

## Family Spirastrellidae Ridley & Dendy, 1886

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Spirastrellidae Ridley & Dendy (Demospongiae, Hadromerida) is reduced from its traditional definition by excluding massive sponges, such as *Sphaciospongia* and part of *Spirastrella sensu lato*, with rare and minute spirasters or amphisters which are now placed in the Family Clionaidae. The new definition applies to primarily encrusting sponges with prominent layers of relatively large spirasters, amphisters or diplasters at the surface and the base or throughout the entire body. In contrast to clionoids, tylostyles in spirastrellids are quantitatively unimportant and occur in bouquets or simple tracts perpendicular to the substrate, without forming dense networks or tangential layers. Two genera represent the family, *Diplastrella* and *Spirastrella*, with several species that are common in shaded tropical and subtropical shallow-water habitats including coral reefs.

**Keywords:** Porifera; Demospongiae; Hadromerida; Spirastrellidae; *Diplastrella*; *Spirastrella*.

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### DEFINITION, DIAGNOSIS, SCOPE

#### Synonymy

Spirastrellidae Ridley & Dendy, 1886: 490 (part). Choanitidae de Laubenfels, 1936a: 140.

#### Definition

Encrusting Hadromerida with few tylostyles in fascicular tracts and very abundant and fairly large streptasters forming cortical and basal crusts.

#### Diagnosis

Encrusting sponges with limestone-excavating capability in early stages but without adult endolithic habit. Exhalant canal system apparent at the surface (particularly obvious in live sponges, contracted in preserved specimens) as meandering, vein-like structures converging on oscula. Skeleton formed by relatively uncommon megascleres in ascending radial tracts and dense layers of microscleres in the ectosomal region and as base layer. Megascleres mainly tylostyles, tracts starting at the sponge base and ending in bouquet-like fashion (spicule points outward) in the ectosomal region or protruding beyond the sponge surface; some megascleres oriented at random in the choanosome. Microscleres composed of large and stout streptasters (spirasters, diplasters), very common throughout the sponge but forming extra-dense cortex-like layers in the ectosome and at the base (substrate attachment).

#### Scope

As a result of the present revision, four nominal genera are included of which two are recognized here as valid: *Diplastrella* and *Spirastrella*.

### History and biology

Based solely on the spicule combination of tylostyles and spirasters and ignoring other morphological characteristics, Ridley & Dendy (1886, 1887) in their 'Challenger' Expedition monograph lumped together incrusting and massive sponges under Spirastrellidae. This concept prevailed in the literature, particularly after Vosmaer (1911) reduced more than 30 species (including the genus type) under the name of the massive species *Spirastrella purpurea* (Lamarck) and despite Topsent's (1918) argument against such radical measure. Also de Laubenfels (1950a: 96) pointed out that although sponges such as *Spirastrella sensu stricto* and *Sphaciospongia* had the same spicule combination (tylostyles and spirasters), the former had incrusting instead of massive growth form and large and stout instead of delicate and small spirasters. A recent cladistical analysis of clionoids (Rosell & Uriz, 1997) confirmed this separation.

Members of Spirastrellidae are generally colorful (orange, red) and dominate many shaded habitats such as caves, overhangs, and the lower surfaces of rocks. They are prominent in tropical and subtropical shallow-water habitats including coral reefs.

### Taxonomic Remarks

The family name Choanitidae established by de Laubenfels (1936a: 140) was again rejected (de Laubenfels, 1955a: 140) because it was shown (Topsent, 1933: 27) that the type of the genus *Choanites* is a compound ascidian.

Massive species among the Spirastrellidae *sensu lato*, with an abundance of large megascleres, with rare, minute spirasters and derivatives, and special incurrent or excurrent features (pore sieves, papillae) are now assigned to the Clionaidae (*Cervicornia*, *Cliona*, *Poterion*, *Sphaciospongia*) and are further discussed in that chapter. The distinction between Spirastrellidae, Clionaidae, and Placospongiidae in this revision is further supported by 28S-rRNA genetic analysis (Chombard, 1998).

The genus *Diplastrella* (formerly in the Timeidae) is included among the Spirastrellidae because of its structure and robust

microscleres (diplasters) which, as has already been suggested by Rosell & Uriz (1997), are obviously derived from spirasters.

**KEY TO GENERA**

- (1) Microscleres composed primarily of spirasters ..... *Spirastrella*
- Microscleres composed primarily of diplasters ..... *Diplastrella*

**DIPLASTRELLA TOPSENT, 1918**

**Synonymy**

*Diplastrella* Topsent, 1918: 549.

**Type species**

*Tethya bistellata* Schmidt, 1862: 45 (by original designation).

**Definition**

Spirastrellidae with diplasters and spherasters as principal microscleres.

**Diagnosis**

Thin incrustations of typical spirastrellid structure, with erect tylostyles in bouquet-like arrangement and a basal layer of diplasters and spherasters, and an ectosomal crust of diplasters. Modification of these spicules include spirasters, but they occur in small numbers, relative to the other microscleres.

**Previous review**

Topsent (1918); for more illustrations refer to Rützler & Sarà (1962).

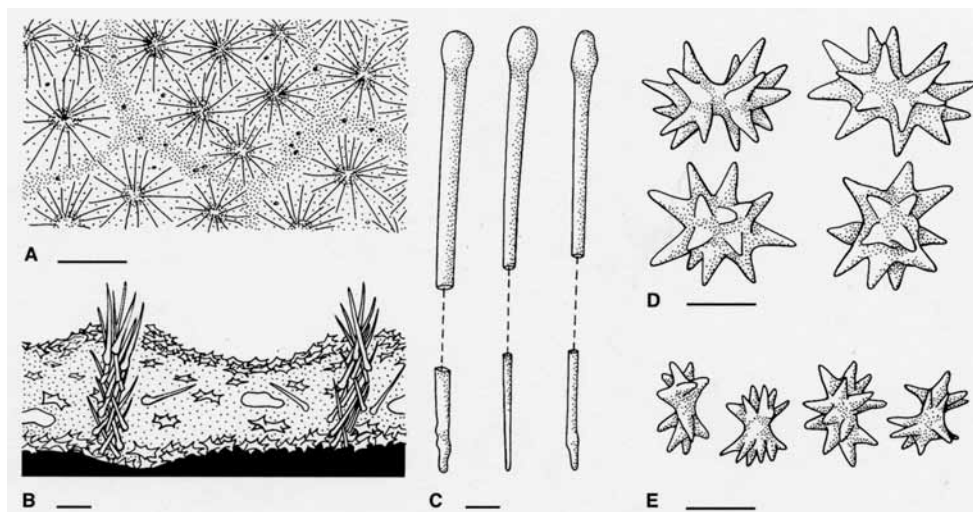
**Description of type species**

*Diplastrella bistellata* (Schmidt, 1862) (Figs 1–3).

**Synonymy.** *Tethya bistellata* Schmidt, 1862: 45, pl. VII, fig. 1 [pl. IV, fig. 1 as stated by Schmidt is incorrect]. *Suberites bistellatus*; Schmidt, 1864: 36. *Hymedesmia bistellata*; Topsent, 1900: 125, pl. III, figs 13 & 16. *Diplastrella bistellata*; Topsent, 1918: 549; Vosmaer, 1933: 416. Not *Spirastrella bistellata*; Lendenfeld, 1897a: 55, pl. VI, fig. 59, pl. VII, fig. 65, pl. IX, figs. 120–122; Vosmaer, 1911: 8, pl. 12, fig. 9; Vosmaer, 1933: 416, pl. 32, figs 12–14, pl. 41, fig. 11, pl. 54, figs 8–9 (= *Spirastrella cunctatrix* Schmidt, as was pointed out by Topsent 1918: 549 and verified by our study of Lendenfeld’s slide preparations deposited at the Naturhistorisches Museum Wien, Austria, catalog number 9099, and USNM, uncatalogued).

**Material examined.** Holotype: LMJG – not found. BMNH 1867.3.11.16A – slide labelled “*Suberites bistellatus* Schmidt” (see Desqueyroux-Faúndez & Stone, 1992), re-examined in May, 2001 (courtesy Ms Clare Valentine), was found to be another preparation of *Spirastrella cunctatrix*, thus making it necessary to establish a neotype. Neotype: USNM 2022309 (accession number) – Tremiti Islands, Adriatic, Italy, Grotta Bue Marino, 1.5 m depth, coll. G. Corriero, 30.v.2001 (courtesy of G. Corriero); collected from very near the type locality which is off the southern coast of the Adriatic island Lesina (now, Hvar, Croatia).

**Description.** The original author described the sponge as a red incrustation (which he considered a juvenile) with tylostyles, spirasters, and diplasters (Schmidt, 1862: 45; pl. VII, fig. 1, shows a tylostyle head portion and one of the characteristic diplasters). The neotype was reported to be pale yellow in life (G. Corriero pers. comm.). Schmidt may have confused the color with that of co-occurring *Spirastrella cunctatrix* because only yellowish, whitish pink, and whitish brown forms are known from underwater photographs of cave walls (for instance, in Harmelin *et al.*, 1987:



**Fig. 1.** *Diplastrella*, habitus and anatomy. A–B, after Rützler & Sarà (1962). C–E, *D. bistellata* Schmidt (neotype USNM acc. no. 2022309). A, detail of surface of live specimen of *D. ornata* Rützler & Sarà (scale 0.5 mm). B, cross-section of *D. ornata* illustrating skeleton structure (scale 200 µm). C, tylostyles (scale 10 µm). D, large diplasters (scale 10 µm). E, small diplasters/spirasters (scale 10 µm).

129; M. Panzini & R. Pronzato, pers. comm.). Surface appearance and anatomy of this species is similar to that of *Spirastrella* (see below). The neotype is a very thin (0.5 mm) crust covering an area of about 20×30 mm; collapsed subsurface canals are faintly visible. The color in alcohol is a pale drab. Tylostyles have circular

or oval head outlines and taper to a rounded (most common), stepped, or sharp point. They measure 450–630 (515)  $\mu\text{m}$  × 10–13 (4.7)  $\mu\text{m}$ , with 13–18 (15.2)  $\mu\text{m}$  heads. Diplasters fall into two size classes. The larger ones are stout and appear like large spirasters except that the spines originate from two closely spaced centers. Many of the smaller size are more distinctly amphiaströse, with a short but smooth shaft and distally divergent spines, but there are also spiraster-like modifications. Diplasters: (I) 25–45 × 22–42 (34.8 × 40.3)  $\mu\text{m}$ ; (II) 11–20 × 8–15 (13.6 × 11.3)  $\mu\text{m}$ . In other specimens described before, tylostyles were noted to have rounded points (approaching tylostrogyles) and a few of the larger diplaster were reported with rays split near the distal end (Sarà, 1961). Several authors confirmed the abundance of this characteristic species in the Mediterranean, particularly in shaded habitats, such as shallow caves and under rocks (Topsent, 1918; Sarà, 1961).

**Remarks.** Topsent (1918: 549) points out that a misplaced label at the Graz Museum has led to Lendenfeld's (1897a) and Vosmaer's (1911) misinterpretation of this species.

### *SPIRASTRELLA* SCHMIDT, 1868

#### Synonymy

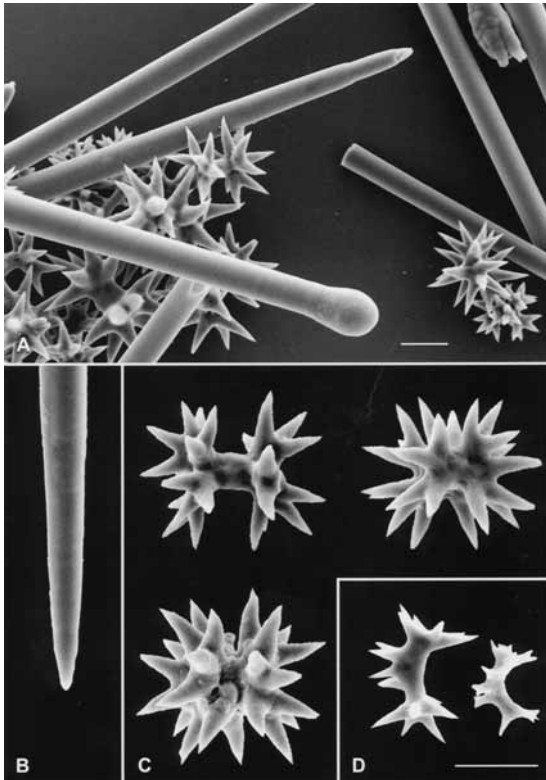
*Spirastrella* Schmidt, 1868: 17. *Chondrilla* de Laubenfels, 1936a (for *Chondrilla phyllodes* Schmidt, 1870). Taxonomic decision for synonymy: Wiedenmayer, 1977b: 162.

#### Type species

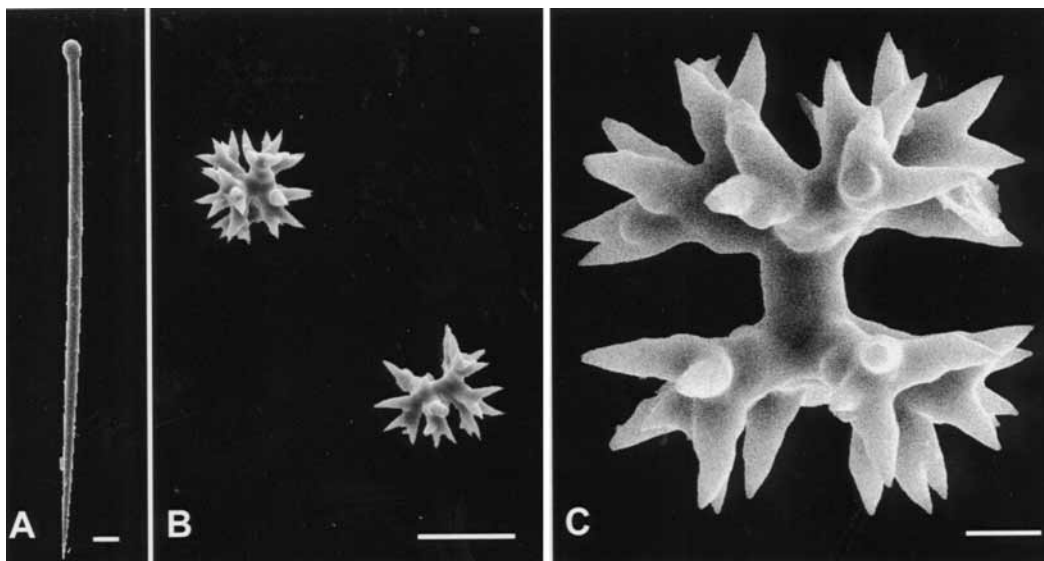
*Spirastrella cunctatrix* Schmidt, 1868: 17 (by monotypy).

#### Definition

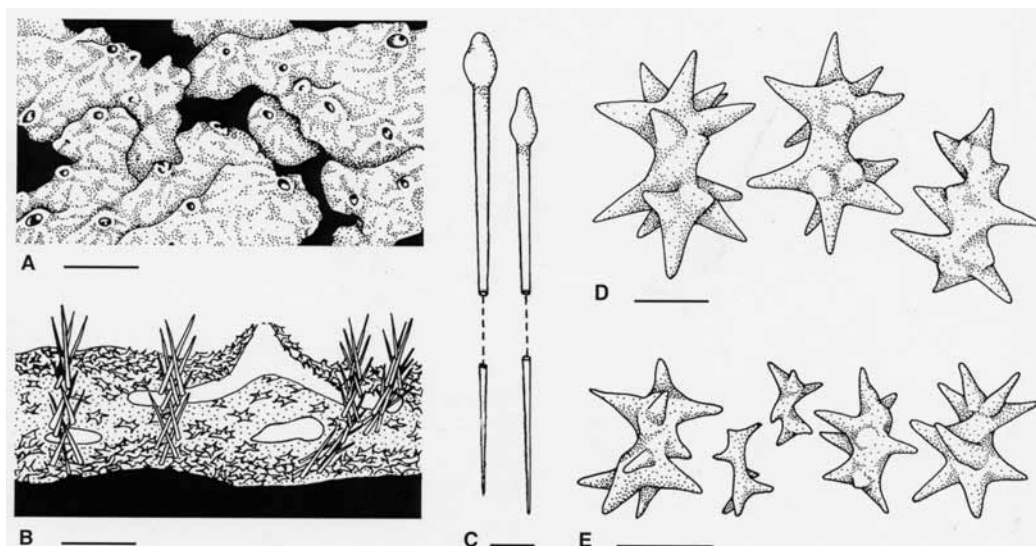
Spirastrellidae with spirasters as principal microscleres.



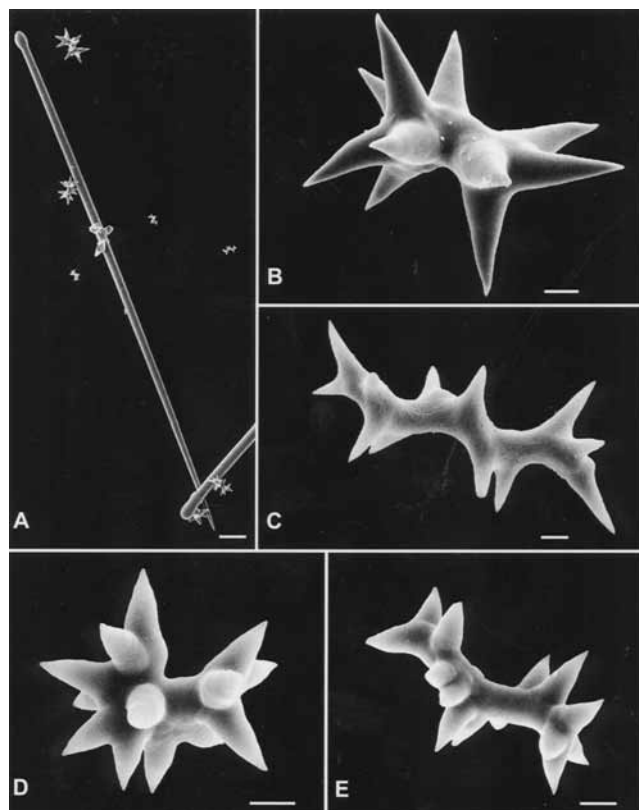
**Fig. 2.** *Diplastrella bistellata* Schmidt (neotype USNM 2022309), SEM images of spicules. A, tylostyles and diplasters. B, tylostyle point enlarged. C, large diplasters. D, small diplasters/spirasters (all scales 10  $\mu\text{m}$ ).



**Fig. 3.** *Diplastrella megastellata* Hechtel (paratype USNM 24503), SEM images of spicules to show extreme development of diplasters. A, tylostyle (scale 20  $\mu\text{m}$ ). B–C, diplasters (scales: B, 10  $\mu\text{m}$ ; C, 2  $\mu\text{m}$ ).



**Fig. 4.** *Spirastrella cunctatrix* Schmidt, habitus and anatomy (USNM 23944). A, habitus from an underwater photograph (scale 10 mm). B, cross section showing skeleton arrangement (scale 1 mm). C, tylostyles (scale 10  $\mu\text{m}$ ). D, large spirasters (scale 10  $\mu\text{m}$ ). E, small spirasters (scale 20  $\mu\text{m}$ ).



**Fig. 5.** *Spirastrella cunctatrix* Schmidt, SEM views of spicules (USNM 23944). A, tylostyle and spirasters (scale 20  $\mu\text{m}$ ). B, large spiraster (scale 5  $\mu\text{m}$ ). C–E, small spirasters (scales 2  $\mu\text{m}$ ).

### Diagnosis

Spirastrellidae with dense layers of spirasters in both ectosomal and basal choanosomal regions of the sponge. Spirasters are very common and of considerable size range; tylostyles comparatively small and rare.

### Previous review

Vosmaer (1911), Topsent (1918, 1938b).

### Description of type species

*Spirastrella cunctatrix* Schmidt, 1868 (Figs 4, 5).

**Synonymy.** *Spirastrella cunctatrix* Schmidt, 1868: 17, pl. 3 fig. 8. Not Wiedenmayer, 1977b: 162 (= *Spirastrella mollis* Verrill).

**Material examined.** Holotype (fragments): MNHN DT 735 (1 slide, labeled “type, Algérie”); BMNH 1868.3.2.4 (1 slide, labeled “Algier”, original balsam spicule mount by Schmidt) – Coast of Algeria. Other material. USNM 23944 – specimen photographed and collected in a shallow cave near Rovinj, Croatia (Rützler, 1965).

**Description.** Live specimens are dull pinkish-red crusts, 5–10 cm or more in diameter, 1–5 mm thick, depending on the state of contraction. They are soft and show vein-like, branching surface canals converging toward elevated oscula, as it is common for encrusting species, with incurrent pores dispersed in between. The ectosomal membranes that cover the canals collapse upon fixation, leaving a pattern of radiating grooves; preserved sponges are leathery tough, with rough surface texture, and about 1 mm thick. Topsent (1938b) describes the type specimen as a faintly pinkish (in alcohol) crust, 5  $\times$  8 cm, 1 mm thick. In cross section, bundles of a few tylostyles each extend from the base to the surface of the crust, spicule points directed outward. The smaller spirasters are condensed near the surface, the larger ones near the base, but there are many of both types strewn in between. Tylostyles have rounded to oval, pronounced heads from which they taper gradually to a sharp point; they measure 480  $\times$  8  $\mu\text{m}$  on average. Small spirasters vary 10–25  $\mu\text{m}$  in length, 5–23  $\mu\text{m}$  in width (including spines), large spirasters are 28–50  $\times$  23–35  $\mu\text{m}$ .

**Remarks.** Vosmaer (1911) considered this species a junior synonym of *Spirastrella purpurea* (Lamarck), and later (Vosmaer, 1933) synonymized it with *Diplastrella bistellata* (Schmidt). Topsent (1918) argued strongly and correctly against this unjustified lumping of distinctive species.