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

Astrophorida *Incertae Sedis*

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Lamellomorpha Bergquist (Demospongiae, ? Astrophorida) is a monotypic genus from cool temperate and subantarctic New Zealand. It has contort oxeas, strongyles and strongyloxeas as megascleres forming a lax confused choanosomal skeleton with only slight traces of radial structure near the surface, and a skin-like membranous ectosomal skeleton packed with microstrongyles, and with streptasters (amphiaster- , metaster- and spiraster-like) scattered throughout. Its precise taxonomic allocation cannot be presently resolved, with discussion provided on possible affinities with Astrophorida (e.g., Ancorinidae, Pachastrellidae), some 'lithistid' demosponges (e.g., Corallistidae, Isoraphinidae, Phymaraphiniidae), Hadromerida (e.g., Alectonidae) and Halichondrida (e.g., Axinellidae, Bubaridae), and is left *incertae sedis* within Astrophorida.
Keywords: Porifera; Demospongiae; Astrophorida; *incertae sedis*; *Lamellomorpha*.

LAMELLOMORPHA BERGQUIST, 1968

Synonymy

Lamellomorpha Bergquist, 1968: 30.

Type species

Lamellomorpha strongylata Bergquist, 1968 (by monotypy).

Definition

? Astrophorida with only contort monaxons (oxeas, strongyles and strongyloxeas) as megascleres, and microscleres being streptasters and microstrongyles.

Diagnosis

Massive folded lamellate sponge with smooth surface. Ectosomal skeleton a skin-like membrane packed with microstrongyles. Choanosomal skeletal architecture lax and confused with only slight traces of radial structure, with subectosomal tracts of contorted oxeas or modified forms (strongyles, strongyloxeas) – curving outwards and supporting the ectosomal skeleton. Microstrongyles and streptasters (amphiaster-, metaster- and spiraster-like) scattered throughout the body.

Remarks

The genus contains one or possibly two species (see remarks below), and is known only from southern temperate and subantarctic waters (Three Kings Island, Campbell Plateau, and South Africa).

Description of type species

Lamellomorpha strongylata Bergquist (Fig. 1).

Synonymy. *Lamellomorpha strongylata* Bergquist, 1968: 31–32, pl. 4a, 11e–f, fig. 10.

Material examined. None. Holotype: NMNZ Por.33 (not seen): South of Three Kings Island, New Zealand, 34°00′S, 172°30′E, 60–120 m depth, coll. MV 'Tui', 22 × .58, NZOI stn. B93.

Description. Massive thickly folded lamellate growth form, 13–16 cm high, with incurved lamellae 2–6 cm thick, supported by stout stalk about 3 cm in diameter. Texture firm, compressible, easily broken. Surface smooth, oscules scattered over the convex surface of lamellae, flush with the surface. Ectosomal skeleton with a distinct skin-like dermal membrane densely packed with microstrongyles. Choanosomal skeleton with only slight traces of radial construction, where in the subectosomal region of both surfaces of lamellae tracts of megascleres, of variable thickness, curve outwards and intersect the surface at acute angles. These tracts are absent from deeper regions of the choanosomal skeleton which is lax and confused. Microstrongyles and streptasters scattered throughout the choanosomal skeleton. Megascleres are basically oxeote with strongylote and strongyloxeote modifications, predominantly contort/sinuous, sometimes merely curved, 1000–(1980)–2808 μm long, 14–(26)–33 μm wide. Microscleres are squat microstrongyles, evenly rounded, slightly roughened, occasionally centrotylote (23–(24.8)–30 μm long, 2.3–(2.9)–4.3 μm wide), and small streptasters with 3–12 smooth, sharply pointed rays and mostly a straight shaft (amphiaster- transitional to metaster- and spiraster-like, but not plesiasters as stated by Bergquist, 1968) (8.0–(9.8)–11.0 μm long).

Remarks. The original description of this species is relatively comprehensive and well-illustrated, yet the affinities of the genus are still highly problematic.

Bergquist (1968) made comparisons between *Lamellomorpha* and *Jaspis* (Coppatiidae, now Ancorinidae) based on skeletal structure and megasclere geometry, in particular *J. serpentina* Wilson, but differing significantly in their microsclere composition, with putative differences being the presence of streptasters in the former, termed plesiasters by Bergquist but clearly more similar to amphiasters-metasters (with a straight shaft) and spirasters (with a curved shaft), and the presence of euasters in the latter. Bergquist (1968) also suggested that *Coppatias baculifer* Kirkpatrick from South Africa may also belong to *Lamellomorpha*, being similar to *L. strongylata* in most respects, also having microstrongyles, but lacking streptasters. She hypothesised further that microstrongyles of *C. baculifer* were derived from streptasters through loss of rays,

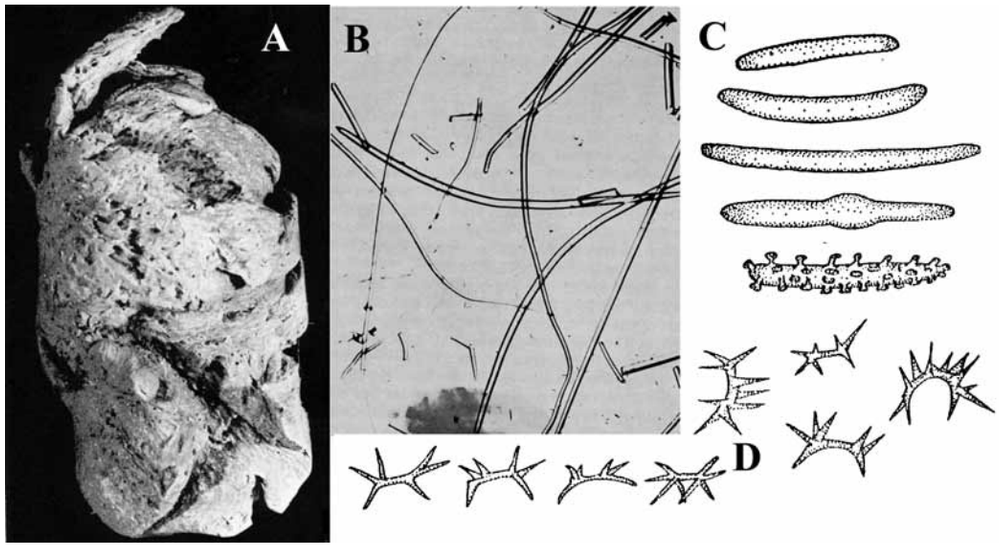

Fig. 1. *Lamellomorpha strongylata* Bergquist. A, holotype (size 13 cm high). B, light micrograph of contort oxeas, strongyles and strongyloxeas. C, microrhabds. D, streptasters (refer to text for sizes) (all modified from Bergquist, 1968).

and *L. strongylata* presented an intermediate condition between *Jaspis* and *C. baculifer* (having both sorts of microscleres). Indeed microstrongyles in *L. strongylata* do appear to be derived from streptasters, through loss of rays (Bergquist, 1968: pl. 11, Fig. F2), but it is unlikely that these are related to euasters, and the only obvious homology between *Lamellomorpha* and Coppatiidae (=Ancorinidae) is the lack (loss) of triaene megascleres. It is therefore unlikely that these species belong to Ancorinidae as they lack euasters (a relatively strong synapomorphy for the family, although some ancorinid genera do lack them; see chapter by Uriz, this volume).

A second alternative, and possibly more plausible allocation, is with the Pachastrellidae, but this hypothesis is also speculative given the absence of triaene megascleres or their derivatives with which to judge affinities (see chapter by Maldonado, this volume). Ignoring for the moment the absence of triaenes (and/or calthrops) in *Lamellomorpha* (which could be hypothesised as a secondary loss), the genus shows some superficial similarities to *Pachastrella* which also has an ectosomal skeleton composed of a felt of microstrongyles, and amphiaster- to metaster-like streptasters. However, the shape of oxeas and strongyloxeas in *Lamellomorpha* is not the same as those seen in various genera of Pachastrellidae. Microstrongyles in the former are not necessarily homologous to the oval microstrongyles of *Pachastrella*, for example (measuring 8.5–15 μm × 4–6 μm), but are longer and thinner (23–30 μm × 2.3–4.3 μm). Bergquist (1968) described for *Lamellomorpha* "In the subdermal region, on each surface of the sponge, tracts of megascleres curve outward and intersect the surface at an acute angle". This feature is so far unknown in typical pachastrellids. Furthermore, she adds "A distinct skin-like membrane is present and is densely packed with microstrongyles", whereas a skin-like membrane is so far unknown from typical pachastrellids, and indeed none have an ectosomal felt that can be easily detached. *Lamellomorpha* is described as bright green in life, and although sponge colouration often may be taxonomically unimportant, there are some physiological pathways and ecological concerns about colour in sponges (see Maldonado & Young, 1996c) suggesting that pachastrellids – and astrophorids in general – are unlikely to be bright green. Astrophorids are usually whiteish, with only some shallow-water species (which is not the case of *Lamellomorpha*, collected from 60 to 120 m depth) showing melanine-derived blackish or grayish colours for UV protection. Green colouration in sponges usually results from either subectosomal development of photoautotrophic symbionts or translocation of undegraded phytoplankton pigments, likely for UV protection. Both possibilities are unlikely in sponges with a thick cortex of microscleres or tangential felts, which diffract incident light. Thus, despite similarities in several features between *Lamellomorpha* and some Pachastrellidae it is unsure whether these are homologous features or analogous convergences, and the genus is not included here either.

A third alternative is that *Lamellomorpha* may be a 'lithistid' sponge that has lost its desmas. There are several 'lithistids' that have contorted strongyles and streptasters, in addition to monocrepidial or tetracrepidial desmas (such as Corallistidae and Isoraphinidae, and Phymaraphiniidae, respectively; refer to chapters by Pisera & Lévi, this volume). Maldonado *et al*. (1999) demonstrated that production of desmas may be inhibited in shallow-water 'lithistids' because the levels of dissolved silicon in shallow waters are lower than those required for secretion of desmas and other hypersilicified spicules. This might also be the case for *Lamellomorpha* (with a known depth range of 60–120 m). To test this idea would require searching for a significant resemblance between the free (non-lithistid) skeletons of *Lamellomorpha* and various 'lithistids'. However, given that the concept of 'order Lithistida' is now formally abandoned (Pisera & Lévi, this volume), such a relationship would need to be postulated at the family or genus level to have any taxonomic meaning. While a number of 'lithistids' have obvious affinities with various families in the orders Poecilosclerida, Halichondrida and Spirophorida, most are not yet resolved but many are astrophorids and it is plausible that *Lamellomorpha* belongs to one of these.

Finally, it is possible that *Lamellomorpha* may not belong to Ancorinidae at all, but may have affinities to Hadromerida or Halichondrida. For example, some genera of Alectonidae

(Hadromerida) have oxeas and strongyles (and they are known to lose their megascleres), and streptasters (amphiasters) and strongylote microscleres. In addition, the latter ones usually show thick, tubercule-like microspines similar to those illustrated by Bergquist (1968: pl. 11, Fig. F2) in some spicules of *Lamellomorpha*, which she called "abnormal microrhabds". Nevertheless, alectonid strongylote microscleres are usually bent, spiral and/or with spirally arranged microspines (see chapter by Rützler, this volume). Similarly, some species of Axinellidae and Bubaridae (Halichondrida) have contorted oxeas, strongyloxeas and strongyles vaguely reminiscent of those found in *Lamellomorpha* (see chapters by Alvarez *et al*., this volume), with the supporting feature being possession of a stalked growth form (common to Axinellidae), and a lax choanosomal skeleton (characteristic of many halichondrids). Nevertheless, this evidence is very weak and highly speculative. All these above hypotheses require further testing through comparative morphological studies based on type material (including a redescription of the holotype of *Lamellomorpha*), and until such a study is completed this genus remains *incertae sedis* within Astrophorida.