

Family Alectonidae Rosell, 1996

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Alectonidae Rosell (Demospongiae, Hadromerida), including Thoosidae Rosell & Uriz (part) and [Scolopidae] Sollas (a *nomen oblitum*), contains species with limestone-excavating capability and habitus similar to many Clionaidae, including some massive (gamma) forms, but lacking tylostyles. Instead, megascleres may be missing or include oxeas, styles, and strongyles, some with fanciful ornamentation. Microscleres are generally large strongylote forms, bent or spiral and with simple or spirally arranged microspines, and small amphiasters or diplasters. Because many of the species are rare and rather small and living cryptically inside calcareous substrates with other excavating sponges, contamination of spicules with foreign elements may be common. More material and reliable live observations are needed to confidently separate genera and species. Six genera are presently recognized.

Keywords: Porifera; Demospongiae; Hadromerida; Alectonidae; *Alectona*; *Delectona*; *Dotona*; *Neamphius*; *Scolopes*; *Spiroxya*.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

[Scolopidae] Sollas, 1888: 432 (*nomen oblitum*). Alectonidae Rosell, 1996b: 53. Thoosidae Rosell & Uriz, 1997: 350 (part).

Definition

Hadromerida with oxeas and their derivatives, microrhabds, and amphiasters.

Diagnosis

Hadromerid excavating sponges, but including massive gamma forms, with oxeas, styles, or strongyles as megascleres (or megascleres absent) and microrhabds (straight, bent, or spiral) or amphiasters, or both, as microscleres. Megascleres may be smooth or spiny and kinked or branched forms may occur. Microscleres are usually ornamented by microspines that are arranged uniformly, clustered, or spiraled. Excavations are chambered, as in Clionaidae. Papillae, where known, are small and inconspicuous, massive sponges are rare.

Scope

Six genera are here assigned: *Alectona*, *Delectona*, *Dotona*, *Neamphius*, *Scolopes* and *Spiroxya*.

KEY TO GENERA

- | | |
|---|------------------------|
| (1) Megascleres present | 2 |
| Megascleres absent | 6 |
| (2) Robust tuberculate and smooth diactines (or derived polyactines) for megascleres, amphiasters for microscleres | <i>Alectona</i> |
| Megascleres are smooth monactines and diactines | 3 |
| (3) Megascleres are smooth oxeas | 4 |
| Megascleres are smooth styles or strongyles, microscleres include microspined rhabds and delicate, microspined diplasters | <i>Dotona</i> |

History and biology

Despite the strong disagreement in spicule complement, species in this family have traditionally been lumped with relatives of *Cliona* (possessing tylostyles and spirasters) under Clionaidae (or its junior homonym [Clionidae]), solely based on the common capability to excavate limestone substrates. Most species known are small and live in burrows made in calcareous algae, scleractinian corallites, or the axial skeleton of octocorals. Asexual reproduction through planktonic, armoured propagules ('gemmules') has been reported for some species (Topsent, 1920b; Tregouboff, 1942; Rosell, 1996a).

Remarks

The lack of tylostyles as principal megascleres in this family of excavating sponges is considered a more important character than the large variety of microscleres that prompted some authors to separate a family Thoosidae from Clionaidae (Rosell & Uriz, 1997: 350). Despite the similarities between amphiasters of *Alectona*-like sponges, *Thoosa* and *Cliothisa*, I consider the latter two genera to be closer to the Clionaidae than those discussed below.

The massive species of *Scolopes* were previously allocated to Coppatiidae (=Ancorinidae) but demonstrating Hadromerida structure, megasclere and microsclere geometry. They possess oxea megascleres and amphiaster and granular microstrongyle microscleres, typical of other Alectonidae sponges, in particular *Neamphius*. The inclusion of this genus here would theoretically require that the family name Scolopidae Sollas, 1888 takes precedence over Alectonidae Rosell, 1996b. However, the name Scolopidae Sollas has not been used since 1899 and therefore can be suppressed under Article 23.9.1.1. of the ICZN (Anon., 1999).

- (4) Microscleres are only microspined rhabds *Spiroxya*
 Microscleres include amphiasters; sponges grow massive 5
- (5) Microscleres are delicate, microspined amphiasters *Neamphius*
 Microscleres are minute diplaster-like amphiasters and granular microstrongyles *Scolopes*
- (6) Microscleres are stout rhabds with annular swellings or with amphiaströse ornamentation, and delicate diplasters *Delectona*

ALECTONA CARTER, 1879**Synonymy**

Corticium sensu Carter, 1879b: 353. *Alectona* Carter, 1879c: 493 (not *Alectona sensu* Carter, 1880b: 58). [*Nisella*] Johnson, 1899: 463 (preocc.).

Type species

Alectona millari Carter, 1879c (by monotypy).

Definition

Alectonidae with robust diactine and polyactine megascleres, smooth or covered by spines or tubercles; with delicate amphiasters.

Diagnosis

Excavating sponges occupying chambers similar to clionoids in alpha stage. Most species have delicate papillae that are easily overlooked on the substrate surface, some exhibit massive growth outside the limestone-penetrating base. Spicules occur throughout the sponge. Megascleres are stout oxeas, some kinked or with extra rays thus forming tri- or polyactines that are usually spined or covered by a few or many spines, tubercles, or mushroom-shaped knobs. Microscleres are delicate amphiasters with small center and straight, slender or conical rays that are beset by minute spines or hooks. In some species, amphiasters have a stout diactine axis and

two symmetrical sets of perpendicular lumps (rays) near the center; all microspined. Species are reported from the Indopacific and Atlantic region, and the Mediterranean Sea.

Previous reviews

Bavestrello *et al.* (1998a); Vacelet (1999b: 627).

Description of type species

Alectona millari Carter, 1879c (Figs 1–3).

Synonymy. *Alectona millari* Carter, 1879c: 495, pl. 17 figs 1–7.

Material examined. Holotype: BMNH 82.4.27.4 – spicule preparation, ‘from type’, North Atlantic, 59°56’N, 6°27’W, between north of Scotland and Faroe Islands, ‘Porcupine’ Exped., 1869, stn. 54, 202 m depth. Other material. BMNH – there is also a specimen (fragment) labeled ‘*Alectona millari*, pres. by Dr. Millar (in *Lophohelia*), nr. 85.12.22.1, cf. slide in collection’; it is possible that this is the holotype specimen from which the two available microscope slide preparations were made and that it was catalogued at a later date under a different number.

Description (based on Carter, 1979a; with my own observations and measurements of spicules added). The sponge is excavating a coral skeleton from which small papillae (ca. 1 mm in diameter) are protruding. Spicules in the papillae are arranged in radial fashion but they are dispersed throughout the choanosome without particular orientation. There are three principal types of spicules: (1) Large spiny oxeas, bent, kinked, or sharply angled in

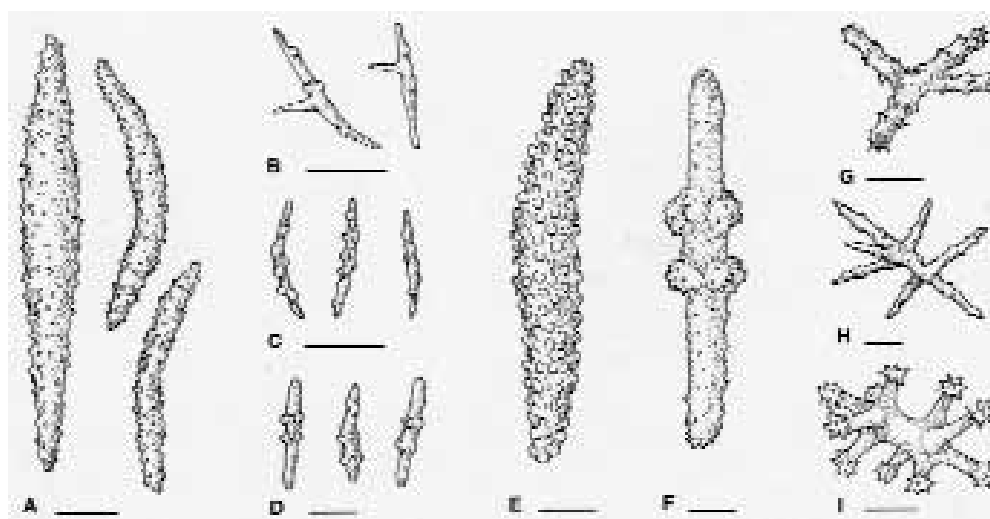


Fig. 1. *Alectona*, spicule characteristics. A–D, *Alectona millari* Carter, holotype BMNH 82.4.27.4. E–F, *A. walichii* Carter, drawn after SEM photomicrographs in Bavestrello *et al.* (1998a). G–I, *A. triradiata* Lévi & Lévi, drawn from SEM photomicrographs in Bavestrello *et al.* (1998a). A, large acanthoxea (scale 50 μm). B, spiny triactines (scale 20 μm). C, small spiny oxeas (scale 20 μm). D, amphiasters (scale 20 μm). E, larger tuberculate oxea (scale 100 μm). F, amphiaster (scale 5 μm). G, spined triactine (one ray divided) (scale 50 μm). H, large amphiaster (scale 10 μm). I, small amphiaster (scale 5 μm).

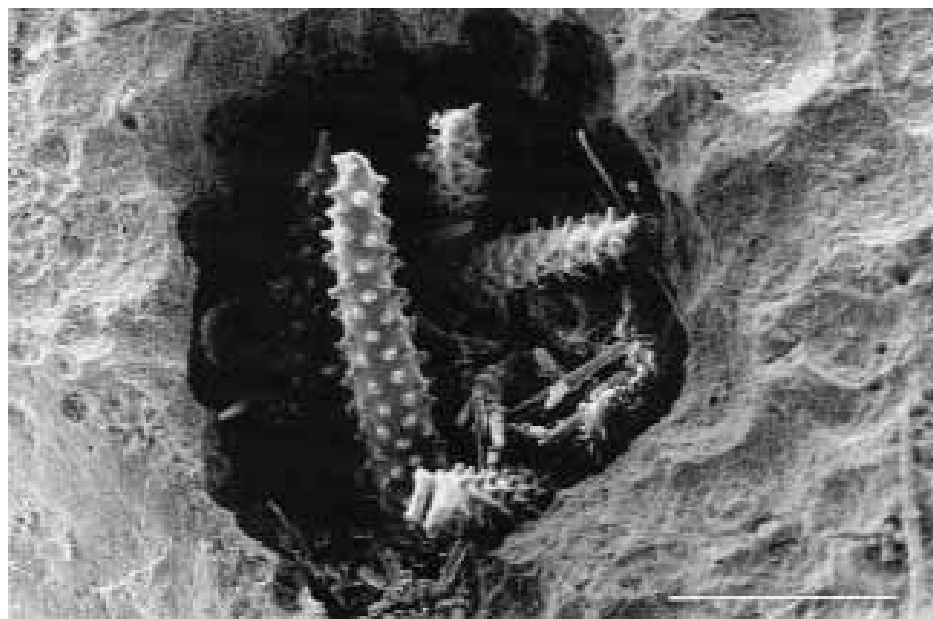


Fig. 2. *Alectona millari* Carter, holotype BMNH 82.4.27.4. SEM view of substrate excavation with large acanthoxea protruding (scale 100 μ m).

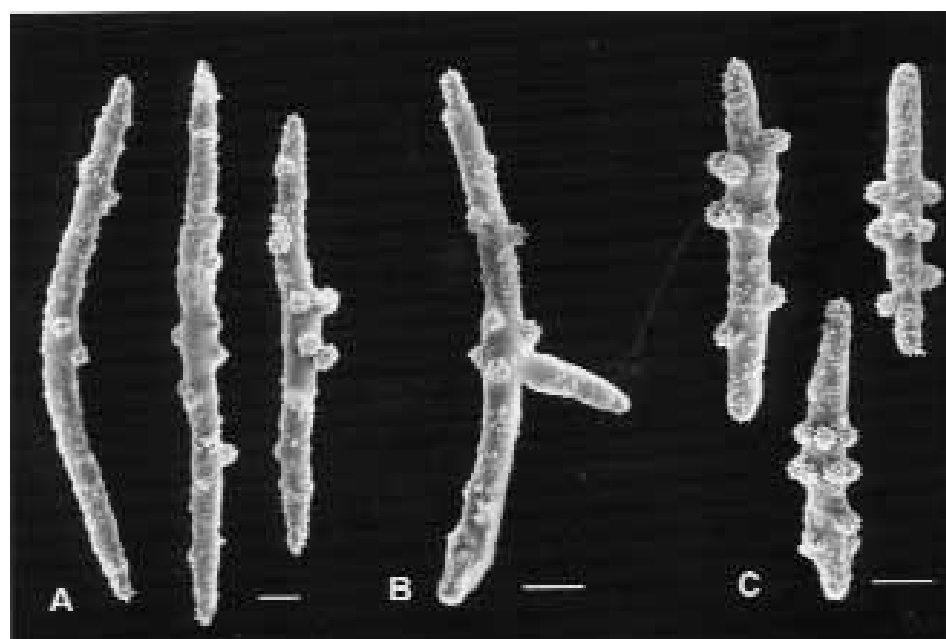


Fig. 3. *Alectona millari* Carter, holotype BMNH 82.4.27.4. SEM view of spicules. A, small acanthoxeas. B, acanthotriactine. C, spiny microstrongyle, transition to amphiasters (scale 10 μ m).

the center, with tubercle-like spines arranged in longitudinal rows; 225–370 μ m long, 16–28 μ m in diameter. (2) Small, spiny or smooth oxeas, sharply kinked or bent in the center (a small number with a third ray originating near the center, or polyactine), with only few, sporadic, microspined tubercles and covered in patches by a fine spination; large size variation, 64–132 \times 6–16 μ m. (3) Amphiasters with fusiform, microspined shaft and two central circles of microspined tubercles (a few extra tubercles may occur along the shaft); 35–60 \times 9–14 μ m.

Remarks. De Laubenfels (1936a: 156) included *Alectona wallichii* (Carter, 1874a) with *A. millari*, which would make *A. wallichii* a senior synonym, but Bavestrello *et al.* (1998a) demonstrated that the two species are distinct.

The genus [*Nisella*] Johnson, 1899: 463 (preocc. by *Nisella* Heine & Reichenow erected in 1890, Aves; see Neave, 1940: 338) was erected for type species [*Nisella*] *verticillata* Johnson, 1899: 463, pl. VI fig. 6. No type material has been retrieved. Several specimens of this sponge were found boring in deep-water corals

off Madeira. The spicules include two types of amphiasters, one with two regular whorls of knobbed rays, the other with a short shaft and unequal rays. One of the sponges contained in addition bent centrotylote oxeas. This description clearly fits the genus *Alectona*, and accordingly [*Nisella*] Johnson becomes a junior synonym.

DELECTONA DE LAUBENFELS, 1936

Synonymy

Alectona sensu Carter, 1880b: 58 (not *Alectona* Carter, 1879c: 493). *Delectona* de Laubenfels, 1936a: 156.

Type species

Alectona higgini Carter, 1880b (by original designation).

Definition

Alectonidae without megascleres. Microscleres occur in haphazard arrangement and include rhabds and fusiform amphiasters with tuberculate surface, toxiform oxeas, and amphiasters with long, delicate rays.

Diagnosis

Sponges excavating and filling small chambers in limestone (alpha stage). Papillae have not been observed. Spicules occur throughout the choanosome, without particular orientation. There are no confirmed megascleres. The most common spicules are microstrongyles (rhabds) which are ornamented by microspined or smooth annular swellings or tubercles and may be modified to fusiform amphiasters or diplasters. Less common are toxiform oxeas (some with central swelling) and delicate amphiasters with long, thin, microspined rays (some may be reduced to oxyasters); rugose discs occur in some species. All known species are boring in skeletons of coralline algae (*Melobesia*) and cnidarians (*Corallium*, *Leptopsammia*, *Madracis*). Distribution is Indian Ocean and Mediterranean Sea.

Previous reviews

Bavestrello *et al.* (1996, 1997); Rosell (1996a).

Description of type species

Delectona higgini (Carter, 1880b) (Figs 4–5).

Synonymy. *Alectona higgini* Carter, 1880b: 58–59, pl. 5 fig. 25a–c.

Material examined. None. According to letters exchanged between Shirley Stone (BMNH) and the curator at Liverpool Museum (1979) the material (ZL.3033, syntypes and 2 spicule slides) is missing since bombing during World War II (in lit., 2000, Clare Valentine, BMNH). The type specimens occupied coralline nodules dredged from the Gulf of Mannar (Manaar) (Sri Lanka).

Description (from Carter, 1880b). The syntype specimens are yellowish, in the dry state, and their tissue coats the honeycomb-like chambers they excavate in coralline (melobesian) nodules of up to 30 mm diameter. The chambers reach 4 mm in diameter and

communicate with each other and with the outside through small openings in the substratum. There are three types of spicules, all microscleres: Microstrongyles, slightly curved, with rounded ends and annular constrictions alternating with microspined ridges along the length of the rhabd; 21–85 μm long, 6.4–10.6 μm in diameter. Hair-like, mostly toxiform oxea, ca. 50 μm long. Amphiasters with straight, thin shaft and equally delicate rays radiating from two points near the center of the shaft; both shaft and rays are microspined, the amphiasters measure 21 \times 20 μm in overall length by width.

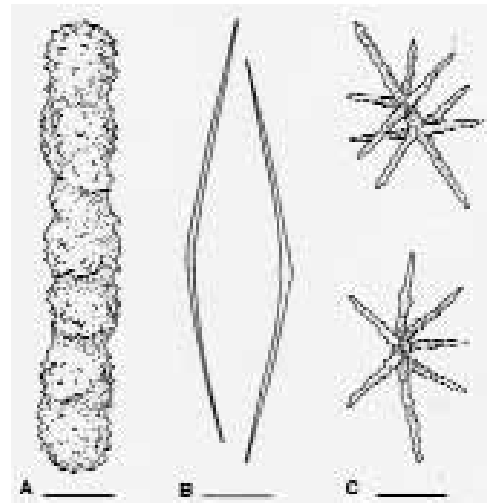


Fig. 4. *Delectona higgini* (Carter), spicules (from Carter, 1880b; with details from Bavestrello *et al.*, 1996). A, microstrongyle (scale 10 μm). B, toxiform oxea (scale 10 μm). C, amphiaster (scale 5 μm).

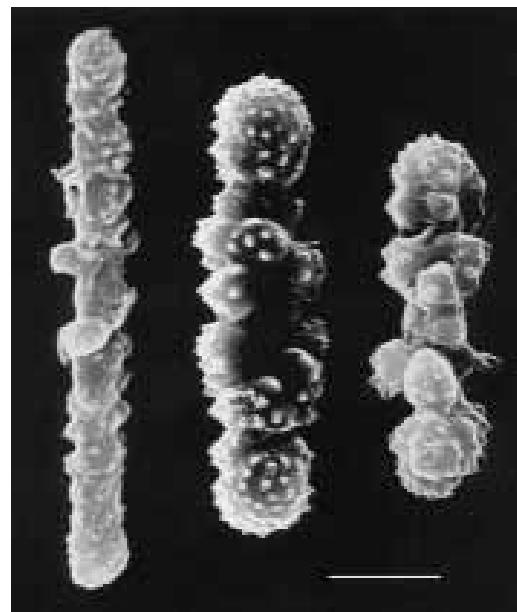


Fig. 5. *Delectona ciconiae* Bavestrello, Calcinaï, & Sarà, SEM photomicrographs of microstrongyles (unpublished images, courtesy of the authors) (scale 10 μm).

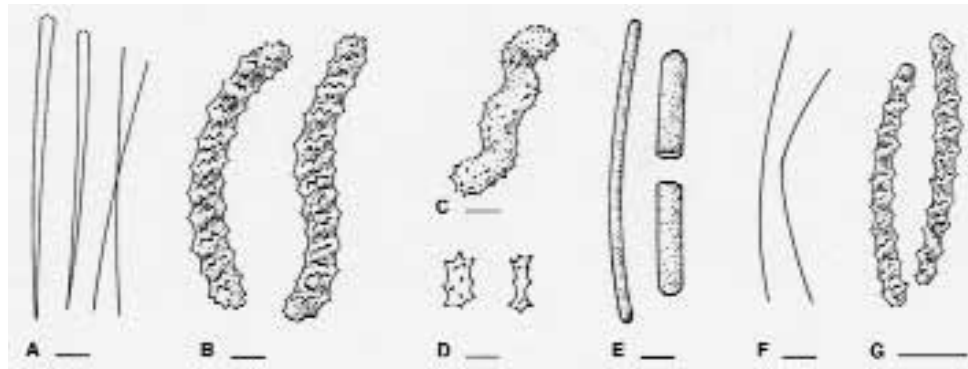


Fig. 6. *Dotona*, spicule characteristics. A–C, *D. pulchella* Carter, after Carter (1880b) and Topsent (1904b). E–G, *D. davidi* Kirkpatrick from SEM photomicrographs (E, F) and after Kirkpatrick (1900b) (E, adjusted to reflect the proportions of the measurements). A, styles and raphides (scale 10 μm). B, spiral-spined microstrongyles (scale 10 μm). C, spiny microstrongyle (scale 10 μm). D, diplasters (scale 5 μm). E, strongyles (scale 20 μm). F, raphides (scale 10 μm). G, spiral-spined microstrongyle (scale 20 μm).

Remarks. The presence of rather large subtylostyles (345–355 \times 10–27 μm) was signaled from one species in this group (Rosell, 1996a) but in view of other recent studies of related taxa (Bavestrello *et al.*, 1996, 1997) it is likely that these spicules were foreign. Future studies of new material should focus on this discrepancy.

DOTONA CARTER, 1880

Synonymy

Dotona Carter, 1880b: 57. *Dyscliona* Kirkpatrick, 1900b: 352.

Type species

Dotona pulchella Carter, 1880b (by monotypy).

Definition

Alecetonidae with smooth styles or strongyles for principal megascleres and two types of microscleres, large, bent or undulate, microspined strongyles and small diplasters.

Diagnosis

Alpha-stage excavating sponges with whitish tissue filling very small chambers and tiny papillae. Megascleres are styles or strongyles which may form perpendicular bundles in the papillae or are scattered through the choanosome. The main microscleres are bent or undulating strongyles ornamented by fine spination which most commonly is patterned in a spiral around the rhabd. Less conspicuous microscleres, if present, are short, stout, spiny microstrongyles or diplasters and hair-like (raphide) spicules. Specimens of the few species and forms so far reported are from Indopacific, Atlantic, and Mediterranean locations.

Previous review

Rosell & Uriz (1997).

Description of type species

Dotona pulchella Carter, 1880b (Fig. 6).

Synonymy. *Dotona pulchella* Carter, 1880b: 57, pl. 5 fig. 24a–d.

Material examined. None. According to letters exchanged between Shirley Stone (BMNH) and the curator at Liverpool Museum (1979) the material (ZI.3032, holotype and 1 spicule slide) is missing since bombing during World War II (in lit., 2000, Clare Valentine, BMNH). The specimens occupied burrows in coralline nodules dredged from the Gulf of Mannar (Sri Lanka).

Description (from Carter, 1880b). Specimens occurred in small (3 mm), whitish masses filling cavities excavated in coralline (melobesian) nodules. Spicules of three kinds: curved strongyles covered by a tightly wound spiral of minute spines; average size, 50.8 \times 6.4 μm . Very thin, hair-like spicules (raphides), about 85 μm long. Straight microstrongyles with diverging spines at both ends and a ring of spines around the center (diplasters), 8.5 \times 2.1 μm . No megascleres are mentioned in the original description but Topsent (1904b), studying material from the Azores, emphasized the presence of small styles (100 \times 2 μm), concentrated in bundles, point outward, in the papillae. The same author provided additional measurements and illustrations (Topsent, 1904b: 108, pl. 12, fig. 2) of the spiral-spined strongyles (110–120 \times 6 μm) and small spiny ‘spirasters’ (diplasters), 6–8 \times 2–3 μm , which are located in the papillae.

Remarks. Topsent (1904b) considered the small styles to be megascleres and the (longer) spiral-spined strongyles to be very large microscleres. We support this distinction because the styles play a structural role in the papillae.

In contrast to the older authors, Rosell & Uriz (1997) report the presence of oxeas in material examined by them. If this observation is substantiated, a merger of *Dotona* with the genus *Spiroxya* (see below) should be contemplated. Stylote and strongylole modifications of oxeas are not unusual, for instance, in *Cliona acus* (Bavestrello, Calcinai, & Sarà) and *C. sarai* (Melone), but *Dotona*, here, is understood to be without oxeas as principal megascleres.

Dotona davidi Kirkpatrick, 1900b: 352 (type of *Dyscliona* Kirkpatrick, holotype BMNH 1900.10.19.12) clearly contains strongyles as megascleres; unfortunately, a preparation made from the small remaining holotype did not reveal the spiral-spined microstrongyles illustrated by Kirkpatrick (1900b: pl. 14, fig. 1d). The strongyle size originally reported as 126–246 \times 3–5.5 μm was found to be larger (up to 268 \times 11 μm) and contrary to the original description, they are never roughened on the ends (SEM observation). The microstrongyles measured by Kirkpatrick were

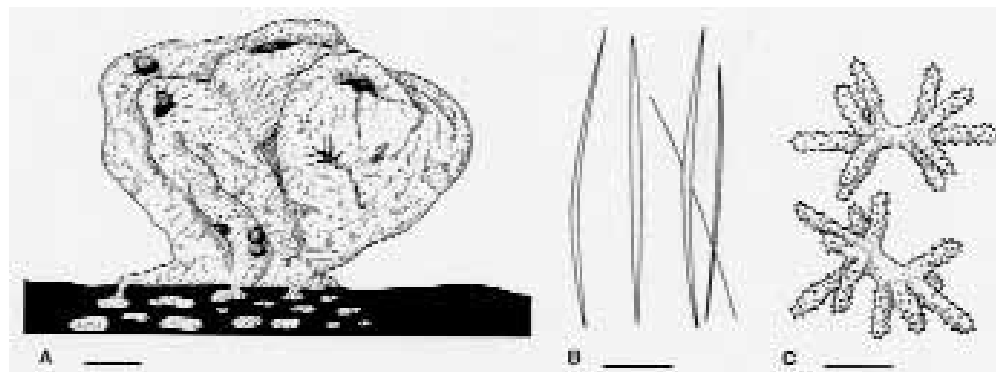


Fig. 7. *Neamphius huxleyi* (Sollas), holotype BMNH 1889.1.1.76. A, habitus with attachment base added to suggest boring capacity evident from incorporated rock fragment (scale 10 mm). B, oxeas (scale 100 μm). C, amphiaster (scale 5 μm).

90 \times 3 μm and considered rather rare. Inclusion by Kirkpatrick (1900b: 353, pl. 14, fig. 1f, g) of *Cliona purpurea* Hancock in *Dyscliona* was inappropriate, as it was shown to belong to *Paracornulum* in the Poecilosclerida (see discussion in Rützler & Stone, 1986).

NEAMPHIUS DE LAUBENFELS, 1953

Synonymy

[*Amphius*] Sollas, 1888: 177 (preocc. by a Coleoptera).
Neamphius de Laubenfels, 1953a: 545.

Type species

Amphius huxleyi Sollas, 1888 (by monotypy).

Definition

Alectonidae of massive (gamma stage), initially boring, with oxeas in radial tracts and delicate, microspined amphiasters.

Diagnosis

Massive sponges with large oscula elevated on mounds. They excavate calcareous substrate at their base but alpha-stage borers are hitherto unknown. Radial skeleton structure. Megascleres are oxeas, scattered throughout the choanosome and organized in vague tracts radiating from the base toward the surface where they are oriented in tangential fashion. Microscleres are abundant and scattered throughout the choanosome. Only known from moderate depth (120 m) in the southern Pacific Ocean.

Previous review

Burton & Rao (1932).

Description of type species

Neamphius huxleyi (Sollas, 1888) (Figs 7–8).

Synonymy. *Amphius huxleyi* Sollas, 1888: 178, pl. 42, figs 5–11.

Material examined. Holotype: BMNH 1889:1:1:76 – ‘Challenger’ Exped., off Api, New Hebrides, 108–126 m.

Description. The original description (Sollas, 1888) could be confirmed. The specimen measures 11 \times 6 cm, 7 cm high. There are several fused mounds topped by oscula, 4–10 mm in diameter. The ectosome (‘skin’) is brown and wrinkled, the texture is soft elastic. Pores are clustered, sieve-like. Choanocyte chambers are diplodal and measure about 24 μm in diameter. There are only two spicule types. The megascleres are oxeas, partly scattered but also organized in radial strands. Oxeas are slender, straight or gently and evenly bent, gradually tapering to sharp points; they measure 425–600 \times 6–8 μm . Microscleres are amphiasters and are dispersed throughout the choanosome. They are delicate, with two whorls of four slender, microspined rays, slightly bent outward toward an identical fifth ray which is a continuation of the axial shaft. Amphiasters measure 16–20 \times 12–16 μm , rays are about 2 μm in diameter.

Remarks. De Laubenfels (1936a: 156) listed *Amphius huxleyi* under Clionidae but commented that it was ‘not certainly boring’. His hunch seems well founded, however, because fragments of substrate in close contact with the sponge, examined by SEM, show fresh etchings and dislodged chips characteristic of sponge burrowing.

We do not agree with Burton & Rao (1932) who emended the original diagnosis to ‘microscleres in the form of euasters or some modification thereof’ to accommodate their species *Amphius sollasi*, which has euasters and does not belong here.

SCOLOPES SOLLAS, 1888

Synonymy

Scolopes Sollas, 1888: 432. *Paracordyla* Hallmann, 1912: 132.

Type species

Scolopes moseleyi Sollas, 1888 (by monotypy).

Definition

Alectonidae with two size categories of oxeas. Microscleres include both minute amphiasters (diplaster-like) and granulated centro-angulate microstrongyles.

Diagnosis

Massive (gamma) growth form, with oxea megascleres in two size classes, the larger forming a compact choanosomal skeleton,

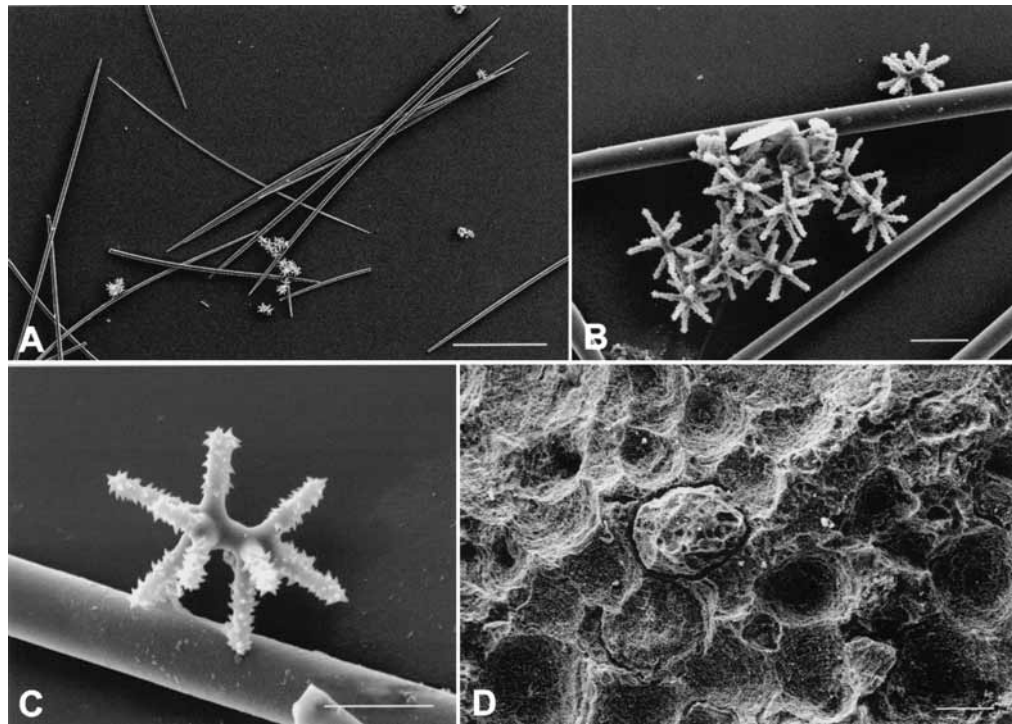


Fig. 8. *Neamphius huxleyi* (Sollas), holotype BMNH 1889.1.1.76. SEM photomicrographs. A–B, tylostyles and amphiasters (scales: A, 100 μm ; B, 10 μm). C, amphiaster enlarged (scale 5 μm). D, substrate grain with characteristic pitting of sponge excavations, one chip freshly etched out but still attached (scale 20 μm).

the smaller forming an ectosomal palisade, and with an intermediate category of oxeas (or occasionally modified styles) forming a sparse paratangential subectosomal skeleton that protrudes through the surface. Microscleres are minute amphiasters (diplaster-like), and granulated centro-angulate microstrongyles.

Scope

Three species: *Scolopes moseleyi* Sollas, *Paracordyla lignea* Hallmann, 1912, *Scolopes megastrea* de Laubenfels, 1953.

Description of type species

Scolopes moseleyi Sollas, 1888 (Fig. 9).

Synonymy. *Scolopes moseleyi* Sollas, 1888: 432, pl. XLIII figs 1–9.

Material examined. Holotype: BMNH (not seen) – Bahia.

Description (from Sollas). Massive growth form, surface even and uniformly pilose, oscules and pores not observed, with a dense spicular cortex. Choanosomal skeleton with coarse spicular fibres radiating to the surface, cored by large oxeas, with intermediate sized oxeas projecting through the surface in loose plumose tracts. Ectosome with radially arranged smaller oxeas in an erect palisade lying between the protruding medium sized oxeas. Smaller oxeas also scattered within the mesohyl and around lacunae formed by the aquiferous system. Megascleres oxeas of two clearly differentiated size classes. Largest (choanosomal oxeas) straight or slightly curved, symmetrical, sharply pointed (2250 \times 60 μm); medium sized (subectosomal oxeas) more cylindrical, abruptly pointed (556 \times 13 μm); smallest (ectosomal oxeas) cylindrical, straight, abruptly pointed (125 \times 4 μm). Microscleres amphiasters with spines at the ends in terminal whorls (7 \times 3 μm).

Description of second species

Scolopes lignea (Hallmann, 1912) (Fig. 9).

Synonymy. *Paracordyla lignea* Hallmann, 1912: 132. *Scolopes lignea*; de Laubenfels, 1936a: 160.

Material examined. Holotype: AM Z195 (slide) – Off Sandon Bluffs, southern NSW, 70–80 m depth, RV 'Endeavour'.

Description (from type material and original description). Sponge massive, apparently with branch-like elongations (? blind fistules), with dense and solid consistency. Surface even and pilose. Oscules not observed. Choanosomal skeleton is composed nearly exclusively of densely packed larger oxeas in more-or-less parallel arrangement, thicker towards the axis and at the core of the fistules. In the subectosomal region are bundles of larger oxeas criss-crossing and projecting through the surface in vaguely plumose bundles. The ectosomal skeleton is a dense erect or paratangential palisade of small oxeas (described as microscleres by Hallmann, 1912, but more accurately a second category of smaller megascleres). Contrary to Hallmann's observations only very few of these are modified to styles. Smaller oxeas are also dispersed throughout the mesohyl, particularly surrounding lacunae of the aquiferous system. Amphiasters and granulated microstrongyles are rare within the ectosomal or choanosomal skeletons. Megascleres large oxeas, symmetrical or asymmetrical, slightly bent towards one end, between 650–3500 μm or more long, 15–55 μm wide. Some smaller oxeas, modified styles or occasionally tylostyles present in surface brushes, and probably intermediate examples between the two size categories of megascleres (uncommon, reported as 200–700 μm long and maximum diameter 18 μm). Small oxeas of the ectosomal skeleton usually symmetrical, occasionally asymmetrical and bent slightly towards one end, but with symmetrical points (80–135 μm long, 3–6 μm wide). Microscleres are minute

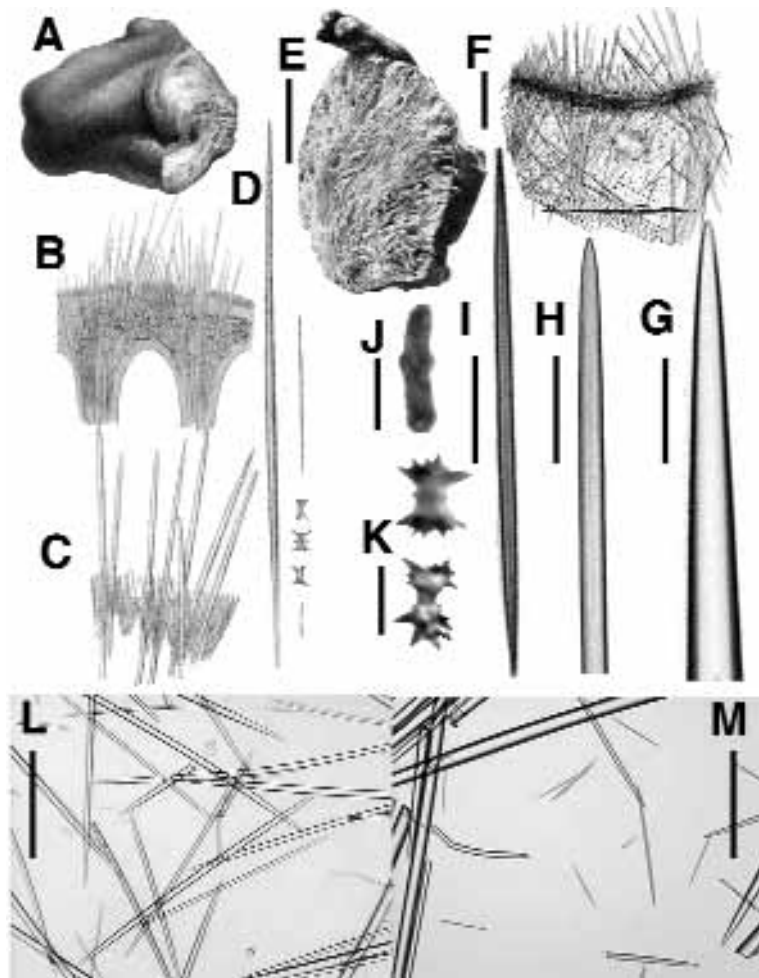


Fig. 9. *Scolopos*, spiculation and habitus. A–D, *S. moseleyi* Sollas. A, habitus. B, choanosomal skeletal structure. C, ectosomal palisade and hispidation. D, spiculation. E–M, *S. lignea* (Hallmann). E, habitus (scale 40 mm). F, choanosomal skeletal structure (scale 300 μm). G, tip of large choanosomal oxea (scale 60 μm). H, tip of medium sized subectosomal oxea (scale 30 μm). I, small oxea of ectosomal palisade (scale 20 μm). J, granular microrhabd (scale 10 μm). K, amphiasters (scale 5 μm). L, large choanosomal oxeas (scale 500 μm). M, small and medium sized ectosomal oxeas (scale 100 μm). (A–D, after Sollas, 1888, pl. XLIII. E–F, after Hallmann, 1912, fig. 27, pl. xxii fig. 2.)

amphiasters, slightly resembling diplasters, with clusters of spines at either end and a smooth rod in between, rare (3–6 μm long, 1–2 μm wide at the centre). Microstrongyles are also present, granulated over the whole surface and with a slight centrotyle swelling, also rare (12–16 μm long, 2–3 μm wide). Very few spirasters also seen (about $14 \times 3 \mu\text{m}$) but most likely contaminants.

Remarks. *Paracordyla* Hallmann is an obvious synonym of *Scolopos*, despite Hallmann's (1912) arguments to the contrary. These arguments concern the possession of fibres in the cortex and the radial skeletal structure in *Scolopos*, allegedly different from features of *Paracordyla*. However, illustrations provided by both Sollas (1888) and Hallmann (1912) are nearly identical, and observed differences are probably due to different growth states of preservation of their respective material. The type material of *Scolopos* from the BMNH has not yet been examined, and consequently a description of *P. lignea* is also provided as this material has been re-examined. No new material of *Scolopos* has yet been collected, with the descriptions given above based on antiquated museum specimens over a century old. Consequently, it is not possible at this time to confirm whether *Scolopos* has an excavating growth stage.

Both genera have been previously allocated to Rhaphidhistiinae (=Trachycladidae) (de Laubenfels, 1936a), Coppatiidae (=Ancorinidae), or Spirastrellidae, and comparisons have also been made with Suberitidae (e.g., *Trachya* = *Aaptos*). It is clear, however, that *Scolopos* belongs to Hadromerida based on its skeletal structure and spiculation, whereas its supposed resemblance to *Jaspis*, *Trachycladus*, *Rhaphidhastia* or *Trachya* (= *Aaptos*) is superficial. Conversely, the definitive allocation of *Scolopos* to a family is more difficult given that on the one hand it has an organised ectosomal skeletal palisade that fits better with Polymastiidae (e.g., *Pseudotrachya*), but on the other hand its amphiaster and microstrongyle microscleres are the same as those found in some Alectonidae. The possession of oxeas (not tylostyles) also precludes this genus from Clionidae, and for these reasons the genus fits closest with Alectonidae. It is closest to *Neamphius* in having a massive (gamma) growth stage, and amphiaster microscleres. By comparison, *Scolopos* has two size categories of oxeas (*Neamphius* has only one), with the smaller organised into an ectosomal palisade, and in having both amphiasters and microstrongyles (versus only amphiasters in *Neamphius*). In the case of the type species, *S. moseleyi*, microscleres are apparently

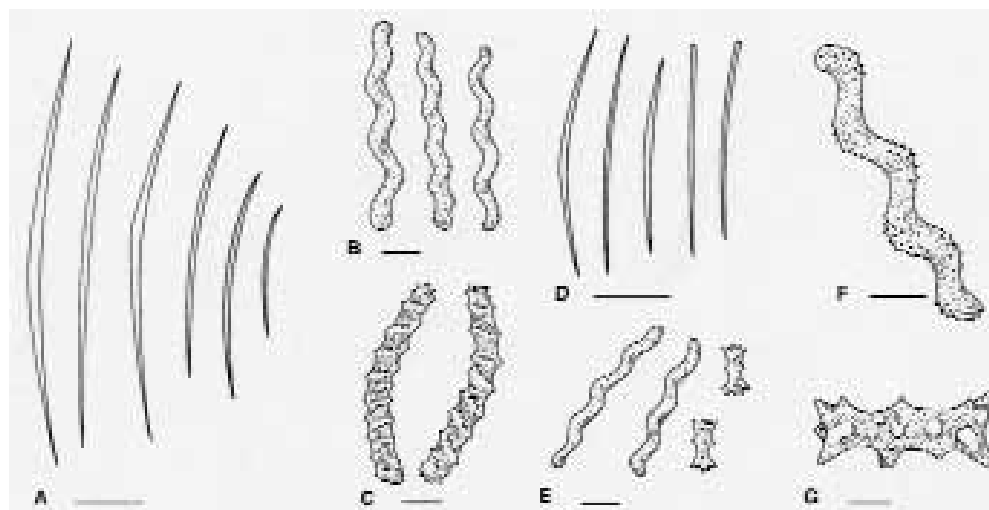


Fig. 10. *Spiroxya* spicules. A–C, *S. heteroclita* Topsent, after Topsent (1900), and from holotype, MNHN DT 2413. D–E, *Cliona levispira* Topsent, after Topsent (1898b), and from holotype, MNHN DT 873. G–F, after SEM photomicrographs of *Scantiletta* sp. (courtesy B. Calcinai). A, oxeas (scale 100 μm). B, spiral microstrongyles (scale 10 μm). C, spiral-spined microstrongyles (scale 10 μm). D, oxeas with styloid modifications (scale 100 μm). E, spiral microstrongyles and amphiasters (scale 10 μm). F, spiral microstrongyle with microspination (scale 10 μm). G, amphiaster (scale 2 μm).

abundant and clearly native, albeit very small. In the case of *P. lignea*, it is uncertain whether or not all the microscleres are native to the sponge (notwithstanding re-examination of the type material; courtesy of J.N.A. Hooper), as they are very rare. In both species amphiasters are extremely small (about 5 μm long), with clusters of spines at either end reminiscent of diplasters or nodulose amphiasters. Furthermore, a second form of microsclere was also discovered in *P. lignea*, consisting of small granular microstrongylote rhabds, with slight centrotyle swelling (reminiscent of acanthorhabds seen in some Theonellidae lithistids). These were not mentioned by Sollas (1888) for *S. moseleyi* although he depicts something similar in his plate XLIII, figure 4, and it can only be assumed that he considered these were growth stages of amphiasters.

SPIROXYA TOPSENT, 1896

Synonymy

Spiroxya Topsent, 1896a: 121. [*Scantilla*] Johnson, 1899: 462 (preocc. by an Insecta). *Donotella* de Laubenfels, 1936a: 156 (for *Cliona acustella* Annandale, 1915a: 14). *Scantiletta* de Laubenfels, 1936a: 156 (replacement for [*Scantilla*] Johnson). *Cliona* Grant, 1826a, in part (e.g., *C. levispira* Topsent, 1898b: 235; *C. pruvoti* Topsent, 1900: 104; *C. sarai* Melone, 1965: 348; *C. acus* Bavestrello *et al.*, 1995: 380).

Type species

Spiroxya heteroclita Topsent, 1896a: 122 (by monotypy).

Definition

Alecetonidae with oxeas as principal megascleres and one or two size classes of microspined rhabds as microscleres.

Diagnosis

Excavating and thinly encrusting, small sponges inhabiting the scleraxis of octocorals and crevices in rock. Oxeas are present as megascleres and occur in two size classes: the larger in tracts crossing the choanosome, smaller ones arranged in palisade-fashion in the papillae (Calcinai *et al.*, in press). Styloid modifications or accessory spicules may occur. Microscleres are dispersed throughout the sponge body. The microscleres are microspined, spiral rhabds or short, straight spiny microstrongyles, or both.

Previous reviews

Rosell & Uriz (1997); Calcinai *et al.* (in press).

Description of type species

Spiroxya heteroclita Topsent, 1896a (Fig. 10).

Synonymy. *Spiroxya heteroclita* Topsent, 1896a: 122; Topsent, 1900: 280, pl. 8 fig. 11.

Material examined. Holotype: MNHN DT 2413 (spicule preparation) – Banyuls (Cap Abeille), France (Mediterranean). Other material. *Cliona levispira* Topsent, 1898b: 235, fig. 2ii: MNHN DT 873 (8 PA 1895), DT 874 (8 PA 1897) – Azores. *Cliona pruvoti* Topsent, 1900: 104, pl. 3, fig. 6: DT 2424 – Banyuls.

Description. The original author describes a thin whitish crust penetrating crevices in rock, no openings known. Nothing else is known about the live type species. Related taxa are whitish or yellowish and clearly boring, with chambers ranging 1–6 mm in diameter and very small papillae (Melone, 1965; Calcinai *et al.*, in press, pers. comm.). Oxeas are bent, asymmetrical, and taper to sharp points. These megascleres have a great size range and can be separated into a smaller category of about 76–110 \times 1.5–2.5 μm and a larger one of 200–900 \times 15–20 μm . The microscleres are of

two kinds: spiral strongylotes with 4–8 turns, smooth or minutely spined, $60 \times 3 \mu\text{m}$ in average dimension; curved (but not spiral) strongyles, $70 \times 4 \mu\text{m}$, ornamented with small spines that run in a spiral around the rhabd.

Remarks. Topsent (1896a) considered the spiral rhabds to be smooth but high magnifications show that many have microspination.

Because several combinations of oxeas with spiral rhabds, spiral-spined rhabds, and spiny microstrongyles may occur in this group of excavating species there is no justification of separating genera until more material becomes available. In this context, *Spiroxya* is the senior genus.