Oxeas and occasional protriaenes protrude the sponge surface producing hispid areas. Oxeas densely placed but disarranged in the central zone of the sponge. Oxyasters and chiasters spread thorough the sponge.

Remarks. The term 'somal' is used here in the sense of the older literature. This term refers to those spicules which are not exclusively restricted to either the ectosome or choanosome, but are present throughout the sponge.

Some variation in spicule size has been observed in specimens of the type species recorded from different localities. Thus, specimens from the Mediterranean (Topsent, 1894d; Uriz, 1981) have smaller spicules than those from the North Atlantic (Arndt, 1935).

Although the genus *Dorypleres* Sollas, 1888 has been considered to be synonymous with *Jaspis* by previous authors (e.g., Bergquist, 1968, Sanders *et al*., 1999), based on similarities in their spicule complement, it has clear affinities with *Stelletta*, as stated by Burton and Rao (1932) and Kennedy (2000). The type species (*D. dendyi* Sollas 1888), *D. affinis* (Carter 1879b, as *Hemiasterella*)

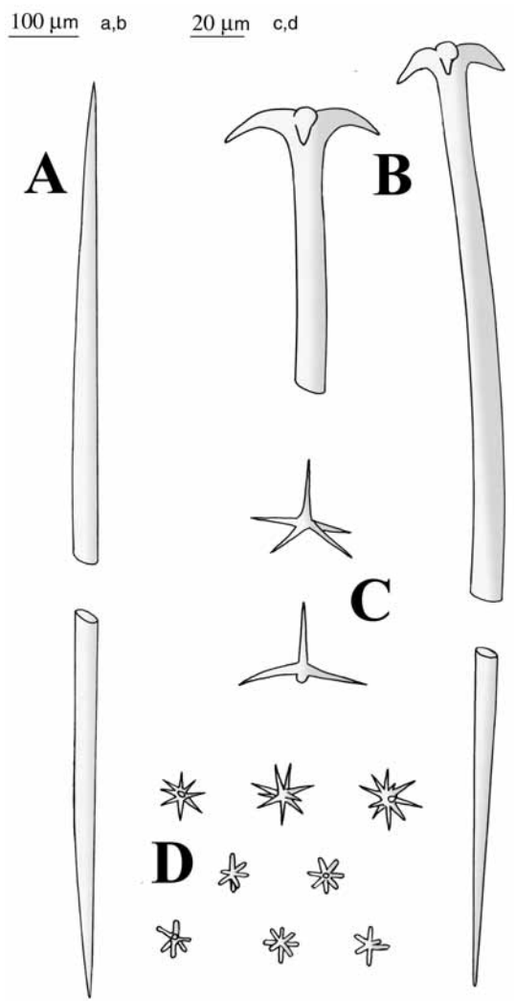

Fig. 1. *Stelletta grubei* Schmidt, 1862. Spicules from specimen CEAB.POR.BIO.013a. A, oxeas. B, orthotriaenes. C, choanosomal oxyasters. D, somal chiasters.

and *D. splendens* de Laubenfels, 1954 lack the paratangential ectosomal layer of oxeas typical of *Jaspis*. In contrast, as in *Stelletta*, the oxyasters form an ectosomal layer. The reduction or total loss of triaenes is a recurrent character in species of different genera of Ancorinidae and, consequently, does not seem to be synapomorphic, as Hajdu & Van Soest (1992) suggested. De Laubenfels' description (1954) of the species, *Dorypleres splendens*, highlights another character making the genus more distant from *Jaspis*, viz., the surface protuberances in *Dorypleres* (Sanders *et al*., 1999), which are the products of the radial multispiculate tracts of oxeas, in contrast to the confused arrangement of oxeas in *Jaspis*.

The genus *Monotria* de Laubenfels, 1936a: 179 (with type species *Coppatias solidissima* Wilson, 1902) is also a possible ancorinid, with some triaenes mentioned by the original author, and thus inferring possible synonymy with *Stelletta*. De Laubenfels (1936a) states that the taxon is characterised by oxeas and triods, with the latter plausibly regarded as calthrops that have lost one of the four rays. This assumption suggests that the genus should be placed in Calthropellidae, due to possession of reduced calthops. However, re-examination of the type specimen slide (in the USNM, courtesy of Klaus Rützler, pers. comm.), found neither triaenes nor calthrops, suggesting that the taxon was inaccurately described and that it has more probable affinites with Ancorinidae than with Calthropellidae. Consequently, the nominal genus is included here as Ancorinidae *incertae sedis* within *Stelletta*, but requires more detailed study to confirm this hypothesised synonymy.

Distribution

Cosmopolitan.

***CRYPTOSYRINGA* VACELET, 1979**

Synonymy

Cryptosyringa Vacelet, 1979c: 34.

Type species

Cryptosyringa membranophila Vacelet, 1979c (by monotypy).

Definition

Ancorinidae with oscula and ostia clustered at the opposite sides of the sponge's longest axis. Megascleres are strongyles, oxeas, and dichotriaenes. Microscleres are euasters (tylasters and/or spherasters).

Diagnosis

Sponge, small, pyriform, with inhalant orifices at the narrow apical part, and oscula clustered in a well-delimited area at the opposite zone. Megascleres are mainly strongyles, which form a condensation following the longitudinal axis, and are also arranged radially in the choanosome, dichotriaenes with the cladome tangential to the sponge surface and the rhabdome inwards. The somal microsclere is a tylaster. Spherasters are confined to the basal exhalant zone.

Previous reviews

Vacelet, 1979c.

Description of type species

Cryptosyringa membranophila Vacelet, 1979c (Figs 2 and 3).

Synonymy. *Cryptosyringa membranophila* Vacelet, 1979c: 33.

Material examined. Holotype, paratypes (3): MNHN.D. JV78.1 – with single registration number (the holotype is labeled); central Atlantic, Jamaica, coral reef cave, 20 m in depth.

Description. Typically pyriform, small sponge, 2.3–3.5 mm high, 1.8–2.1 mm wide, with a globular base and a narrower, rounded apical zone. The inhalant orifices are located at the apical zone, while the oscula are clustered together in a well-delimited sieve at the bottom of the globular part. The sponge is inserted in a foreign membranous bag with just the exhalant sieve piercing the membrane and the rest of the body inside the bag. The surface is even, without foreign debris. The color is white both in living specimens (Vacelet, 1979c) and after preservation in alcohol. The

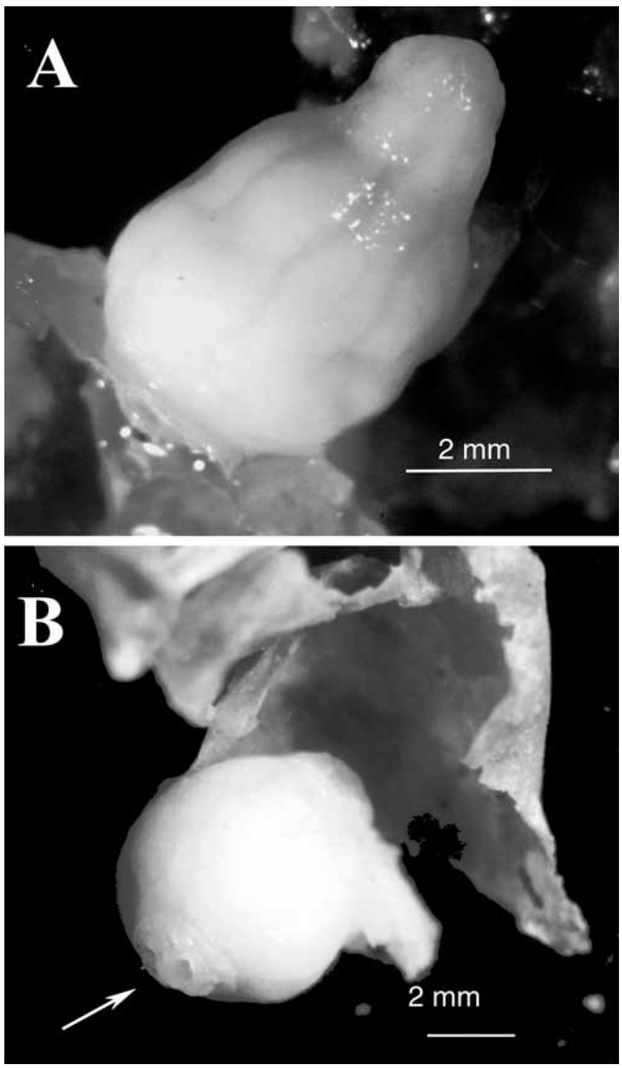

Fig. 2. *Cryptosyringa membranophila* Vacelet, 1979c. A, lateral view of a paratype with the posterior zone inserted (bottom on the left) in the foreign membrane. B, paratype showing the sieve area on the bottom (arrow) where the exhalant canals flow.

consistency is fleshy. The spicule complement is weak. Megascleres: subtylotes to strongyles straight or slightly bent, with an axial vesicle clearly discernible in the tyles, 500–650 × 5–7 μm in size; thin oxeas, probably corresponding to immature subtylotes, can only be rarely found; fragile dichotriaenes, with clads and rhabdome ending in rounded points; deuteroclads (150–160 × 4.4.5 μm) much longer than protoclads (20 × 4–5 μm) and rhabdome straight, 425–550 × 4–7 μm in size; occasional protriaenes with one or two undivided clads can also be found. Microscleres: tylasters, 5–6 μm in diameter, with actines ending in a flat knob; oxyspheraster of the basal sieve, 18–26 μm in diameter, with conical actines, and a centrum of about 5 μm (the occasional large oxyasters with few actines, 12.5–30 μm long, described by Vacelet (1979c) in the holotype may be foreign spicules since they are not present in the paratype). Skeletal arrangement: axial condensation of subtylotes, which also are spread in a radial manner; dichotriaenes at the sponge periphery with the clads tangential to the sponge surface and the rhabdome directed radially inwards, together with a couple of subtylostrongyles. The oxyspheraster are exclusively found at the inner face of the exhalant, sieve area. The tylasters accumulate at the periphery forming a dense layer although they can also be found thorough the sponge (somal microsclere).

Distribution and ecology. Known only from the type locality. The sponge grows in very particular microhabitats consisting of small (10–25 mm in diameter) crevices of the rock covered by a foreign membrane. From 3–10 small individuals live together in each cavity.

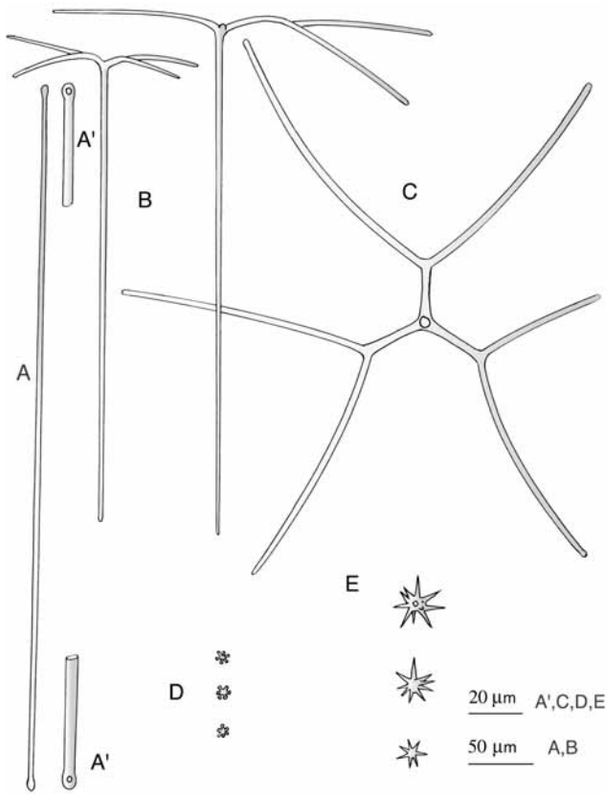

Fig. 3. *Cryptosyringa membranophila* Vacelet, 1979c. Spicules from the paratype. A-A', subtylotes. B–C, dichotriaenes. D, tylasters. E, oxyspheraster.

Remarks. This is a monotypic genus. The very odd and cryptic habitat of the type species, if this is a generic adaptation, makes it potentially difficult to find more species of this genus.

TETHYOPSIS STEWART, 1870

Synonymy

Tethyopsis Stewart, 1870: 281. *Monosyringa* Brøndsted, 1924: 441.

Type species

Tethyopsis columnifer Stewart, 1870 (by monotypy).

Definition

Ancorinidae with a four- to six ducted tube. Choanosomal megascleres are oxeas and orthotriaenes to plagiotriaenes. Particularly modified orhotriaenes form the tube skeleton. Microscleres are euasters, to which orthodragmata may be added.

Diagnosis

Globular sponge with a four- to six ducts tube, with exhalant and inhalant (?) functions. Sponge body with a radiately arranged skeleton. Megascleres are oxeas and orthotriaenes to plagiotriaenes in the sponge body and modified orthotriaenes with a clad much longer than the other two, or orthodiaenes (also with a clad much longer than the other one). Microscleres are chiasters to spherochiasters and oxyasters. Orthodragmata may be present. Sanidasters are absent.

Previous reviews

Stewart, 1870; Sollas, 1888.

Description of type species

Tethyopsis columnifer Stewart, 1870 (Figs 4 and 5).

Synonymy. *Tethyopsis columnifer* Steward, 1870: 281.

Material examined. Holotype: BMNH 1870.11.2.1 – Philippines.

Description. Globular sponge, 3.5 cm in diameter, with the basal part torn away, covered by foreign debris. Cortex 350–420 μm thick. From the sponge apex arises a cylindrical tube, free of foreign debris, rounded at the distal end. Four main conducts run along of the tube. The tube surface protrudes into conical projections. Inhalant orifices are present on the main sponge body, on the rare areas free of foreign bodies and, probably, on the tube walls. The tube, as in other Ancorinidae with complex tubes, seems to serve as both inhalant and exhalant functions. Megascleres of the main body: plagiotriaenes with a conical, straight or curved rhabdome, 5000–6654 × 52–118 μm in size, which ends in a very thin point; clads relatively short and stout, 190–386 × 79–85 μm in size; oxeas 5400–7000 × 60–90 μm rare according to Sollas (1888). Megascleres of the tube: orthotriaenes, 5800–6800 × 85–110 μm in size, with one clad much more developed (370–400 μm long) than the other two. Microscleres: spheraster (spherochiasters) with short rounded actines, 7–9 μm in diameter; oxyasters with numerous conical, pointed actines, 13.6–25 μm in diameter (the smallest

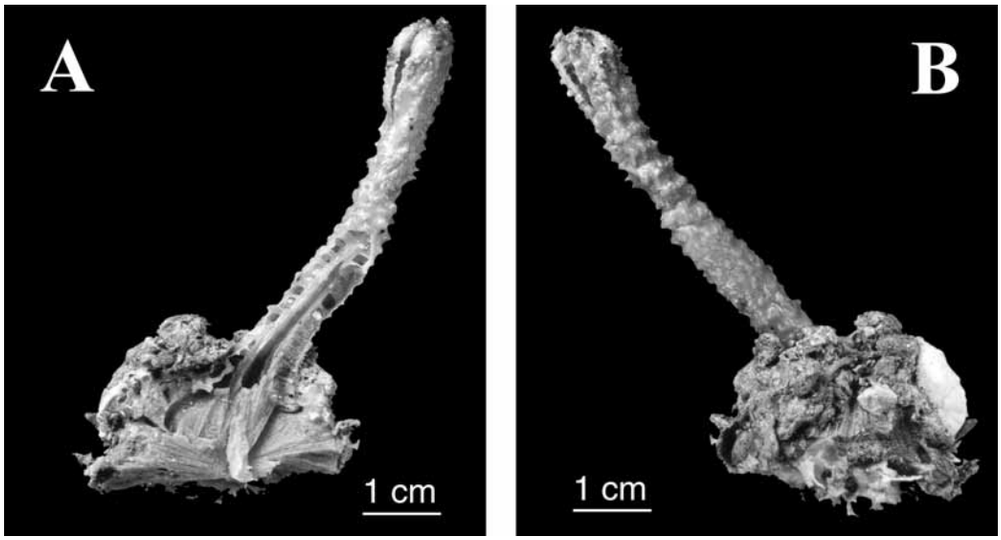

Fig. 4. *Tethyopsis columnifer* Stewart, 1870 (holotype). A, transverse section showing the radial arrangement of megascleres. B, external surface of the spherical body completely covered by foreign debris.

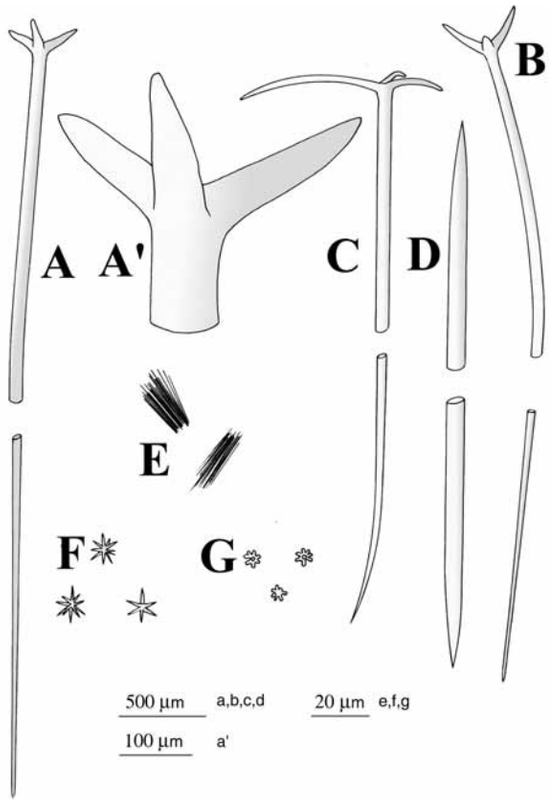

Fig. 5. *Tethyopsis columnifer* Stewart, 1870. Spicules from the holotype. A– B, plagiotriaenes from the spherical body. C, orthotriaene of the tube with a clad longer than the other two. D, oxea. E, trichodragmata. F, oxyasters. G, spherochiasters.

have the highest number of actines); trichodragmata, 29.5–34 × 9–10 µm in size. Skeletal arrangement. The main skeleton of the tube is made of a central spicular axis formed by oxeas and modified orthotriaenes with the longer clad directed toward the tube walls. Plagiotriaenes and oxeas, arranged in radiate tracts, form the skeleton of the spherical sponge body. Chiasters are spread through the sponge; oxyasters are mainly concentrated in the choanosome.

Remarks. Wilson (1925) expanded the genus diagnosis of Sollas (1888) by stating that "euaster forms may be slightly modified in the direction of a streptaster" in order to accommodate his new species *Tethyopsis dubia*, in which (according to his figs 45a–c), sanidasters are clearly present whereas in the diagnosis of this genus Sollas (1888) specifies that sanidasters are absent. Furthermore, plagiotriaenes and orthodiaenes were described in *T. dubia*. As a whole, the spicule complement of *T. dubia* resembles more that of a *Disyringa* (with sanidasters) than to that of *Tethyopsis*. Sollas (1888) also reports on the presence of choanosomal chiasters in the holotype. However, he describes these chiasters with actines slender, "hair-like, reminding one of a young sterraster". This description does not match that of a chiaster but that of the oxyasters I found from re-examination of the holotype. As for the choanosomal orthotriaenes reported by Sollas (1888), they are clearly plagiotriaenes with the clads directed obliquely upwards.

The genus *Monosyringa* Brøndsted (1924) (type species *M. mortenseni* Brøndsted, 1924: 442) is a junior synonym of *Tethyopsis*. The external shape, tube structure, and spicule complement are similar in the type species of both genera. The only difference is the presence of modified triaenes in the tube of *Tethyopsis* versus the modified diaenes in *Monosyringa*. Amazingly, Brøndsted (1924) did not mention *Tethyopsis* when he erected the genus *Monosyringa*, whereas he compared his new genus with *Tribrachium* and *Disyringa*, which have sanidasters instead of chiasters. Subsequently, Bergquist (1968) suggested that the species *Agilardiella radiata* Marshall, 1883, which Sollas (1888) placed into *Tethyopsis*, may be conspecific with *Monosyringa mortenseni* but, according to de Laubenfels (1936a), she considered *A. radiata* unrecognizable and did not include *T. columnifer* in her discussion.

Distribution

Pacific and Antarctic Oceans, between 54–117 m depth.

RHABDASTRELLA THIELE, 1903

Synonymy

[*Aurora*] Sollas, 1888: 187 (preoccupied; Lepidoptera (Ragonot 1887)). *Rhabdastrella* Thiele, 1903a: 934. *Diastra* Row, 1911: 300. [*Aurorella*] de Laubenfels, 1957: 245 (*nomen nudum* for *Aurora* Sollas, 1888).

Type species

Coppatias distinctus Thiele, 1900 (by original designation).

Definition

Ancorinidae with euasters, among which, large spherasters or sterrospherasters are abundant.

Diagnosis

Ancorinidae with large spherasters or sterrospherasters, mainly concentrated in the cortex. Triaenes may be reduced or absent in some species.

Previous reviews

Dendy, 1916c; Bergquist, 1968; Kennedy, 2000.

Description of type species

Rhabdastrella distincta (Thiele, 1900) (Fig. 6).

Synonymy. *Coppatias distinctus* Thiele, 1900: 56; *Rhabdastrella distincta* (Thiele 1900: 56).

Material examined. None. Holotype is missing – Ternate, Moluccas, Indonesia.

Description (from Thiele, 1900). Fragment of a massive sponge, 1 cm thick, 3.5 cm in area, blackish in color in alcohol. Cortex 200 μm thick. Megascleres: oxeas, fusiform, with short points, about 850 × 25 μm in size: Microscleres: spherasters up to 40 μm in diameter, with 15–16 conical, smooth actines; oxyasters up to 80 μm in diameter, without a centrum, with few long actines; oxyspherasters about 15 μm in diameter, with a centrum of 5 μm, with conical actines. Skeletal arrangement. Oxeas radiately arranged from the sponge periphery toward the innermost zones where they are confusedly arranged. Spherasters form a crust at the external zone of the cortex. Oxyasters and oxyspherasters are dispersed thoroughout the choanosome.

Remarks. [*Aurora*] was erected by Sollas (1888) for species of *Stelletta* having large oxyspherasters. Lendenfeld (1903) merged it with *Stelletta* but Dendy (1916c) convincingly considered it a good genus and provided arguments to consider the genera [*Aurora*], *Diastra* and *Coppatias* synonyms. Dendy's opinion has been followed by modern authors (e.g., Bergquist, 1968). *Rhabdastrella*, including its several synonyms, is characterised by a frequent reduction of triaenes, which may be completely absent in species such as *R. sterrastrosa* (Row, 1911) and *R. cribriporosa* (Dendy, 1916c), and the presence of a cortex formed by large spherasters.

Distribution

Indian and Pacific Oceans.

JASPIS GRAY, 1867

Synonymy

Astropeplus Sollas, 1888: 416, 422. *Coppatias* Sollas, 1888: 206. *Astroplakina* Dendy & Burton, 1926. *Zaplethea* de Laubenfels, 1950b: 32.

Type species

Vioa johnstonii Schmidt, 1862 (by original designation).

Definition

Ancorinidae without triaenes, spicules are oxeas and euasters without a marked centrum.

Diagnosis

Encrusting or massive sponges without triaenes; choanosomal skeleton composed of oxeas irregularly interlaced, ectosomal skeleton formed by a layer of paratangential oxeas, generally smaller than those in the choanosome; microscleres are euasters without a centrum (never spherasters).

Previous reviews

Topsent, 1900; Dendy, 1916c; Hadju & Van Soest, 1992; Sanders *et al*., 1999; Kennedy, 2000.

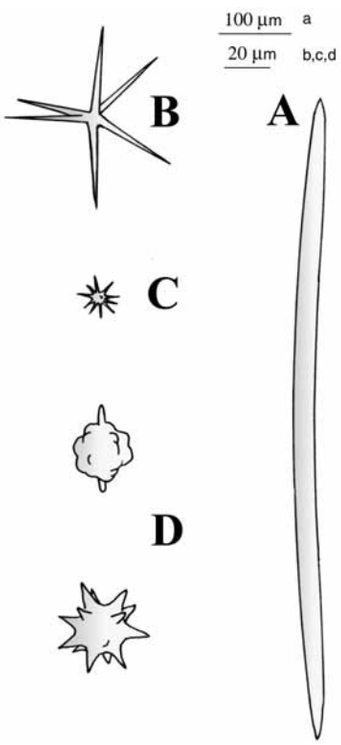

Fig. 6. *Rhabdastrella distinctus* (Thiele, 1900). Spicules from the holotype (redrawn from Thiele, 1900). A, oxea. B, choanosomal oxyaster. C, choanosomal oxyspheraster. D, large spherasters from the cortex.

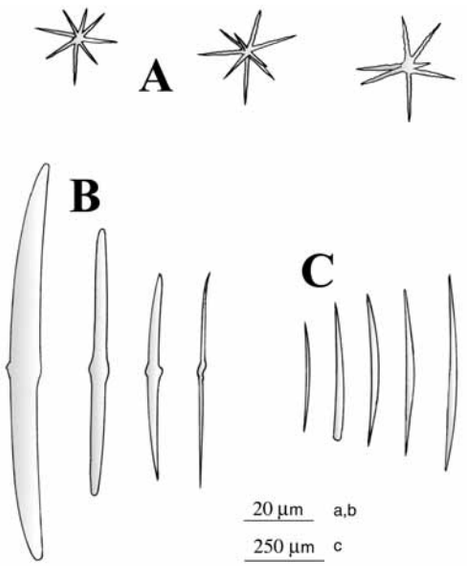

Fig. 7. *Jaspis johnstoni* (Gray, 1867a). Spicules (redrawn from Dendy, 1916c). A, oxyasters. B, centrotylote small oxeas. C, large oxeas.

Description of type species

Jaspis johnstonii (Schmidt, 1862) (Fig. 7).

Synonymy. *Vioa johnstonii* Schmidt, 1862: 78.

Material examined. Syntypes (not seen): LMJG 15256, 15258, 15268, 15649 – Adriatic Sea, Sebenico; see Desqueyroux-Faúndez & Stone (1992). Other material. Specimens of *J. johnstoni*: MA:9(4); MA:11; MA:31; MA:E(P3) – from caves at the Balearic Islands (Spain, western Mediterranean).

Description. Thinly encrusting sponge inhabiting rock crevices or covering bivalve shells. Surface smooth, perforated by sparse oscules, 0.4–0.5 mm in diameter. Cortex undifferentiated. Ectosome reinforced by paratangential small oxeas and asters. Megascleres: oxeas fusiform and slightly curved, of variable size from 70×1.2 µm up to 1000×15 µm, the larger ones predominantly located in the choanosome and the smaller in the ectosome; the smallest ones may be centrotylote. Microscleres: oxyasters without a marked centrum, with 6–10 conical, sharp-pointed actines, 4–13 µm long (total diameter 10–28 µm). Skeletal arrangement: the large oxeas are radial at the sponge periphery and confused toward the interior. The small oxeas are arranged tangentially to the sponge surface. Oxyasters dispersed thoroughout the sponge but more abundant in the peripheral region. Distribution. Adriatic; Mediterranean, (coasts of France and Spain); Atlantic (Azores and Cape Verde).

Remarks. The monotypic genus *Zaplethea* de Laubenfels, 1950b has a similar spicule complement to *Jaspis*. According to Sanders *et al*. (1999), it only differs from *Jaspis* in possessing double-bent small oxeas, which does not seem to justify a different genus. Moreover, these double-bent spicules have also been described in the type species of *Jaspis* (Topsent, 1900). The type species of *Zaplethea* (*Z. digonoxea* de Laubenfels, 1950b, holotype USNM 22746) has been considered synonymous with the type species of *Jaspis* in previous works (see Sanders *et al*., 1999), although these authors did not take into account the very disjunct distribution of the two species (Mediterranean-Adriatic versus Indo-Pacific, respectively), which alone casts some doubt on this synonymy. The genus *Jaspis*, in contrast to *Dorypleres*, is maintained separately from *Stelletta* due to the possession of a paratengential layer of oxeas at the sponge periphery.

One species of *Jaspis*, *J. stellifera* (Carter), has been copiously described or cited in the contemporary literature, particularly that pertaining to marine natural products chemistry, but Kennedy (2000) demonstrated that virtually all contemporary records of this species refer to *Rhabdastrella globostellata* (Carter).

Distribution

East and West Atlantic, Indian and Pacific Oceans, Mediterranean and Red Sea.

ANCORINA SCHMIDT, 1862

Synonymy

Ancorina Schmidt, 1862: 51. *Sanidastrella* Topsent, 1892b: 18. *Seiriola* Hanitsch, 1889: 170.

Type species

Ancorina cerebrum Schmidt, 1862 (by subsequent designation).

Definition

Ancorinidae with triaenes, oxeas, sanidasters and euasters.

Diagnosis

Ancorinidae with a conspicuous cortex, with triaenes and oxeas as megascleres and sanidasters and euasters (chiasters, tylasters or oxyasters) as microscleres.

Previous reviews

Sollas 1888; Hooper & Wiedenmayer 1994.

Description of type species

Ancorina cerebrum Schmidt, 1862 (Fig. 8).

Synonymy. *Ancorina cerebrum* Schmidt, 1862: 51. *Ancorina verruca* Schmidt, 1862: 52.

Material examined. Syntypes: ZMB2414 (slides), ZMB 6441 (1 slide), BMNH 1867.3.11.12 – Adriatic Sea (holotype not designated).

Description. Large globose, lobate sponge, with a folded surface like that of a human brain. Cortex up to 3 mm thick with a collagen rich outer layer and a fibrous inner layer. Megascleres: oxeas up to 3000×51.6–58 µm; orthotriaenes to dichotriaenes with a rhabdome 3250–3400×39–60 µm in size, protoclads 60–65 µm, deuteroclads 75–80 µm; anatriaenes with rhabdome 2800–3400×26–29 µm in size, clads 100 µm long, 150 µm chord length. Microscleres: ectosomal sanidasters, 7–8 µm long; somal chiasters with actines slender, ending in a swelling (tylasters), 8–9 µm in diameter. Skeletal arrangement. Triaenes with the cladome in the cortex and the rhabdome inwards; oxeas radial at the sponge periphery and confusedly arranged toward the interior.

Sanidasters concentrated in the cortex; chiasters dispersed throughout the sponge. Distribution. Adriatic, Zara and Quarnero, in a wide bathymetrical range.

Remarks. Following Sollas (1888), Lendenfeld (1903), Wilson (1925), Lévi (1973) and Hooper *et al*. (2000), among others, I consider *Ecionemia* as a genus different from *Ancorina*. However, the main spicule difference between species of both genera (presence of sanidasters in *Ancorina* versus spiny microrhabds in *Ecionemia*) is not always clear because it is not always possible to determine whether or not the spiny microrhabds have a sanidaster origin by reduction of the actine length.

Distribution

Mediterranean, Atlantic, Indian, and Pacific Oceans.

DISYRINGA SOLLAS, 1888

Synonymy

Disyringa Sollas, 1888: 161.

Type species

Tethyopsis dissimilis Ridley, 1884a (by original designation).

Definition

Ancorinidae of subspherical growth form, with inhalant and exhalant tubes placed at opposite sides of the sponge. Megascleres: oxeas, orthotriaenes, orthodiaenes and orthomonaenes. Microscleres: oxyasters, sanidasters and orthodragmata.

Previous reviews

Sollas, 1888; Ridley, 1884a; Hentchel, 1912; Fry & Fry, 1979.

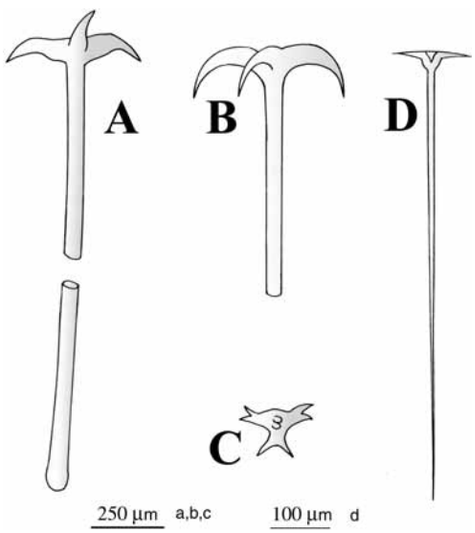

Fig. 8. *Ancorina cerebrum* Schmidt, 1862: spicules from the holotype (redrawn from Schmidt, 1862). A, orthotriaene. B, D, anatriaene. C, cladome of a dichotriaene.

Description of type species

Disyringa dissimilis (Ridley, 1884a) (Fig. 9).

Synonymy. *Tethyopsis dissimilis* Ridley, 1884a: 447.

Material examined. None. Holotype and paratype (not seen): BMHH 1882.2.23.220 – consisting of fragments (tubes); according to Fry & Fry (1979) these and some of Sollas' (1888) specimens correspond to different species. Type locality – Port Darwin, 13–22 m in mixed sand and mud bottom.

Description (from Fry & Fry, 1979). Free sponge with a spherical body, which produces a long cylindrical whole tube (exhalant tube) ending in a single opening, and at the opposite side of the sponge another long, cylindrical tube containing four ducts, which are arranged symmetrically around a central spicule axis. The latter tube ends blindy at a solid pad of packed oxea, which extend radially to give the appearance of a fringed funnel. Surface even, rough to touch. Ostia forming clusters, 0.57 mm in diameter, along the walls of the inhalant (four-ducted) tube. Ostia inconspicuous. Megascleres: somal oxeas fusiform, straight or gently curved, variously pointed, 4.641 × 59.3 µm in size. Orthotriaenes with conical, sharply pointed clads, 470 µm long, and straight, sharply pointed rhabdome, 3600 × 50 µm in size; they derive into asymmetrical orthodiaenes (with a clad longer than the other one) and orthomonaenes by reduction of one or two clads. The orthodiaenes in the tube have the long clad much longer (700–2142 µm) than those spicules in the spherical body. In some cases, the

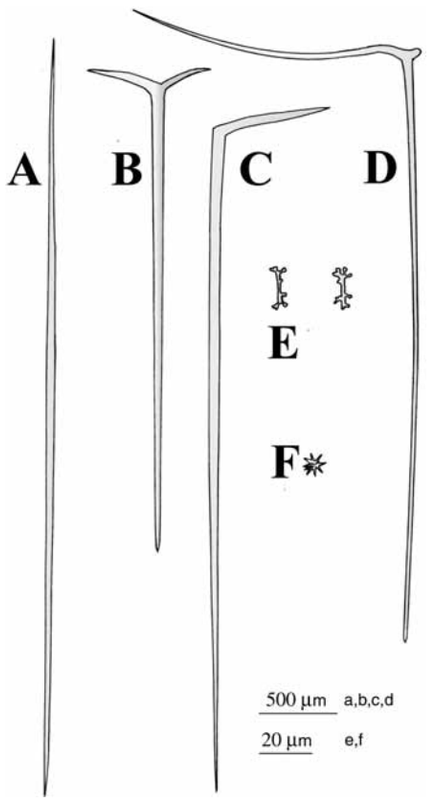

Fig. 9. *Disyringa dissimilis* (Ridley, 1884a). Spicules (redrawn from Sollas, 1888). A, oxea. B, orthodiaene from the spherical body. C, orthomonoaene from the spherical body. D, orthodiaene with an aborted clad, from the tube; E, sanidasters. F, oxyaster.

monodiaenes have the only clad divided but one of the deuteroclads is aborted. Fry & Fry (1979) reported the presence of numerous styles at the inhalant tube, which were not mentioned by Sollas (1888). Microscleres. Oxyasters with comparatively large centrum and numerous, conical, sharp-pointed actines, 8–11.8 μm in diameter, sanidasters of normal shape, 11.8–15.8 μm long; orthodragmata 23.7–27.6 × 11.8 μm in size, confined to the inhalant tube (called exhalant by Sollas, 1888). Skeletal arrangement. The skeleton of the exhalant tube consists of an external layer of tangential oxeas and an inner layer of orthodiaenes, besides numerous sanidasters lining the duct and tube surfaces. The skeleton of the inhalant (four-ducted) tube is made of a central axis of oxeas and asymmetrical orthodiaenes with the long clad arising radially; sanidasters and small styles are also abundant. The body skeleton contains oxeas, triaenes, diaenes, sanidasters, oxyasters, and trichodragmata.

Remarks. This genus is monotypic. The holotype and paratype of this species fixed by Ridley (1984) only consisted of fragments of two tubes in which there were not represented all the spicule types present in the sponge. Furthermore, according to Fry & Fry (1979), these tubes appear not to belong to the same species. Thus, we describe here the morphology of the type species on the basis of the reconstruction provided by Fry & Fry (1979) who revised Ridley's and Sollas's material. Spicule data are taken from the redescription of the type material by Sollas (1888).

Distribution

North Australian coasts: Great Barrier Reef, Arafura Sea, Timor Sea and Indonesia, 5.5–50 m depth.

STRYPHNUS SOLLAS, 1886

Synonymy

Stryphnus Sollas, 1886a: 193.

Type species

Stryphnus niger Sollas, 1886a: 193 (by subsequent designation).

Definition

Ancorinidae with large oxeas and ortho-, plagio- or dichotriaenes as megascleres, and euasters and streptasters (amphiasters or sanidasters) as microscleres.

Diagnosis

Ancorinidae with large oxeas as the somal megascleres, densely packed in the choanosome, and tangential, oblique or pependicular to the surface at the peripheral zone. The ectosomal megascleres include ortho-, plagio- or dichotriaenes. The microscleres are a euaster and an irregular amphiaster or sanidaster. The cortex is collenchymatous.

Previous reviews

Sollas, 1888; Topsent, 1894d; Lendenfeld, 1903.

Description of type species

Stryphnus niger Sollas, 1886a (Fig. 10).

Synonymy. *Stryphnus niger* Sollas, 1886a: 193. *Stelletta mucronata* Schmidt, 1868: 19; *Stryphnus mucronatus*; Sollas, 1888: 193; Marenzeller, 1889: 16. *Stelletta carbonaria* Schmidt, 1880: 280; Weltner, 1882: 52; *Stryphnus carbonarius*; Sollas, 1888: 192.

Material examined. Holotype: BMNH 1889.1.1.79 – Port Jackson, New South Wales, Australia, 55.5–64.7 m depth. Comparative material. *S. fortis* Vosmaer, 1883: MNHN CP98-E45, CP98-E43. *S. ponderosus* Sollas, 1886a: CEAB.POR.BIOL.146a, 146b, 169b.

Description. Large, massive, irregularly lobate sponge, 18 × 12 × 8 cm in size. Colour black outside, gray inside. Surface generally even but rough to touch, with some hispid zones. Cortex 1750–3000 μm thick. Ostia uniporal. Oscula simple, 3 mm in diameter, clustered on the top of lobes. Megascleres: oxeas large, stout, fusiform, usually curved obtusely, sharply or round pointed, 1563–4720 × 43–60 μm; dichotriaenes small, with a rhabdome conical, obtusely pointed, 430–450 × 29–36 μm in size, protoclads, 50–558 μm long, projecting chiefly outwards, and deuteroclads horizontal, 72–80 μm long; cladome chord 254 μm. Microscleres: oxyasters with numerous, conical, sharply pointed actines, 11.5–29.5 μm in diameter; amphiasters with a straight, short axis and long rounded or conical actines, 13.6–19.8 μm long (included actines) and 2.3–4.5 μm wide (without actines). Skeletal arrangement. Oxeas lying in various directions, densely crowded in the choanosome; they are tangential, oblique-or perpendicularly to the sponge surface at the ectosome. The dichotriaenes, confined to the cortex, with the cladome at the sponge periphery and the rhabdome inwards. Amphiasters mainly concentrated in the cortex

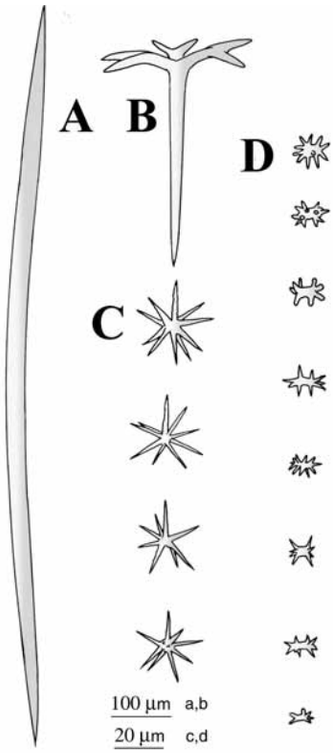

Fig. 10. *Stryphnus niger* Sollas, 1886a. Spicules from the holotype. A, oxea. B, dichotriaene. C, choanosomal oxyasters. D, somal sanidasters.

although they are also present in the choanosome. The oxyasters chiefly located in the choanosome. Distribution. E. coast of Australia, and Adriatic and Mediterranean Seas (the latter as *S. mucronatus*).

Remarks. The disjunct distribution of this species (Australia and Mediterranean/Adriatic) casts some doubt over the alleged synonymy between *S. niger* and *S. mucronatus* (Schmidt). However, there are no current spicular and morhological characters that allow us to consistently differentiate both species. The spicules described for *S. mucronatus* (Topsent, 1894d) are: stout oxeas, fusiform, straight or bent, sharply pointed, 2000–2500 × 55–60 μm, dichotriaenes with deuteroclads 40–60 μm long, shorter than the protoclads, 70 μm long, rhabdome straight, 400–450 × 20–25 μm; amphiasters, 10–13 μm long; oxyasters 12–20 μm in diameter.

Distribution

East coast of Australia, Mediterranean, Arctic, NE Atlantic and Indian Ocean.

ECIONEMIA BOWERBANK, 1864

Synonymy

Ecionemia Bowerbank, 1862: 1101. *Stellettinopsis* Carter, 1879b: 348 (in part). *Algol* Sollas, 1888: 200. *Thalassomora* Lendenfeld, 1888: 40. *Hezekia* de Laubenfels, 1934: 4.

Type species

Ecionemia acervus Bowerbank, 1864 (by monotypy).

Definition

Ancorinidae with oxeas and triaenes as megascleres, euasters (but never oxyasters) and spiny microrhabds as microscleres.

Diagnosis

Massive or thickly encrusting sponges without a distinct cortex. Triaenes of different types, and large oxeas as megascleres. Microscleres include spiny microrhabds in addition to euasters. Microrhabds usually form a dermal layer.

Previous reviews

Bowerbank, 1864; Sollas, 1888; Wilson, 1925.

Description of type species

Ecionemia acervus Bowerbank, 1864 (Figs 11 and 12).

Synonymy. *Ecionemia acervus* Bowerbank, 1864: 173; *Stelletta acervus* Ridley, 1884a: 627. *Ecionemia rotundum* Sollas, 1888: 198. *Ancorina nova-zealandiae* Dendy, 1924: 301.

Material examined. Holotype: Lost, previously deposited at the Museum of the Royal College of Surgeons, London (Stone, 1986) – Pacific, Fiji. Other material. BMNH 1882.10.17.53 – labeled as "*E. rotundum* Sollas". Specimen of *Stellettinopsis corticata* Carter (holotype of *Algol* and *Stellettinopsis*): BMNH 1885.3.14.8. Holotype of *Hezekia demera* de Laubenfels, 1934: USNM 22286 – dry specimen.

Description. Ovoid, massive sponge, 5.6 cm high, 4.8 cm wide, with the surface minutely hispid and the oscula dispersed.

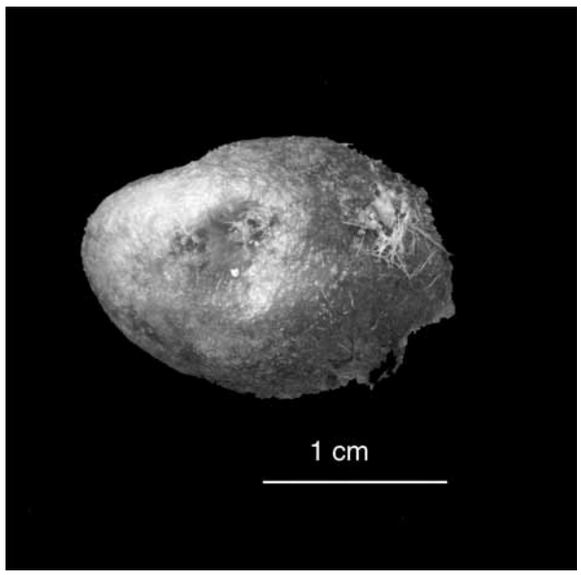

Fig. 11. *Ecionemia acervus* Bowerbank, 1864: specimen BMNH 1882.10.17.53.

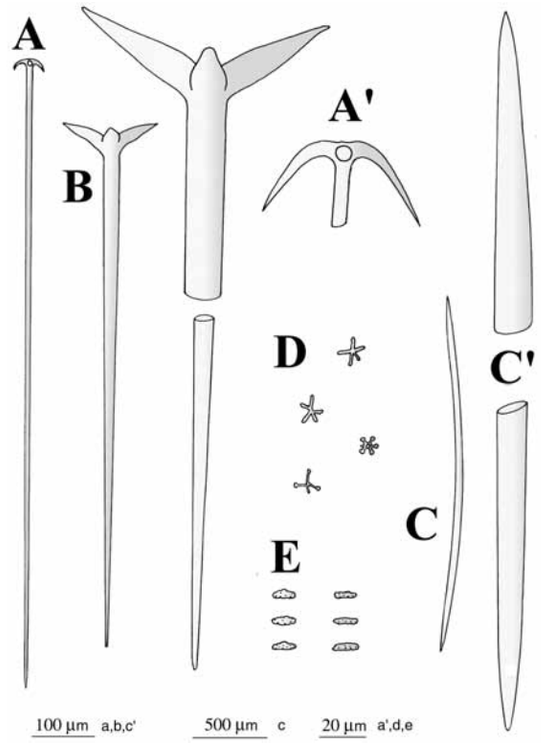

Fig. 12. *Ecionemia acervus* Bowerbank, 1864: spicules from specimen BMNH 1882.10.17.53. A-A′, anatriaene. B, plagiotriaenes. C-C′, oxeas. D, somal chiasters. E, cortical rough microrhabds.

Brown in color when dried. Megascleres: oxeas fusiform, abruptly pointed, 1700–4000 × 43–72.5 μm; orthotriaenes with rhabdome strongylate, 1890–3030 × 43.5–84 μm in size and clads 130–270 × 36.5–65 μm; anatriaenes with rhabdome 1200–4000 × 19.5–29 μm in size, cladome 110–118 μm in chord length, and clads 83–97.5 μm long; Microscleres: microstrongyles rough, 9–13.6 × 2.6–3.4 μm; chiasters with terminal tylote actines, 8–15 μm in diameter, some of them with a conspicuous centrum (called spheraster by Sollas, 1888). Skeletal arrangement: central condensation of oxeas from which spicular bundles arise radially toward the sponge surface. Triaenes with the cladome placed immediately beneath the sponge surface and the rhabdome directed inwards. A layer of micro-strongyles beneath the ectosome. Chiasters dispersed through the sponge. Distribution. W Pacific, Indian Ocean, Indo-Pacific, Australia and New Zealand, to 180 m depth.

Remarks. The differences between *Ecionemia* and *Ancorina* rely mainly on the type of microsclere which accompanies the euaster. It is basically a sanidaster in *Ancorina* and a spiny microrhabd in *Ecionemia*. However, some spiny microrhabds might have a sanidaster-origin, and both genera likely display strong relationship.

The genus *Hezekia* de Laubenfels is also a junior synonym of *Ecionemia*. The type species of *Hezekia* (*H. demera* de Laubenfels, 1934) was described as possessing microrhabds as the only certain microsclere. De Laubenfels (1934), however, reported the presence of some other kind of aster, 18 μm in diameter, which were not present in boiled-out spicule mounts but which were observed in sponge sections. He stated that these forms might be the result of a particular arrangement of microrhabds (rosette-like) or crystal precipitation due to specimen preservation. When revising the holotype I also had occasion to see these formations and can state that they are certainly not spicules. In contrast, I found true small euasters in the choanosome (Fig. 14). These spicules are very small and scarce but they certainly belong to the sponge. Thus, this genus contains microrhabds and euasters, and consequently it cannot be separated from *Ecionemia*, although the microrhabds in both genera (at least in the type species of both genera), appear to be typical rhabds and sanidaster-like, respectively.

Hooper & Wiedenmayer (1994) already considered *H. walkeri* de Laubenfels, 1954 synonymous with *Ecionemia acervus*. However, examination of the respecticve holotypes allowed me to verify that *E. acervus* has abundant, characteristic chiasters, up to 16 μm in diameter, together with the spiny microrhabds. The latter are relatively thick (11.3–13.6 × 2.7–3.4 μm) and most often centrotylote. In contrast, in *H. walkeri* the microscleres are only spiny microrhabds, slender (only 1–1.5 μm thick) and not centrotylote. Consequently, *E. acervus* and *H. walkeri* are not conspecific.

After revising the type species of *Algol* (*Stellettinopsis corticata* Carter, BMNH 1855.3.14, Fig. 13), I found only two triaenes in the several slides of the holotype. Carter (1879b) did not find triaenes, and Sollas (188) remarked on their rarity. This is probably why de Laubenfels (1954) erroneously placed into synonymy *Stellettinopsis corticata* and *Stellettinopsis simplex* (type species of *Asteropus*). This is another example of the reduction of triaenes in a species of a genus such as *Ecionemia*, which typically bears triaenes, and supports the relatively low diagnostic value of this spicule morphology as synapomorphic for the family.

Fig. 13. *Stellettinopsis corticata* Carter, 1879b (type species of *Algol* Sollas and *Stellettinopsis* Carter): holotype.

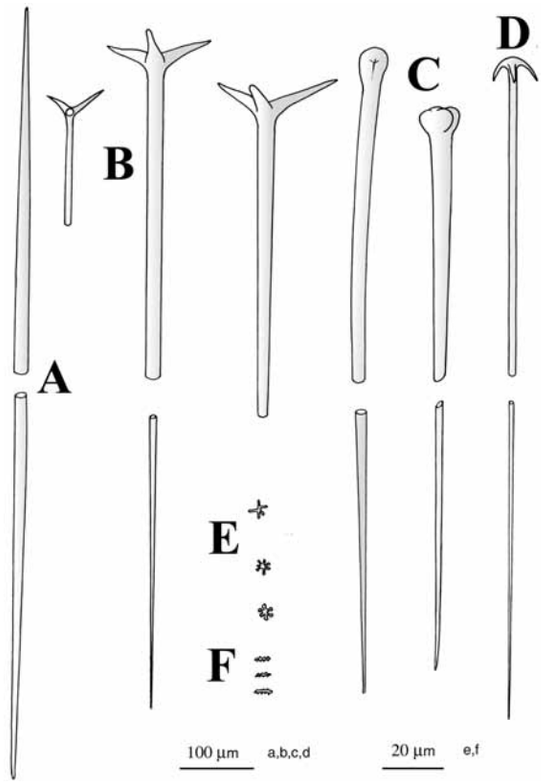

Fig. 14. *Hezekia demera* de Laubenfels, 1934. Spicules from the holotype. A, oxea. B, plagiotriaenes. C, aborted triaenes which resemble tylostyles. D, anatriaene. E, choanosomal chiasters. F, cortical rough microrhabds.

Distribution

Indian, Pacific and Atlantic Oceans.

PSAMMASTRA SOLLAS, 1886

Synonymy

Psammastra Sollas, 1886a: 195. *Rhabdodragma* Dendy, 1916c: 239.

Type species

Psammastra murrayi Sollas, 1886a (by monotypy).

Definition

Ancorinidae with a thick, collagen-rich, conulose cortex, and spiny microrhabds (microstrongyles) and euasters as microscleres.

Diagnosis

Sponges characterized by a conulose surface, thick collagen-rich, cortex often completely encrusted with thin sediment, oxeas and triaenes with short clads as megascleres, and spiny microrhabds and from one to several types of euasters as microscleres. Trichodragmata may be present.

Previous review

Sollas, 1888.

Description of type species

Psammastra murrayi Sollas, 1886a (Figs 15 and 16).

Synonymy. *Psammastra murrayi* Sollas, 1886a: 195.

Material examined. Holotype: BMNH 1889.1.1.80 (dry) – East Moncoeur Island, Bass Strait, Victoria, Australia, 70 m depth, sandy bottom with shells.

Description. Subspherical sponge, 4 × 5 mm in diameter, with a conulose surface completely covered by a thin sand cortex. The conules, irregular in size (1–5 mm high) and unevenly distributed on the surface, are the result of fibro-spicular processes. Three small oscules, 2–5 mm in diameter, lie between the conules. Ostia, 8–15 μm in diameter, are clustered in oval sieve-plates. Conspicuous cortex, 2–3 mm thick, fibrous, prolonged at the sponge base into stout processus for attachment to the substratum. Color brown on the sides and upper surface, pale gray on the lower surface. Megascleres: oxeas fusiform, straight, sometimes slightly bent along the first third of its length, mostly with very sharp ends, occasionally with blunt ends, 1090–4290 × 20–80 μm; Plagiotriaenes with rhabdome conical, sharply pointed, 1815–3090 × 36.5–65.6 μm in size, clads very short 45–109 × 29–36.5 μm. Cladoxeas with the cladal end rounded or strongylate, and from one to four aborted clads, directed at right angles or projecting forwards and/or backwards; rhabdome straight, ending in a sharp point; most of them are smaller (1800–2200 × 43–43.5 μm) than the normal triaenes. Microstrongyles minutely spiny, sometimes with a central constriction, relatively wide, 11.5–16 × 4.5–8 μm in size. Oxyasters with a centrum more or less developed giving rise to

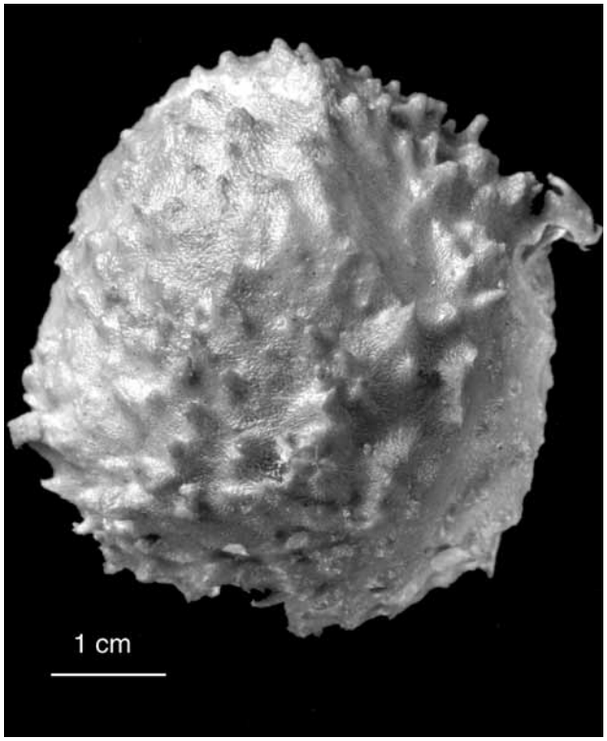

Fig. 15. *Psammastra murrayi* Sollas, 1886a: holotype.

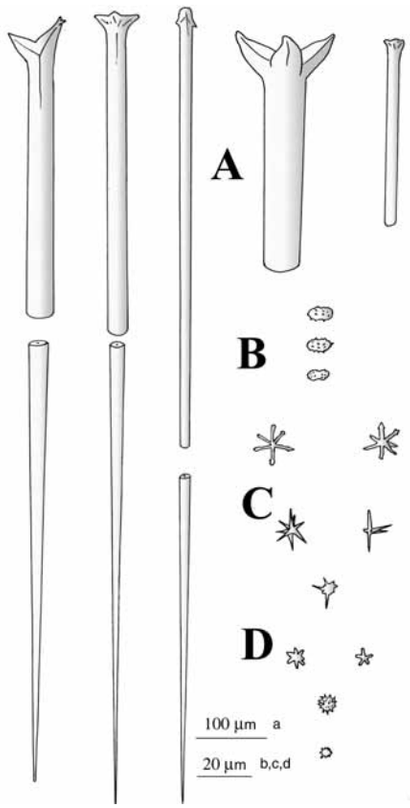

Fig. 16. *Psammastra murrayi* Sollas, 1886a. Spicules from the holotype. A, plagiotriaenes (normal and modified into cladoxea). B, rough microrhabds. C, oxyasters with variable centrum and actines shape. D, spherasters.

spherasters (11.35–20.5 μm) and actines variable in shape (rounded, spiny at the ends, conical); spherasters generally smaller than the oxyasters and with a higher number of actines (11.3–16 μm). Skeletal arrangement. Megascleres radiate from the surface conules to the sponge inwards. Cladoxeas and plagiotriaenes immediately below the cortex, and in the fibrospicular tracks, which form the conules. Occasional plagiotriaenes protrude from the conules. Microstrongyles form a layer at the cortex and are also spread thorough the choanosome. Asters are mingled together both in the inner part of the cortex and in the choanosome.

Remarks. This genus has been considered a synonym of *Ecionemia* Bowerbank (Lendenfeld, 1903) or *Ancorina* Schmidt (Hooper & Wiedenmayer, 1994). It shares with *Ecionemia* the presence of rough microrhabds, but in contrast to that genus it possesses a thick cortex. Furthermore, the cortex in *Psammastra* may be densely encrusted with finely calibrated sand. Dendy (1916c) erected the genus *Rhabdodragma* for *Psammastra conulosa* Kieschnick, 1896, due to the presence of trichodragmata. As stated previously, the presence of trichodragmata appears to be a recurrent character in species of several genera of Ancorinidae (e.g., *Stelletta*) and, thus it is not considered here to be a diagnostic character at the genus level.

Distribution

Pacific Ocean.

***PENARES* GRAY, 1867**

Synonymy

Penares Gray, 1867a; Topsent, 1894d: 357, 1896a: 124; 1925c: 629; 1934a: 5; Lendenfeld, 1903: 61; Babic, 1921: 16; Lévi, 1957a: 204; Sarà, 1961: 32; Rützler, 1965a: 311, 1965b: 11; Pulitzer-Finali, 1979: 15; Boury-Esnault, 1971: 297; Uriz, 1981: 35. *Papyrula* Schmidt, 1868: 18. ? *Pachamphilla* Lendenfeld, 1906.

Type species

Stelletta helleri Schmidt, 1864 (by monotypy).

Definition

Ancorinidae with dichotriaenes, oxeas, smooth microrhabds and euasters.

Diagnosis

Sponges irregularly massive with a very thin cortex, smooth microrhabds, centrotylote or not, forming a crust in the ectosome; euasters may be absent.

Previous reviews

Sollas, 1888; Topsent, 1894d.

Description of type species

Penares helleri (Schmidt, 1864) (Fig. 17).

Synonymy. *Stelletta helleri* Schmidt, 1864: 32; *Penares helleri*; Gray, 1867a: 542; Vosmaer, 1890: 37; *Stelletta helleri*; Weltner, 1882: 46; *Papyrula helleri*; Sollas, 1888:199; Marenzeller, 1889: 17.

Material examined. Holotype: Unknown – Adriatic, Lissa, 64.7 m depth. Other material. MNHN DR49.75-I62 – Balgim N.O. 'Cryos' Expedition; CEAB.POR. Me:56(2) and Ma:9(3) – western Mediterranean.

Description. Irregularly massive sponge with smooth surface, uniporal ostia and simple oscula. Choanosomal skeleton radiate at the sponge periphery. Cortex very thin and coriaceous. Color white inside, white or dark brown outside. Megascleres: oxeas straight or slightly bent, fusiform, 1430 × 39 μm; dichotriaenes with protoclads 60–90 μm long, deuteroclads of 190–240 μm and relatively short rhabdome, 400 × 35 μm in size, fusiform, ending in a rounded point. Microxeas smooth, fusiform and centrotylote, 32–150 × 6 μm in size; oxyasters, with a small centrum and rough conical actines 20 μm in length. Skeletal arrangement: dichotriaenes with the cladome placed at the sponge surface and the rhabdome inwards. Centrotylote microxeas tangential to the sponge surface, forming a crust at the external part of the cortex; they are also spread through the choanosome. Oxeas are tangential to the sponge surface at the inner part of the cortex and arranged more-or-less radially in the choanosome. Oxyasters in the choanosome.

Remarks. The type species is a common sublittoral Mediterranean sponge, which can also be found at greater depths in the adjacent Atlantic, living in zones under the direct influence of the Mediterranean water flow through Gibraltar Strait.

The genus *Pachamphilla* Lendenfeld, 1906 (type species *P. alata* Lendenfeld, 1906, by original designation), appears to be close to *Penares* due to the characteristic, curved, centrotylote smooth microrhabds, as stated by Lévi (1967b) who maintained the genus in its original allocation within Pachastrellidae. I have not sufficient information to certainly assess whether or not this genus is a synonym of *Penares* or even if it is valid. *Penares* and *Pachamphilla* share the presence of smooth microrhabds and the absence of oxyasters in some species (e.g., *Penares sphaera*

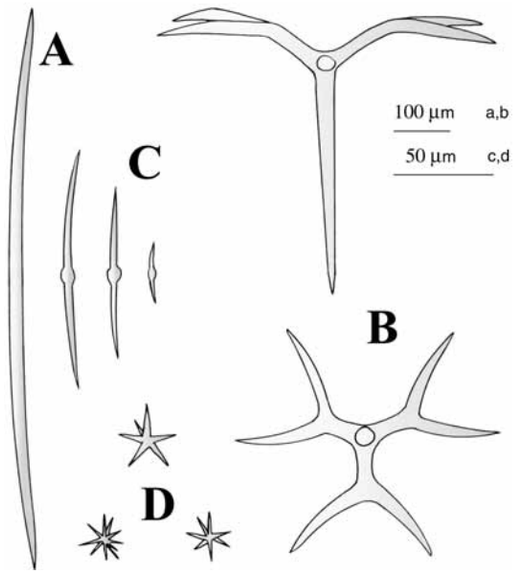

Fig. 17. *Penares helleri* (Schmidt, 1864). Spicules from specimen MNHN DR49–75–162). A, oxea. B, dichotriaenes. C, centrotylote microxeas. D, choanosomal oxyasters.

Lendenfeld and *Pachamphilla alata* Lendenfeld, respectively). However, both genera differ in the presence of calthrops or triaenes, respectively. The presence of calthrops has been considered a distinctive character in Pachastrellidae although their diagnostic value is not clearly established

Distribution

Mediterranean, Atlantic, Indo-Pacific and Antarctic Oceans.

ASTEROPUS SOLLAS, 1888

Synonymy

Asteropus Sollas, 1888: 205.

Type species

Stellettinopsis simplex Carter, 1879b (by monotypy).

Definition

Ancorinidae without triaenes, with oxeas, oxyasters and sanidasters.

Diagnosis

Massive sponges, occasionally bearing long hollow fistulae. Main skeleton is a dense feltwork of large oxeas, which are placed tangential to the surface at the sponge periphery. Triaenes are absent. Microscleres are oxyasters and sanidasters, to which trichodragmata may be added.

Previous reviews

Dendy, 1916c; Dendy, 1924; Bergquist, 1968; Hajdu & Van Soest, 1992; Kennedy, 2000.

Description of type species

Asteropus simplex (Carter, 1879b) (Fig. 18).

Synonymy. *Stellettinopsis simplex* Carter, 1879b: 349; de Laubenfels, 1936a: 160; *Asteropus simplex* Hentschel, 1909: 369; Dendy, 1916c: 251; 1924: 306; Dendy & Frederick, 1924: 494; Wilson, 1925: 327; Vacelet *et al*., 1976: 23; Bergquist, 1968: 32; Van Soest & Stentoft, 1988: 31. *Asteropus haeckeli* Dendy, 1905: 109.

Material examined. Holotype: BMNH 1886.12.15.362 (dry) – Fremantle, Western Australia.

Description. Massive convex sponge of about 6.5 × 2.5 cm in diameter. Surface even, irregularly undulating. Oscules clustered in a shallow cavity on the lower surface. Consistency firm and compact. Color brownish both after drying and in alcohol. Cortex about 1 mm thick. Megascleres: oxeas fusiform, stout, slightly curved, 1320–1900 × 28–35 μm in size, sometimes suddenly bent near one end, resembling reduced triaenes (promonaenes); Microscleres: oxyasters 11–15 μm in diameter, with a small centrum or without centrum, and with a variable number of rough, conical actines. Sanidasters 14–17.5 μm long with a slender axis, and actines either concentrated at both ends and sometimes with two whorls of actines at each end, leaving free the central zone. Skeletal arrangement. Skeleton dense, formed by oxeas confusedly arranged, sometimes forming ill-defined tracks directed toward the sponge surface. Oxeas densely packed tangential to the surface at the sponge periphery. Oxyasters in the choanosome. Sanidasters form an ectosomal crust but are also present in the choanosome.

Remarks. Sollas (1888) defined this genus as "resembling *Stryphnus* from which it differs only in the absence of triaenes". The inclusion (or exclusion) of *Asteropus* and other related genera lacking triaenes but with large oxeas and asters in (or from) Ancorinidae has been a recurrent issue in the literature. Some authors suggested that *Asteropus* may belong in Ancorinidae (e.g., Van Soest & Stentoft, 1988; Hajdu & Van Soest, 1992). Other authors placed them in the polyphyletic families Coppatiidae Topsent, Epipolasidae Sollas (e.g., Dendy, 1905) or Jaspidae de Laubenfels (e.g., Bergquist, 1968) although for obvious practical reasons. However, triaenes range from abundant to rare in ancorinids and, thus, it seems reasonable to think that they have been definitely lost in some genera such as *Asteropus. Asteropus* shares the presence of a paratangential external skeleton of oxeas with other triaene-free genera. The interpretation of this tangential layer as an adaptive answer to strengthen a peripheral skeleton, which has lost the triaene clads as well as the loss of triaenes in different ancorinid lineages, as suggested by Hajdu & Van Soest (1992), seems reliable.

De Laubenfels (1954) wrongly considered the type species of *Asteropus* (*Stellettinopsis simplex*) synonymous with *S. corticata* Carter (a species of *Ecionemia*) due to the rarity of the triaenes in the latter. This is another example on the variation of triaene abundance in an ancorinid genus, which supports de decision to allocate coppatiid genera in Ancorinidae.

Distribution

Indian and Pacific Oceans.

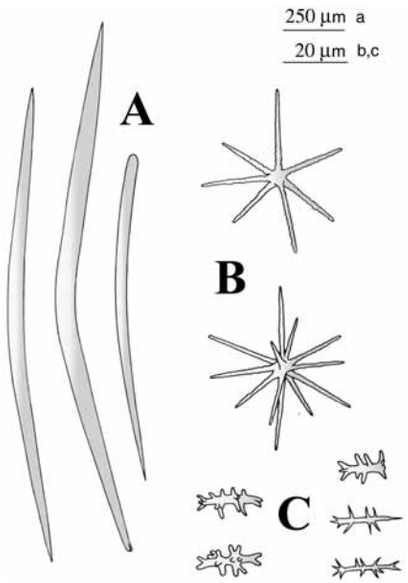

Fig. 18. *Asteropus simplex* (Carter, 1879b). Spicules from the holotype. A, oxeas and style. B, rough oxyasters. C, sanidasters.

MELOPHLUS THIELE, 1899

Synonymy

Melophlus Thiele, 1899: 8.

Type species

Melophlus sarasinorum Thiele, 1889 (by monotypy).

Definition

Ancorinidae without triaenes, with large oxeas, oxyasters and rough microrhabds.

Diagnosis

Thickly encrusting or massive sponge with a dense feltwork of large oxeas, which are placed tangential to the surface at the sponge periphery but in disarray within the choanosome. Microscleres are oxyasters and rough microrhabds. Triaenes are absent.

Previous reviews

Thiele, 1903a; Hadju & Van Soest, 1992.

Description of type species

Melophlus sarasinorum Thiele, 1899 (Fig. 19).

Synonymy. *Melophlus sarasinorum* Thiele, 1899: 8.

Material examined. None. Holotype: presumably in ZMB – Celebes Islands (Sulawesi), Indonesia.

Description (from Thiele, 1899). Irregularly massive sponge, 20 cm high, 14 cm wide (at the widest zone), with basal rhizome-like prolongations up to 10 cm long. Brownish in color. Surface covered by papillae, variable in size and form. On the upper zone there is an atrial cavity, 2 cm wide, 9 cm deep, with smooth walls. The cortex is 4 mm thick. Megascleres: oxeas fusiform with short points Microscleres: spiny microrhabds of three categories: (I) small, rough, centrotylote, 18–20 × 3 μm in size, (II) stout, fusiform, 60 × 6 μm, with round points, and (III) long and slender, 175 × 4 μm in size; oxyasters with 15–20 cylindrical actines, 15–18 μm in diameter, without a conspicuous centrum. Skeletal arrangement. The skeleton of the cortex consists of abundant oxeas confusedly arranged, tangential to the surface at the sponge periphery. Oxeas are scattered in disarray within the choanosome. Asters are located in the cortex. Microrhabds are located both within the cortex and the choanosome.

Remarks. To be consistent with the criterion followed to differentiate *Ancorina* from *Ecionemia*, we consider the genus *Melophus* (with spiny microrhabds) is different from *Asteropus* (with sanidasters among the microscleres), following the proposal of Hajdu & Van Soest (1992). These authors also highlighted the absence of trichodragmata in the two known species of *Melophlus* (i.e., *M. sarasinarum* Thiele, 1899 and *M. cherbonnieri* Lévi, 1961a) versus their presence in *Asteropus*. However, the presence of trichodragmata appears to have a poor diagnostic value at a genus level in Ancorinidae.

Distribution

Pacific Ocean, Carribbean.

TRIBRACHIUM WELTNER, 1882

Synonymy

[*Tribrachion*] Weltner, 1882: 50 (imperfect name); de Laubenfels, 1936a: 168. *Tribrachium*; Ridley, 1884a: 479; Sollas, 1886a: 194. Van Soest & Stentoft, 1988: 34. *Kapnesolenia* de Laubenfels, 1934: 6.

Type species

Tribrachium schmidtii Weltner, 1882 (by monotypy).

Definition

Ancorinidae spherical with a simple hollow long tube. Somal oxeas, triaenes and diaenes as megascleres; sanidaster-like microrhabds as microscleres.

Diagnosis

Ancorinidae spherical with a simple hollow exhalant tube supported by a skeleton of orthodiaenes with long clads, which terminates in a simple osculum. Ostia are evenly spread over the spherical body. Skeletal arrangement of the main body is clearly radial. The skeleton of the tube walls consists of vertically overlapping orthodiaenes with the rhabdome directed towards the sponge body.

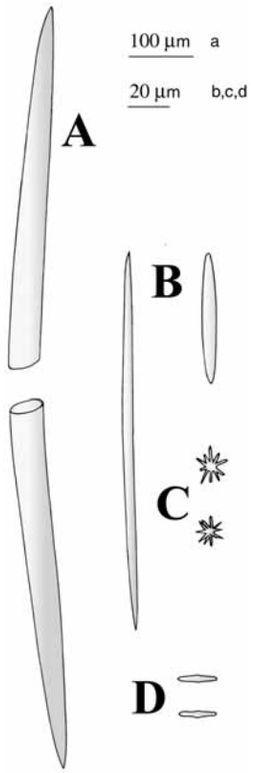

Fig. 19. *Melophlus sarasinorum* Thiele, 1889. Spicules (redrawn from Thiele, 1899). A, oxea. B, medium and large microrhabds. C, oxyasters. D, small, rough microrhabds.

Previous reviews

Sollas, 1888; Weltner, 1882; de Laubenfels, 1934.

Description of type species

Tribrachium schmidtii Weltner, 1882 (Figs 20–21).

Synonymy. *Tribrachion schmidtii* Weltner, 1882: 50; *Tribrachium schmidtii*; Ridley, 1884a: 479.

Material examined. Holotype: missing – only consisted of the atrial tube. Neotype (here designated): BMNH 1889.1.171D – Bahia, 'Challenger' Expedition, 12.6–36 m depth. Other material. Holotype of *Kapnesolenia fisheri* de Laubenfels, 1954: USNM 22370 – specimen in alcohol and five slides, three of them from Johnson's collection.

Description. Sponge spherical, 0.8 cm in diameter with a hollow tube, 4 cm long, 4 mm wide at the base, tapering toward the apex and ending in a single opening. Cortex 200–300 μm thick. Inhalant orifices distributed over the spherical sponge body. Small orifices (inhalant ?) are also located on the tube walls. The color is whitish outside and brownish inside, in alcohol. Megascleres of the tube: orthodiaenes with long symmetrical clads, 360–500 × 22–26.5 μm, and a long, completely straight rhabdome, 2800–4900 × 26–95 μm in size, tapering toward a very thin, sharp point. Spicules of the sponge body: oxeas 1971–6438 × 4–97 μm in size, straight, fusiform, with sharp points; protriaenes to orthotriaenes with the rhabdome (1800–4000 × 20.5–52.2 μm) straight, ending in a sharp point and two types of clads: short (63–80 × 16–18.2 μm), directed upwards, and long (114–295 × 34–41 μm), first slightly upwards and then brusquely doubled perpendicularly to the rhabdome (occasional divided clads can also be observed); anatriaenes, small, with short rounded clads, 13–35 μm long and rhabdome straight or curved, sharply narrowing below the cladome and then enlarged at the point, which is typically rounded or even in the shape of a water droplet (821–1816 × 9–13.5 μm in size). Sanidaster-like microrhabds of two types: those from the tube (type I) are straight and thinner (9–11 × 0.5–1 μm); those from the choanosome (type II) are wider and irregularly twisted (8–11.5 × 2.3–2.7 μm). Skeletal arrangement. Oxeas and ortho- and dichotriaenes, with a radial arrangement, form the main skeleton of the spherical body. The monodiaenes, densely placed, with the rhabdome downwards, and the clads strongly entangled, form the tube skeleton. Microrhabds of type I are extraordinarily abundant along the tube walls and also present in the globular body. Microrhabds of type II are dispersed thorough the choanosome.

Remarks. The oxyasters described by Sollas (1888) in the specimens from Bahia are foreign spicules, as he already suspected. Furthermore, Sollas (1888) did not mention the occasional division of clads in orthotriaenes, and thus the presence of dichotriaenes. The occasional presence of dichotriaenes and dichomonaenes has

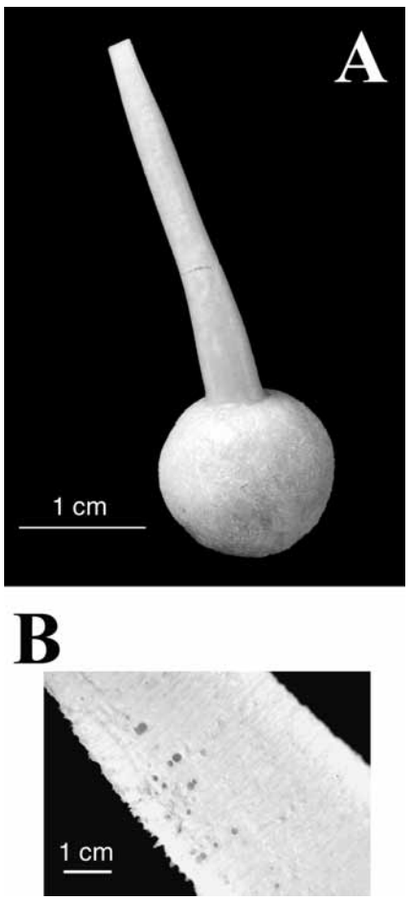

Fig. 20. *Tribrachium schmidtii* Weltner, 1882. A, specimen BMNH 1889.1.171D (neotype). Detail of the tube wall showing small (inhalant ?) orifices.

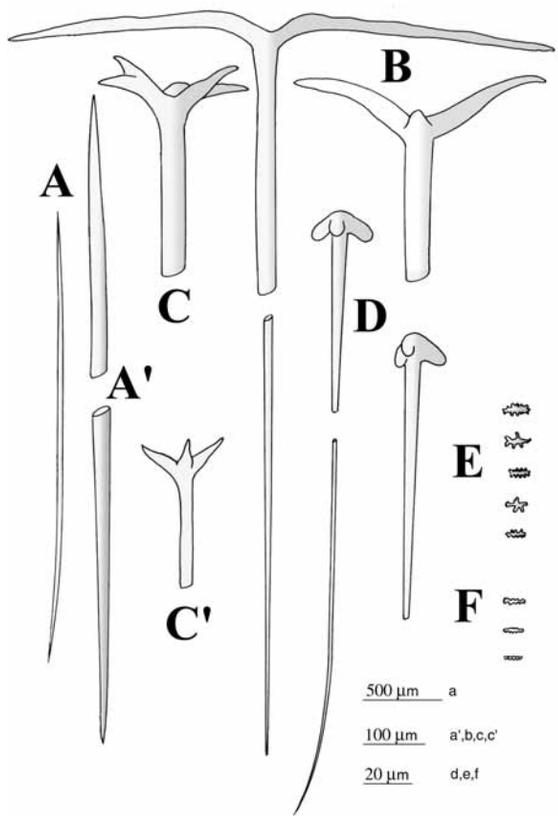

Fig. 21. *Tribrachium schmidtii* Weltner, 1882. Spicules from the neotype. A-A′, oxeas. B, orthodiaene from the tube skeleton. C-C′, orthotriaenes to protriaenes from the body skeleton. D, anatriaenes from the body skeleton. E, sanidaster-like microrhabds from the choanosome. F, rough microrhabds from the tube.

also been reported in other tubular species, such as *Tethyopsis mortenseni* (type of *Monosyringa*) (see Bergquist, 1968) and *Disyringa* (Sollas, 1888), respectively.

The biological function of the tube in this species is somewhat controversial. Sollas (1888) considers the tube to play an exhalant function (the atrial cavity). Fry & Fry (1979) state that the small openings clearly visible on the lateral sides of the tube are ostia and thus the tube would have both exhalant and inhalant functions. However, the presence of these small orifices does not necessarily guarantee their inhalant function. Similar small orifices are frequently observed along the large exhalant canals of several encrusting sponges (author, unpublished data) and may contribute to decrease water pressure over the canal walls by releasing exhalant water, and thus favoring flow speed. On the other hand, it is difficult to imagine how these small orifices, which in *Tribrachium* run into a hollow tube along which a main exhalant current flows, could play an inhalant function.

Kapnesolenia (Fig. 22) is a junior synonym of *Tribrachium*, according to Van Soest & Stentoft (1988). However, the type species of these two genera, although they show a similar growth habit and inhabit the same geographical region, have clear differences in their spicule complements and thus cannot be considered conspecific. *Tribrachium schmidti* differs from *T. fisheri* in the rarity of the dichotriaenes and the presence of two types of sanidaster-like microrhabds: those in the choanosome wider and with the axis curved (type II), and those in the tube straight and thinner (type I), while *T. fisheri* has stout dichotriaenes and spiny microrhabds only of the latter type although longer (11.5–20.4 × 0.6–2.2 μm). The specimen described by Wilson (1902) as *Tribrachium schmidtii*, which according to Van Soest & Stentoft (1988) is conspecific with *K. fisheri*, is in fact *T. fisheri* (but clearly different from *T. schmidtii*). It is possible that these two species have been confounded in the literature. The bathymetrical distribution reported for *T. schmidtii* (shallow waters (less than 12 m depth) and deep waters (more than 700 m depth), respectively), is suspect and the specimens of *T. schmidti* reported from deep zones might belong to *T. fisheri*.

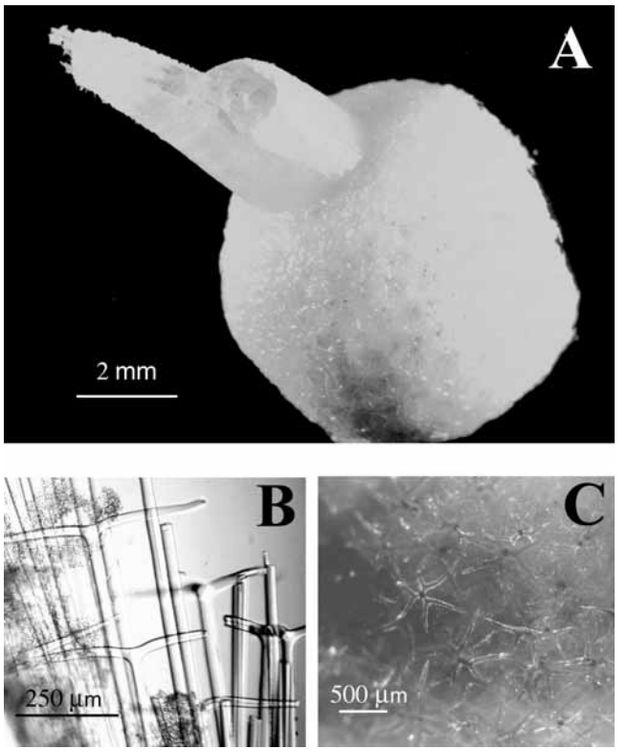

Fig. 22. *Kapnesolenia fisheri* de Laubenfels, 1954 (type species of *Kapnesolenia*, junior synonym of *Tribrachium*). A, holotype. B, orthodiaenes arrangement at the tube walls. C, surface of the spherical body showing the cladome of dichotriaenes.

Distribution

Central Atlantic.

HOLOXEA TOPSENT, 1892

Synonymy

Holoxea Topsent, 1892b: 26; 1900: 272; 1928c: 144; Hallmann, 1917c: 654.

Type species

Holoxea furtiva Topsent, 1892b (by monotypy).

Definition

Ancorinidae with oxeas, spiny (sanidaster-like) microrhabds and trichodragmata.

Diagnosis

Massive or encrusting growth forms with oxeas of two sizes as megascleres and minute sanidaster-like microxeas, and raphides as microscleres, the latter occurring singly or in trichodragmata. Choanosomal skeleton irregularly halichondroid without a clear axial and extra-axial differentiation. Subectosomal megascleres present singly or in loose tracts protruding through the surface; ectosome with smaller category of oxeas erect on surface.

Description of type species

Holoxea furtiva Topsent, 1892b (Fig. 23).

Synonymy. *Holoxea furtiva* Topsent, 1892b: 26; Pulitzer-Finali, 1983: 477.

Material examined. Schizotype: MNHN LBIM DT2414 – Bandol, Banyuls, Mediterranean. Other material. MNHN – specimen from La Calle (Topsent, 1898c).

Description. Thinly encrusting and endolithic sponge which occupies small crevices between calcareous conglomerates; surface hispid, even; consistency coriaceous; color white. Megascleres: oxeas (I) fusiform 1155–1660 × 25–55 μm; oxeas (II) 450–785 × 8–13 μm. Microscleres: sanidaster-like, spiny microxeas, 18–26 × 1–2 μm in size, covered by irregular tubercles, fusiform, straight or slightly bent; trichodragmata small, 8–12 × 5–8 μm in size. Skeletal arrangement. Ectosomal skeleton with erect or paratangential layer of thinner ectosomal oxeas occurring singly or in loose bundles; choanosomal skeleton with disorganized, nearly halichondroid criss-cross of long smooth oxeas, mostly in tracts tangential to the substratum, some erect and protruding through the surface; ectosome with the smaller category of oxeas erect on surface;

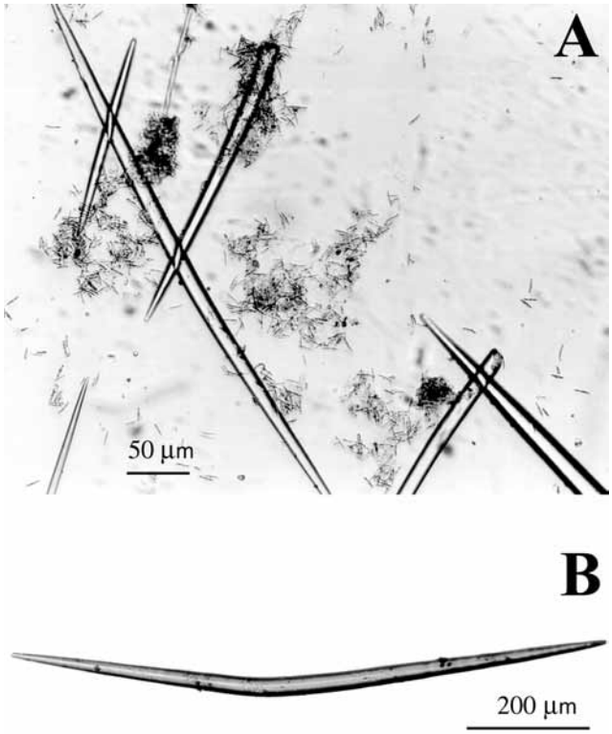

Fig. 23. *Holoxea furtiva* Topsent, 1892b. A, light photograph of spicules complement from the schyzotype (MNHN LBIM DT2414) with oxeas of two sizes and abundant sanidaster-like microrhabds. B, large oxea.

sanidaster-like spined microxeas, scattered predominantly in the ectosomal skeleton, less so throughout the choanosome; raphides occur singly or in trichodragmata abundant in the choanosome.

Remarks. Hallmann (1917c) suggested that *Holoxea* was related to *Desmoxya* in spicule geometry, whereas the presence of an ectosomal skeleton in *H. furtiva* may be of little taxonomic significance since it was absent in other members of the genus. In contrast, Topsent (1928c) suggested that *Holoxea* was more closely related to the Astrophorida (e.g., *Stelletta*, *Dercitus*), having lost tetractinal megascleres and having developed a spicule morphology analogous to the Desmoxyidae. Topsent's decision was adopted by several authors (de Laubenfels, 1936a; Pulitzer-Finali, 1983) and is followed here.

Distribution

Mediterranean (*H. furtiva* Topsent), Indonesia (*H. collectrix* Thiele and *H. valida* Thiele).

ACKNOWLEDGEMENTS

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