

## Family Phellodermidae fam. nov.

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Phellodermidae fam. nov. (Demospongiae, Poecilosclerida) is newly erected in the suborder Myxillina to accommodate sponges with arcuate chelae or derivatives thereof lacking special ectosomal diactinal megascleres. The only megascleres present are styles, which may occur in size categories but are of uniform shape in all parts of the sponge. There are only few sponges with such a combination of characters, and these are assigned to two genera, *Echinostylinos* and *Phelloderma*, differing in the possession of normal or asymmetrically twisted chelae in the former, and peculiar symmetrically modified chelae, called abyssochelae, in the latter. They mostly occur in deep and cold waters. Phellodermidae are similar to Dendoricellidae and Chondropsidae in having only a single megasclere type in combination with arcuate chelae. However in these families the megascleres are respectively oxeads and strongyles, which are probably tornote-derived indicating loss of choanosomal megascleres. In contrast, Phellodermidae seem to lack tornotes and retained their choanosomal megascleres.

**Keywords:** Porifera; Demospongiae; Poecilosclerida; Myxillina; Phellodermidae fam. nov.; *Echinostylinos*; *Phelloderma*.

### DEFINITION, DIAGNOSIS, SCOPE

#### Definition

Myxillina with exclusively styles as megascleres and arcuate or modified arcuate chelae, and if present, sigmas.

#### Diagnosis

Semiglobular, stalked or thinly branching sponges. Surface slightly hispid. Skeleton plumose or radiating, without special ectosomal skeleton. Spicules exclusively smooth styles, no differentiation into ectosomal and choanosomal types, although a smaller size may occur at the surface. Microscleres arcuate isochelae, which may be modified into unique forms by twisting or fusion of the alae, and sigmas, which may be absent.

#### Scope

Two out of five nominal genera are considered valid, *Echinostylinos* and *Phelloderma*, comprising about ten species reported from cold deeper waters.

### KEY TO GENERA

- (1) Chelae include 'abyssochelae', with alae meeting or fusing in the frontal plane ..... *Phelloderma*  
Chelae normal or asymmetrically modified, no fusion of alae ..... *Echinostylinos*

### ECHINOSTYLINOS TOPSENT, 1927

#### Synonymy

*Echinostylinos* Topsent, 1927b: 8. *Camptisocale* Topsent, 1927b: 8. *Ysila* de Laubenfels, 1936a: 126.

#### Type species

*Echinostylinos reticulatus* Topsent, 1927b: 8 (by monotypy).

### Remarks

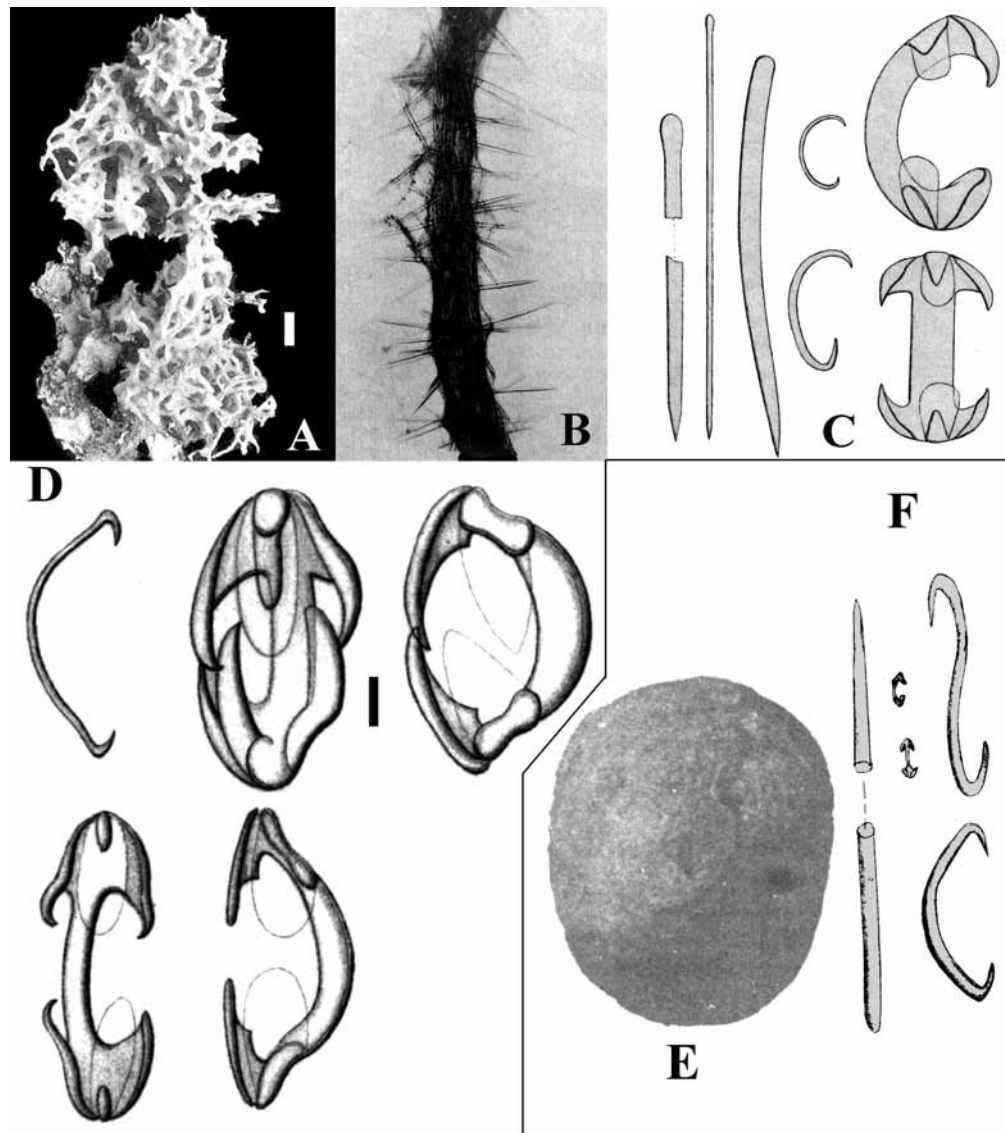
The family is newly erected to unite sponges with the combination of styles and arcuate isochelae. The family differs from other Myxillina sponges that contain arcuate chelae, such as Coelosphaeridae, Hymedesmiidae and Crellidae, in lacking differentiated ectosomal and choanosomal megascleres. Sponges of the family Dendoricellidae and Chondropsidae appear similar in likewise lacking differentiated ectosomal and choanosomal megascleres in combination with arcuate chelae, but the megascleres in those families are diactinal (respectively oxeads and strongyles). The lack of megasclere differentiation in these families is not considered an indication of sister-group relationships, as the diactinal megascleres are probably tornote-derived, whereas Phellodermidae fam. nov. appears to lack these entirely, having retained the choanosomal styles. Other poecilosclerid families, e.g., Desmacididae and certain Mycalina, may appear similar, but these have different chela-types, anchorate or palmate.

### Definition

Phellodermidae with ectosomal megascleres consisting of a smaller size of styles or subtylostyles; choanosomal skeleton consist of tracts of larger styles; microscleres arcuate isochelae and sigmas.

### Diagnosis

Anastomosing branches, erect bushes or semiglobular masses. Surface irregular or conulose. Skeleton of smaller ectosomal



**Fig. 1.** A–C, *Echinostylinos reticulatus* Topsent (1927b). A, habit, reproduced from Topsent's pl. II fig. 21 (scale 1 cm). B, skeleton of branch, reproduced from his pl. VII fig. 15 (scale see text). C, spicules, from his pl. VII fig. 16 (sizes see text). D, *Echinostylinos glomeris* (Topsent, 1904b as *Esperiopsis*), type of *Camptisocole* Topsent, 1927b, drawing of chelae, from Topsent, 1904b: pl. XVII fig. 3 (scale 10  $\mu$ m). E–F, *Echinostylinos schmidti* (Arnesen, 1903 as *Esperiopsis*), type of *Ysila* de Laubenfels. E, photo of holotype, reproduced from Arnesen, 1903 pl. I fig. 4 (size unknown). F, drawing of spicules, from Arnesen, 1903 pl. IV fig. 4 (sizes see text).

subtylostyles assuming a partly erect and partly tangential position and larger choanosomal styles forming an axially condensed mass or a vague reticulation of tracts and single spicules. Microscleres arcuate chelae and sigmas. Approximately eight species.

#### Previous reviews

Topsent, 1928c; Bergquist & Fromont, 1988; Van Soest, 1990.

#### Description of type species

*Echinostylinos reticulatus* Topsent, 1927b (Fig. 1A–C).

**Synonymy** *Esperiopsis polymorpha* var. Topsent, 1892a: 91, pl. VI fig. 10. *Echinostylinos reticulatus* Topsent, 1927b: 8; Topsent, 1928c: 207, pl. II fig. 21, pl. VII figs 15–16; ? Bergquist & Fromont, 1988: 45, pl. 17 figs A–D.

**Material examined.** Holotype: MOM (not seen). Schizotypes: MNHN DT1293 – Two microscopic slides, labeled 'n.g. n.sp. st. 3144', made from the holotype.

**Description (from Topsent, 1928c).** Clathrate mass (Fig. 1A) of thin twisted anastomosed branches with hispid surface. Branches ca. 1.5 mm in diameter, total mass of branches about 10 cm long, 8 cm wide. Consistency tough, not easily broken. Colour white in alcohol. The branches contain an axis of aligned thick styles (Fig. 1B) occasionally interconnected to form a tight spongin-enforced reticulation, and echinated profusely with thick styles at the periphery, forming thus an extra-axial skeleton which carries the surface skeleton of small subtylostyles. The echinating styles protrude through the surface to form hispid conules. The ectosomal skeleton contains a loose arrangement of bundles of thin subtylostyles and solitary subtylostyles. Spicules (Fig. 1C), subtylostyles, smooth, straight, largely isodiametric, with a short point,

245–280 × 3–4 μm; styles robust, smooth, somewhat curved, 500–560 × 26–30 μm. Microscleres, arcuate chelae, with thick, curved shaft and short teeth, 27–49 μm; sigmas of normal shape, 15–22 μm, possibly in two size/form categories. Distribution and ecology. Azores, ? New Zealand, deep water, 900 m (?55–110 m).

**Remarks.** The New Zealand material shows similar spicule sizes and for that reason was assigned to *E. reticulatus*. However, the shape is more lamellate or lobately ramose, different from the thin branches in the North Atlantic specimens. In view of the large geographic separation, it is likely that both are different at the species level. *Echinostylinos* has been associated with *Monanchora* and *Crambe* of the family Crambeidae (e.g., by Van Soest, 1990), on account of shared smaller and larger (subtylo-)styles and seemingly similar microsclere complement. However, the chelae of *Echinostylinos* are clearly arcuate and the sigmas are true sigmas and not the reduced chelae that pass for sigmas in several Crambeidae. Further species are *E. gorgonopsis* Lévi (1993: 49), *E. hirsutus* Koltun (1970: 202), *E. mycaloides* Koltun (1970: 200), *E. shimushirensis* Koltun (1970: 200), and *E. stylophora* (Lévi & Lévi, 1983b: 960, as *Lissodendoryx*). *Echinostylinos unguiferus* de Laubenfels (1953a: 528, fig. 6) is a junior synonym of *Monanchora arbuscula* (Duchassaing & Michelotti, 1864).

The genus *Camptisocale* Topsent (1927b: 8) was erected for the type species (by original designation) *Esperiopsis glomeris* Topsent, 1904b: 213, pl. XVII fig. 3. A MNHN slide (DT. 1000) labeled “108 PA 1897” of the MOM type was examined. The chelae are definitely arcuate rather than modified palmates as Topsent (1904b) maintained. The habit consisted of a damaged thin branch, with a main skeleton of radially arranged larger styles, 1400–1500 × 17–20 μm; at the ectosome there is a partially tangentially arranged layer of polytylote smaller subtylostyles, 900–1000 × 7–8 μm. Peculiarly shaped arcuate isochelae (Fig. 1D) up to 60 μm in length are abundant below the surface. In the combination of stylote ectosomal spicules, smooth choanosomal styles and arcuate isochelae, this species appears to be close to *Echinostylinos*, and only the peculiar shape of the chelae is a clear difference. This is judged to be of specific value only, and accordingly *Camptisocale* is considered a synonym. *Camptisocale* and *Echinostylinos* were erected on the same page, but priority is given here to the name *Echinostylinos* as this has been used much more frequently than *Camptisocale*.

The genus *Ysila* de Laubenfels (1936a: 126) was erected for the type species (by original designation) *Esperiopsis schmidti* Arnesen, 1903: 9. This is a semiglobular sponge (Fig. 1D, size not known) with a confused-plumose skeleton of styles and large numbers of sigmata and arcuate isochelae (Fig. 1F). It has not been redescribed since its introduction and remains ill-known. Lundbeck (1905) noted its odd combination of spicules, but retained the species in *Esperiopsis* (family Mycalidae). Arnesen (1903) stated that the sigmas are very large – and illustrates them like that – but quotes a size of 20 μm, whereas the chelae are said to be 40 μm, but are illustrated at less than a quarter the size of the sigmas. The legend to the figures states that all spicules are illustrated at the same scale. Apart from this inconsistency, if the description by Arnesen will prove to be otherwise correct, the species is better assigned to *Echinostylinos* and it is proposed here to consider *Ysila* a junior synonym of this genus. De Laubenfels also noted the resemblance to *Echinostylinos*, but nevertheless erected *Ysila* because *Echinostylinos* would have a plumose skeleton lacking in *Esperiopsis schmidti*. However, the skeletal structure described and figured by Arnesen, if it does present a recognizable

architecture, would have to be considered plumose. It seems evident that de Laubenfels misinterpreted the skeleton of *E. schmidti* and thus the genus *Ysila* was erected for nought.

## PHELLODERMA RIDLEY & DENDY, 1886

### Synonymy

*Phelloderma* Ridley & Dendy, 1886: 347. *Abyssocladia* Lévi, 1964a: 78.

### Type species

*Phelloderma radiatum* Ridley & Dendy, 1886: 347 (by monotypy).

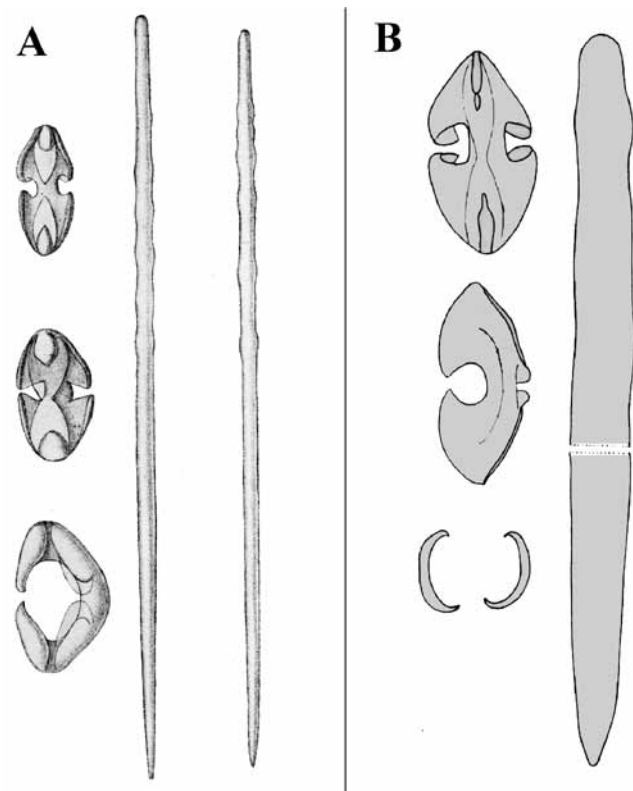
### Diagnosis

Phellodermidae with large styles in a single size category, and abyssochelae (stout isochelae with shaft markedly curved on profile view and frontal teeth touching or fused together).

### Description of type species

*Phelloderma radiatum* Ridley & Dendy, 1886 (Fig. 2A).

**Synonymy.** *Phelloderma radiatum* Ridley & Dendy, 1886: 347; Ridley & Dendy, 1887: 113, pl. XXIII fig. 8.



**Fig. 2.** A, *Phelloderma radiatum* Ridley & Dendy (1886), drawing of spicules reproduced from their pl. XXIII fig. 8 (sizes see text). B, *Phelloderma bruuni* (Lévi, 1964a as *Abyssocladia*), drawing of spicules reproduced from his fig. 30 (sizes see text).

**Material examined.** Holotype: BMNH 1887:5:2:167 (wet) – Rio de la Plata (fragment in ZMB, fide Hooper & Wiedenmayer, 1994:169).

**Description (adapted from Ridley & Dendy, 1887: 113).** Sponge subglobular, with a concave base of attachment, about 13 mm in diameter. A cork-like cortex (ca. 240  $\mu\text{m}$  thick) is found underneath the easily peeled off dermal membrane. A few dubious scattered oscula on small papillae. Skeleton of radiating bundles of megascleres with points directed outwards and embedded in the dense cortex. Large amount of sand scattered throughout. Megascleres styles, straight, smooth, verging upon tylostyles; fairly gradually and sharply pointed, often subpolytylote, 650  $\times$  12.6  $\mu\text{m}$ . Microscleres stout isochelae with shafts markedly bent on profile view and frontal teeth which may fuse together, ca. 44  $\mu\text{m}$  high. Distribution and ecology. Rio de la Plata, Argentina, 1080 m, bottom green sand.

**Remarks.** The genus *Abyssocladia* Lévi, 1964a, with type species *A. bruuni* Lévi, 1964a: 78 (by monotypy) is considered a junior synonym of *Phelloderma*, on account of the similar and peculiar

shape of their isochelae, termed here 'abyssochelae'. Lévi (1964a) used the name *thaumatochela* in referring to the isochelae of *Abyssocladia*, but it is suggested here that its usage should be restricted to chelae similar to those of *Mycale thaumatochela* Lundbeck, 1909, viz. palmate anisochelae with caliciform feet encircling the frontal ala of the head. The type of *A. bruuni* (presumably in ZMUC, a slide of it MNHN DC11404 was examined) from the Kermadec Trench is a deep sea (>5000 m) pedunculate sponge, with stalk of 10  $\times$  1 mm, ending in an umbrella-like main body of 13 mm at the widest. It has fusiform, slightly polytylote styles with a smaller head, 1300–1650  $\times$  25–28  $\mu\text{m}$ , abyssochelae of 70–75  $\mu\text{m}$ , and relatively thick sigmas of 30  $\mu\text{m}$ . As both *Phelloderma* and *Abyssocladia* are known from a single species, it is difficult to objectively evaluate the significance of their apomorphic characters (presence of a 'cortex' in *Phelloderma*, and of centrally thickened sigmas in *Abyssocladia*). It is proposed here to stress the similarities (virtually identical abyssochelae and polytylote styles) and accordingly *Abyssocladia* is considered a synonym of *Phelloderma*.