

Family Placospongiidae Gray, 1867

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Placospongiidae Gray (Demospongiae, Hadromerida) has the typical radial skeleton structure of Hadromerida and *Spirastrella*-like tylostyle-spiraster spicule complement but stands out by the possession of a rigidly cemented cortex of large microscleres. The cortical spicules are ovoid or bean-shaped (selenasters) or dumbbell-like (amphinolasters). The cortex is broken up into distinctive plates that are separated by contractible grooves containing oscula and ostia. Species are encrusting or branching massive and most occur in shallow tropical and subtropical waters, from the intertidal to almost 200 m. The family, until recently considered monotypic, includes two genera, *Placospongia* (including *Physcaphora*) and *Onotoa* (including *Amphinolana*).

Keywords: Porifera; Demospongiae; Hadromerida; Placospongiidae; *Onotoa*; *Placospongia*.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

Placospongiidae Gray, 1867b: 127 (Gray also applied the common name 'Stony Sponges').

Definition

Hadromerida with cortex and selenasters or amphinolasters (amphispherasters) as cortical spicules.

Diagnosis (from Rützler & Hooper, 2000)

Hadromerida with tylostyles as megascleres and selenasters or amphiaster-like sterrasters (amphinolasters) as primary microscleres forming polygonal cortical crusts. Cortical plates separated by contractile ectosomal pore grooves bearing ostia and oscula. Tylostyles in tracts radiating from the base toward the surface and supporting the margins of the cortical plates. Accessory microscleres include spirasters, spherasters, and spherules.

Scope

Two valid genera, *Onotoa* de Laubenfels and *Placospongia* Gray.

History and biology

Because fully formed selenasters are similar to sterrasters in shape and also form a strong cortex, several older authors, such

as Schmidt (1870), Sollas (1888), Hanitsch (1895), Minchin (1900), and Topsent (1933) believed in the close relationship of *Placospongia* then the only genus known in the family, and *Geodia*, although, as Keller (1891) demonstrated, the *Placospongia* 'sterraster' actually develops from a spiraster, originating from a rod-shaped center (Vosmaer & Vernhout, 1902), whereas *Geodia* sterraster starts as an euaster (from one center point).

Species of *Placospongia* may be encrusting or branching; in the latter case, the selenasters of the surface crust form also a dense axial tract. The color is generally brown to tan (tan to white when preserved or dry) but purplish-red specimens are known where the pigment resides in the selenasters and is not dissolved in preservation alcohol (Vosmaer & Vernhout, 1902).

Species in this family occur in tropical or subtropical shallow water (from intertidal to 117 m depth), particularly on coral reefs. Small crusts occur on the lower surfaces of intertidal rock and coral rubble where they can survive periods of falling dry by contracting the unprotected surface grooves; epizoic algae and invertebrates are common.

Remarks

The distinction between Spirastrellidae, Clionidae, and Placospongiidae in this revision is further supported by 28S-genetic analysis (Chombard, 1998).

Developmental stages of selenasters and amphinolasters, spicules with fused rays similar to the sterraster of Geodiidae, show their relationship to both spirasters and amphiasters. Associated typical spirasters indicate kinship with Spirastrellidae and Clionidae.

KEY TO GENERA

- (1) Microscleres of the cortex are ovoid or bean-shaped selenasters *Placospongia*
Microscleres of the cortex are dumbbell-like amphispherasters *Onotoa*

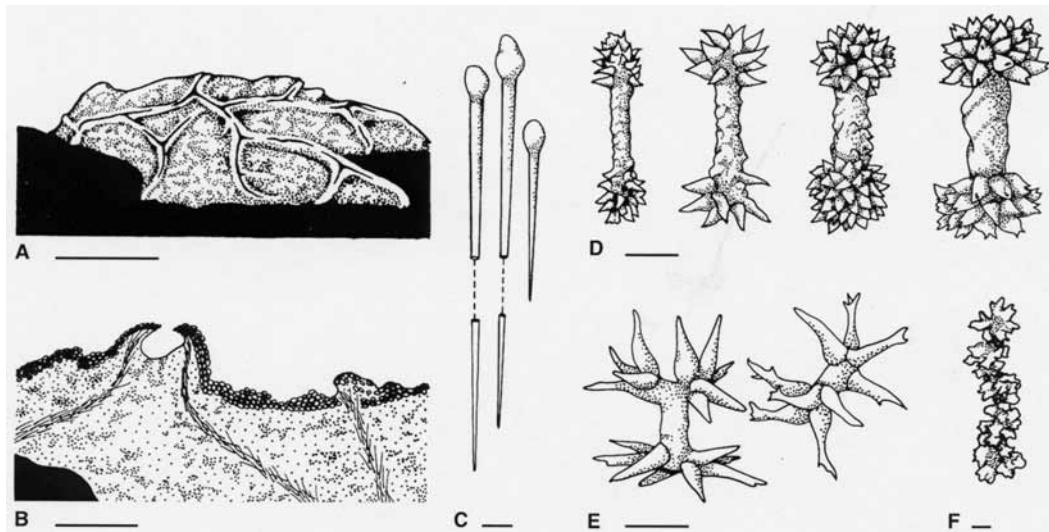


Fig. 1. *Onotoa amphiastra* de Laubenfels, holotype USNM 35385. A, specimen detail showing the cortical plates bounded by ridges (closed grooves) (scale 10 mm). B, cross-section demonstrating skeleton structure: Cortex of cemented amphinolasters and tylostyle bundles supporting cortical plates along the aquiferous grooves (scale 50 μm). C, tylostyles (scale 50 μm). D, large spirasters and amphiasters (scale 10 μm). E, microspined spirasters (scale 10 μm). F, amphinolasters, stages of development (scale 2 μm).

ONOTOA DE LAUBENFELS, 1955

Synonymy

Onotoa de Laubenfels, 1955a: 140. *Amphinolana* Rützler & Hooper, 2000: 339.

Type species

Onotoa amphiastra de Laubenfels, 1955a (by original designation).

Definition

Placospongiidae with a cortex of dumbbell-like amphispherasters (amphinolasters).

Diagnosis

Crustose sponges with cortical plates separated by grooves. Tracts of megascleres (tylostyles) radiating from the base toward the surface. Stony hard cortex and basal spicule layer formed by unusual, cemented microscleres, barbell-shaped amphispherasters (or amphisterrasters). This spicule type was termed amphinolaster (Rützler & Hooper, 2000) to contrast the selenaster of *Placospongia*, a spiraster derivative (Vosmaer & Vernhout, 1902). Accessory microspined spirasters and long-rayed amphiasters (only in the type species) are microscleres found mainly in the choanosome. Two species from intertidal habitats in the Pacific Ocean.

Previous review

None; but detailed description of a representative of the genus, *Amphinolana* (= *Onotoa claudellevii*, in Rützler & Hooper (2000).

Description of type species

Onotoa amphiastra de Laubenfels, 1955a (Figs 1–2).

Synonymy. *Onotoa amphiastra* de Laubenfels, 1955a: 140, fig. 1.

Material examined. Holotype: USNM 35385 (de Laubenfels' original number: 52003) – *Onotoa* Atoll, Gilbert Islands (ca. 1°50'S, 176°30'E).

Description. Small, hard and tough crust (37 × 20 mm), pale tan (alcohol), with polygonal cortical plates separated by ridges (contracted grooves). Fascicular tracts of tylostyles running perpendicularly from substrate to a cortex composed of rigidly cemented amphinolasters. The choanosome contains scattered microscleres of three types: Large spirasters and amphiasters with thin axis and long, slender spines, some branched into secondary spines near the end (called streptasters by de Laubenfels, 1955a); tiny micro-spined spirasters with 1–2 bends (not mentioned by the original author), and developmental stages of amphinolasters. Spicule dimensions (range and means of 10 measurements, unless otherwise indicated): Tylostyles, straight with spherical head that is only slightly thicker than the shaft, and most with rounded point (length × maximum width, head width), 570–820 × 8–13, 10–15 μm (716.0 × 10.5, 13.5 μm), smaller sizes occur in the cortical zone but do not form a separate size class; amphinolasters, dumbbell-shaped and covered by low, broad-based spines (length × maximum diameter, shaft diameter), 58–70 × 25–38, 10–20 μm (63.7 × 31.2, 14.2 μm); immature amphinolasters with thin spines, 30–50 × 5–15, 1–4 μm (40.6 × 10.5, 2.8 μm); large amphiasters and spirasters with long slender spines, 24–38 × 22–25, 3–4 μm (30.8 × 24.0, 3.8 μm); and microspined spirasters (length × width, n=7), 6–14 × 2–3 μm (11.7 × 2.7 μm). Distribution: Tropical Pacific Ocean.

Remarks. Only one specimen of *Onotoa amphiastra* was ever found and the species was all but forgotten until R.W.M. Van Soest (pers. comm.) pointed out its description by de Laubenfels (1955a: 137) who stated that the holotype was sent to USNM. After

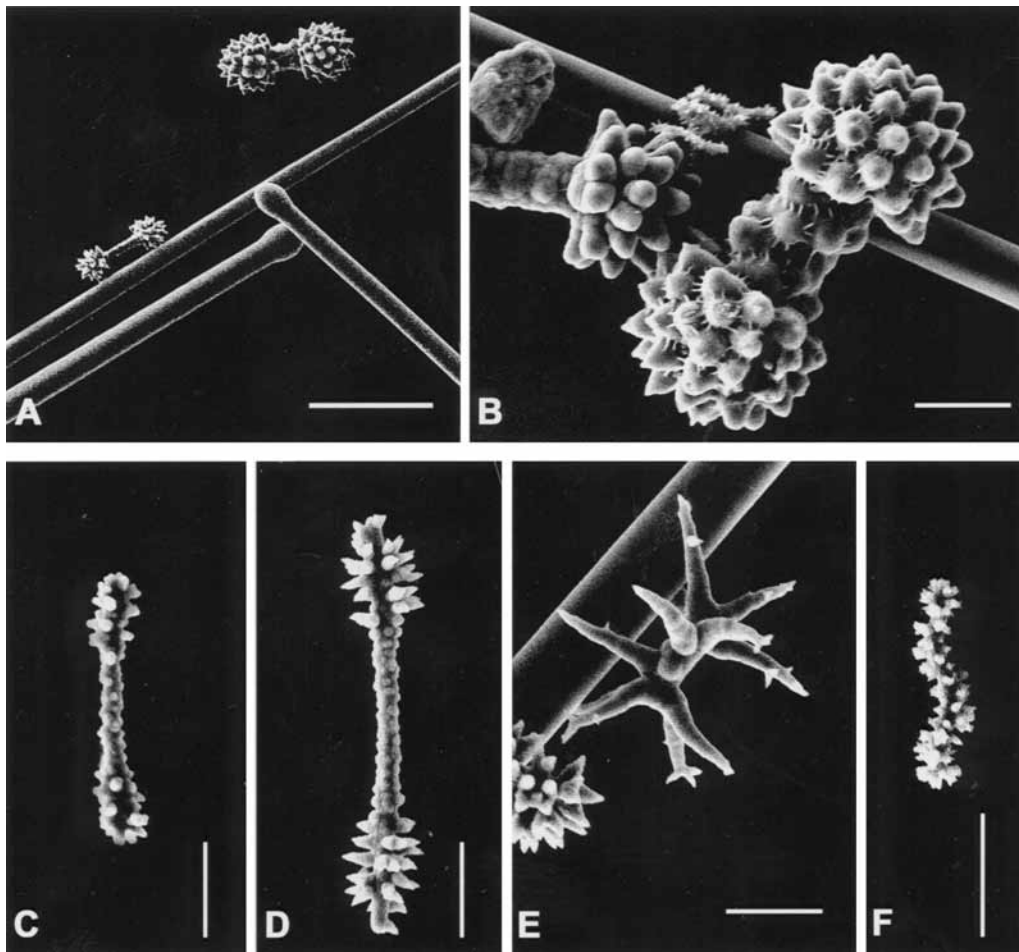


Fig. 2. *Onotoa* spicules, SEM images. A, C–F, *O. amphiastra* de Laubenfels.; B, *O. claudelevii* (Rützler & Hooper). A, tylostyle heads and amphinolasters (scale 50 μ m). B, amphinolasters and (adhering to tylostyle shaft) microspined spirasters. C–D, developing amphinolasters. E, large spiraster (streptaster). F, microspined spiraster (scales B–F, 10 μ m).

lengthy search, the specimen with de Laubenfels' original number was indeed found among unidentified Pacific sponges.

The early stages of amphinolasters of *Onotoa*, which are formed in the choanosome, are very similar to undeveloped *Placospongia* selenasters. Both start as spiny microrhabds, spines longer toward the distal parts, but the shafts of the former stay straight whereas those of the latter bend gradually until fusion of the two heads. Both genera have small accessory spirasters.

PLACOSPONGIA GRAY, 1867

Synonymy

Placospongia Gray, 1867b: 128. *Physcaphora* Hanitsch, 1895.

Type species

Placospongia melobesioides Gray, 1867b (by original designation).

Definition

Placospongiidae with selenasters as cortical spicules.

Diagnosis

Encrusting or lobate and branching sponges covered by smooth cortical plates separated by contractible grooves. Size from small crusts (average 25 cm², 2 mm thick) to erect branches (36 cm tall, 1.5 cm and more in diameter). Live color of known species reddish brown to almost black. Skeleton structure radiate, tylostyle bundles running from a basal crust or a central axis (branching specimens) of selenasters toward the cortex and supporting the margins of cortical plates. Megascleres are tylostyles of two size classes (the shorter ones in the ectosome), microscleres include selenasters of the cortex and base layer (or central axis) and choanosomal and ectosomal spirasters, spherasters, and spherules; developmental stages of selenasters occur throughout the choanosome.

Previous review

Vosmaer & Vernhout, 1902.

Description of type species

Placospongia melobesioides Gray, 1867b (Figs 3, 4).

Synonymy. *Placospongia melobesioides* Gray, 1867b: 128, figs 1–4.

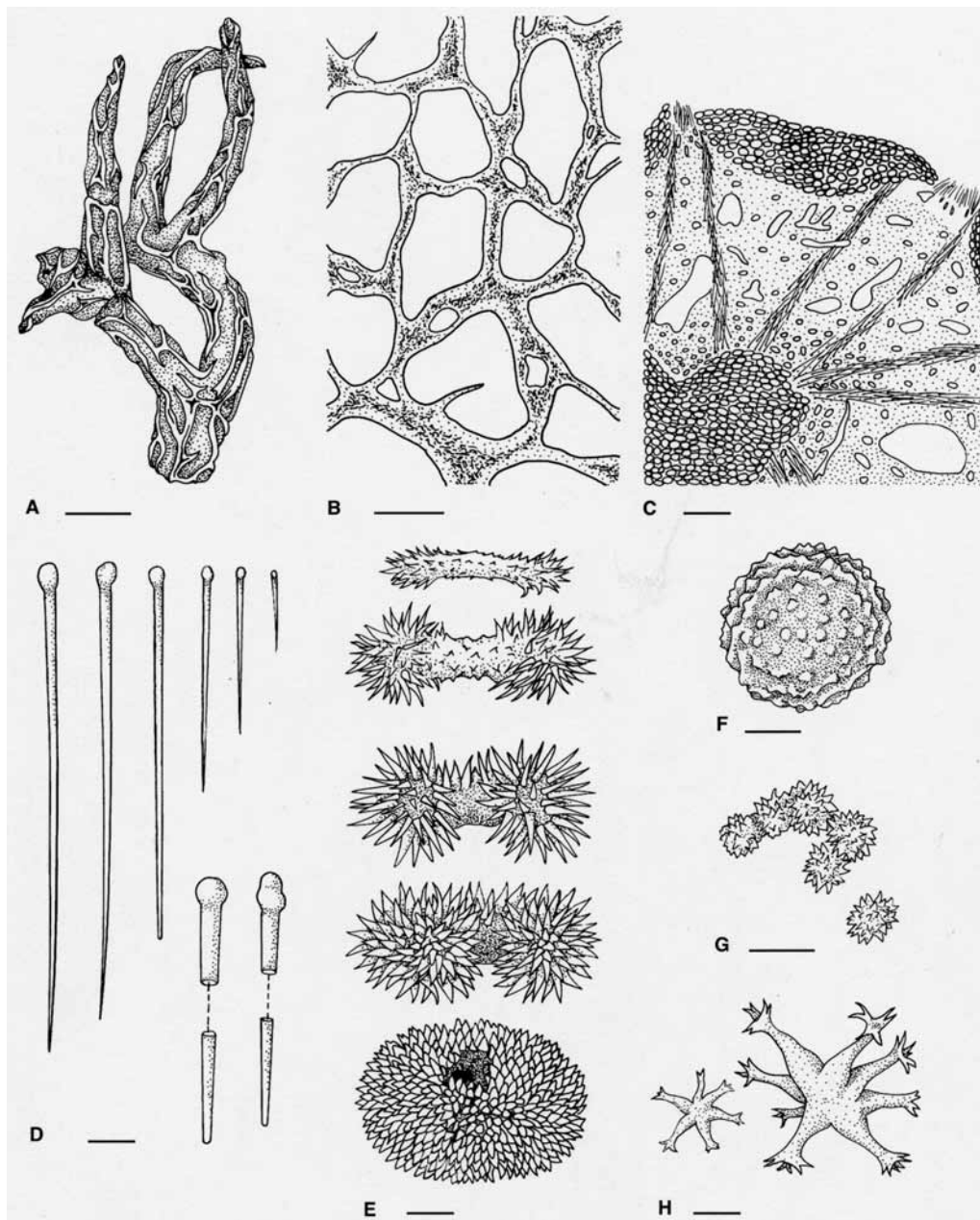


Fig. 3. A–G, *Placospongia melobesioides* Gray, holotype BMNH 52.4.1.14. H, *P. carinata* (Bowerbank) (B, C, H, after Vosmaer & Vernhout, 1902). A, habitus of fragment, USNM 39649, Gulf of Mexico, 76 m (scale 20 mm). B, cortical plates and grooves (scale 5 mm). C, cross-section of branch showing anatomy: selenasters forming central core and exterior cortex, and tylostyle tracts (scale 1 mm). D, tylostyles (scales 100 μm , 200 μm for magnified ends). E, selenasters and stages of development (scale 10 μm). F, spheraster (scale 5 μm). G, spheres (scale 2 μm). H, large spirasters and amphiasters characteristic of *P. carinata* (scale 10 μm).

Material examined. Holotype: BMNH 52.4.1.14 (2 dry fragments, 1 slide) – Borneo.

Description. Chalky white, stone-hard (dry) fragments (60 \times 22 mm, 54 \times 37 mm) of a branching specimen. Cortical plates make up the outermost layer. Tylostyle bundles radiate from an axis of packed selenasters to the cortical plates that are also made up by the characteristic microscleres. Spicules (dimensions are ranges and means of 10 measurements unless otherwise indicated): Tylostyles, straight with spherical head and most with rounded point (length \times maximum width, head width), (I) 720–1200 \times 13–15, 15–18 μm

(963.0 \times 14.1, 17.0 μm), (II) 350–560 \times 8–10, 9–13 μm (438.8 \times 9.1, 10.5 μm), smaller sizes occur in the cortical zone; selenasters, bean-shaped to oval, 38–48 \times 25–38 μm , 42.3 \times 30.1 μm ; immature selenasters, 25–33 \times 13–20 μm (28.4 \times 16.4 μm); spherasters (diameter, $n=5$), 14–16 μm (15.2 μm); and spherules (diameter, $n=5$), 1–3 μm (1.7 μm). Distribution: Tropical Atlantic and Indopacific.

Remarks. *Placospongia melobesioides* lacks spirasters (slender-spined streptasters as well as microspined rhabds) that are common in *P. carinata* (Bowerbank). According to Vosmaer &

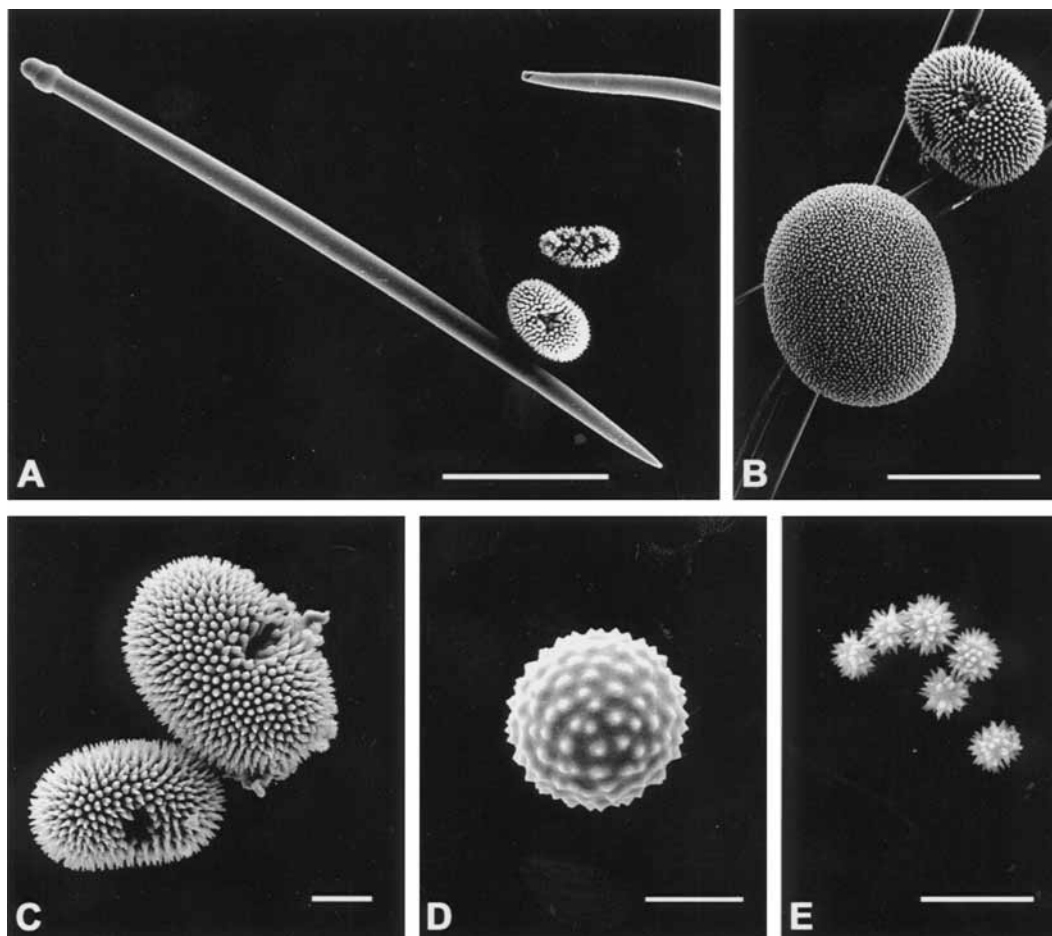


Fig. 4. *Placospongia melobesioides* Gray, SEM images of spicules, holotype BMNH 52.4.1.14. A, tylostyle and developing stages of selenasters (scale 50 μm). B–C, selenasters (scales: B, 50 μm ; C, 10 μm). D, spheraster (scale 10 μm). E, spheres (scale 5 μm).

Vernhout (1902: 9), only three of the six species of *Placospongia* described up to that year could be recognized as valid: the type species *Placospongia melobesioides* Gray, *P. carinata* (Bowerbank) (*Geodia carinata* Bowerbank, 1858: 308; including synonyms *P. intermedia* Sollas, 1888: 272 and *P. mixta* Thiele, 1900: 72), and *P. decorticans* (Hanitsch) (*Physcaphora decorticans* Hanitsch 1895:

205; including synonym *P. graeffei* Lendenfeld, 1897b: 48). Subsequently, one more species was described, *P. cristata* Boury-Esnault, 1973: 276, which was distinguished by the possession of small spherasters and the absence of spirasters, both characteristics of *P. melobesioides*; hence, it may be a junior synonym of the latter species.