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

Order Spirophorida Bergquist & Hogg, 1969

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Spirophorida (Demospongiae) is a well-defined small group of non-lithistid tetractinomorph sponges characterized by sigmaspire microscleres (spined c- or s-shaped spicules of 10–40 μm length). Triaenes and tetractine spicules are shared with sponges of the order Astrophorida, but are absent in some taxa. Sigmaspires are shared with the lithistid family Scleritodermidae, which points to a probable close relationship with this family, once again demonstrating polyphyly of the 'order Lithistida'. Spirophorida comprise three families, Samidae Sollas is monotypic, Spirasigmidae Hallmann with two genera, and Tetillidae Sollas has eight valid genera. Samidae are excavating sponges with amphitriaenes and lacking long-shafted triaenes and lacking oxeas; Spirasigmidae are encrusting to small conical sponges with only oxea megascleres, lacking triaenes, with a plumose skeleton fanning out towards the periphery, and one genus with a secondary skeleton of roughened 'microxeas'; Tetillidae are globular sponges with protriaenes as the characteristic megascleres.
Keywords: Porifera; Demospongiae; Spirophorida; Samidae; Spirasigmidae; Tetillidae.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

Sigmatophora Sollas, 1887, 1888. Spirosclerina Reid, 1963a. Craniellida Reid, 1968d. Spirophoridae Brien, 1968. Spirophorida Bergquist & Hogg, 1969. Spirophorina Wiedenmayer, 1977: 183.

Definition

Tetractinomorpha with triaene megascleres and sigmaspire microscleres.

Diagnosis

Globular, occasionally massive, rarely excavating or encrusting sponges. In non-excavating sponges the structure is strongly radiate, with thickly developed spicule bundles originating from a focal point in the middle of the sponge and running to the surface where they cause a conulose or hispid-bristly surface. At the periphery a strongly collagenous cortical region strengthened by special cortical oxeas may be developed in some genera. Megascleres include protriaenes and anatriaenes, occasionally amphitriaenes and plagiotriaenes, and large oxeas. Triaenes may be lost in some taxa. Microscleres are c- or s-shaped finely spined sigmaspires. In excavating sponges (one genus) oxeas, protriaenes and anatriaenes are lacking, all megascleres are amphitriaenes of a single type. They are small and insignificant bioeroders. In encrusting or small conical sponges (two genera), triaenes are absent, with only large strongyloxeas forming sequentially radial, plumose and eventually tangential halichondroid skeletal tracts extending from the basal to the peripheral skeleton, and one genus (*Spirasigma*) has a secondary disorganised skeleton of roughened 'microxeas' distributed throughout the entire skeleton, overlaying the main skeleton.

Scope

The order is a small compact group consisting of three families, Tetillidae Sollas, Samidae Sollas and Spirasigmidae Hallmann, sharing characteristic sigmaspire microscleres. Aside from this character two of the three families are quite divergent in their habit and further spiculation and they are not considered particularly closely related. Spirasigmidae is *incertae sedis*, containing two genera each with a single species; Tetillidae comprise about 150 species, and Samidae only a few.

Remarks

Sollas (1886b, 1888) recognized spigmaspire microscleres as an important discriminating character and erected a suborder Sigmatophora in his order Choristida for sponges possessing them. He also erected two families, Tetillidae and Samidae, to acknowledge the gap in structural diversity among the members of Sigmatophora, with the 'golf-ball' sponges of the family Tetillidae and the excavating sponges of the family Samidae. This classification found general support (e.g., Wilson, 1925), but was challenged and modified by Lendenfeld (1903, 1907) and de Laubenfels (1936a), who erected special families and genera for species lacking the sigmaspires. De Laubenfels (1936a) went even so far as to consider that sigmaspire-bearing and sigmaspire-lacking representatives were unrelated and distributed these over different parts of the Choristida, abandoning the (sub-)order Sigmatophora. A contrary view was taken by Dendy (1922b), followed by Burton (1934a) and others. These authors assumed homology of sigmaspires with the sigmata and derived microscleres of the Poecilosclerida and Haplosclerida. Dendy (1922b) erected a major order Sigmatotetraxonida Dendy, comprising all demosponges lacking asters; Burton (1934a) called this group the Sigmatosclerophora Burton. Subsequent authors eventually reinstated Sollas' group, but the name was changed (first to Spirosclerina Reid, 1963a, then to Craniellida Reid, 1968d and eventually to Spirophorida Bergquist & Hogg, 1969) in order to avoid confusion with sponges possessing smooth true sigmas (members of Poecilosclerida and Haplosclerida). However, recently Gruber (1993), in the spirit of Dendy and Burton, proposed that Spirophorida, in the sense employed here, and sigma-bearing Poecilosclerida were considered to be a monophyletic group, thus again interpreting sigmaspires and true sigmas as homologous. We do not subscribe to this unrealistic

point of view, which ignores the structural differences between the two orders. The name Spirophorida in the presently employed sense has gained general support and for that reason it is preferred instead of the earlier Sigmatophora (the ICZN rules of priority do not apply to supra-family level taxa). A third family of sponges, Scleritodermidae, possesses the characteristic sigmaspires, but these sponges have a desma-skeleton. Several recent authors (Gruber, 1993; Hooper & Wiedenmayer, 1994) included Scleritodermidae within the Spirophorida, and in view of the likely polyphyletic nature of the 'order Lithistida' this is understandable. However, in the present volume we have taken the conservative approach to retain this taxon within the 'Lithistida', although we expect that in the near future most of the families of this order will be distributed over various orders of the Tetractinomorpha. A fully elaborated proposal for this is still lacking.

The position of Samidae in Spirophorida is controversial, because some authors (e.g., Topsent, 1928c; Wiedenmayer, 1994) consider the amphitriaenes to be microscleres, interpreted as amphiasters. In combination with the excavating habit this would point to the family Thoosidae of the order Hadromerida. We prefer to stress the similarity of the sigmaspires of Tetillidae and Samidae, and retain the two families within Spirophorida. The inclusion of a third family, Spirasigmidae, in this order is proposed here, albeit one of *incertae sedis* and possibly concerning highly aberrant *Cinachyrella*s.

Recent reviews

Rützler, 1987; Hooper & Wiedenmayer, 1994.

KEY TO FAMILIES

(1) Excavating or encrusting on corals 2
Globular or semiglobular sponges, oxeas forming the main spicule type, with protriaenes and other long-shafted triaenes ..... **Tetillidae**

(2) Excavating in corals, lacking oxeas, possessing peculiar small amphitriaenes as the only megascleres ..... **Samidae**
Encrusting or small conical sponges on coral, lacking triaenes, with large strongyloxeas as main megascleres, forming mainly plumose skeletal structure, almost tangential at the periphery, and one genus with a secondary disorganised skeleton of microxeas ..... **Spirasigmidae**