

Family Geodiidae Gray, 1867

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Geodiidae Gray (Demospongiae, Astrophorida) includes astrophorid sponges with sterrasters as the main cortical microsclere and various forms of triaenes among the megascleres. Other microscleres present are euasters and microrhabds. Sponges are generally massive or thickly encrusting and often develop into globular forms. The inhalant or exhalant orifices (or both) may be organized in a sieve. The skeletal arrangement is radiate at the periphery and confused in the inner region of the skeleton. These sponges are usually cream, gray or white in color inside, and gray, brown to black outside, often dependant on their exposure to light. They inhabit bathyal, soft bottoms and, less often, are found in caves and overhangs of the sublittoral zone. The family contains twelve nominal genera of which six are valid: *Erylus*, *Caminus*, *Pachymatisma*, *Geodia*, *Isops*, and *Sidonops*, with species distributed worldwide.

Keywords: Porifera; Demospongiae; Astrophorida; Geodiidae; *Erylus*; *Caminus*; *Geodia*; *Isops*; *Pachymatisma*; *Sidonops*.

DEFINITION, DIAGNOSIS, SCOPE

Synonymy

Geodiadae Gray, 1867a: 504. Geodinidae Schmidt, 1870: 68. Sterrastrosa Sollas, 1887, 1888: 209. Erylidae Lendenfeld, 1910a: 11, 1910b: 267.

Definition

Astrophorida with large oxeas and triaenes as megascleres. Microscleres are sterrasters, together with euasters, spherules or microrhabds.

Diagnosis

Thickly encrusting, massive to globular growth forms with a well-developed cortex. The cortex is made of two differentiated layers: the external layer ('ectochrote') is fleshy and collagenous ("collenchymatose") with one of the various specialized microscleres (euasters, spherules or microrhabds); the inner layer is filled with sterrasters. Euasters or microrhabds may be also present in the choanosome. Megascleres are regular, long shafted triaenes, and oxeas.

Scope

This family has twelve nominal genera, six of which are recognized here as valid: *Erylus*, *Caminus*, *Pachymatisma*, *Geodia*, *Isops*, and *Sidonops*.

History and Biology

The family Geodiidae was named Sterrastrosa by Sollas (1888), referring to the consistent presence of sterrasters. Sollas (1888), followed by Topsent (1894d), divided genera into two sub-families: Erylina and Geodina, and Lendenfeld (1910a), followed by Dendy (1916c) and Wilson (1925), elevated these to family status (Erylidae and Geodiidae) based on alleged fundamental differences between *Erylus* and *Geodia* in their microsclere spiculation. Dendy's diagnosis of Geodiidae differs from that of Erylidae in

recognizing the presence of true sterrasters in the former and flat sterrasters (aspidasters) in the latter. However, the somal microscleres in both families can be either a microrhabd or an aster; protriaenes and anatriaenes may be absent from some genera; and more-or-less subglobular sterrasters are present in genera allocated to both subfamilies. Thus, there is no consistent character to divide genera bearing sterrasters into two different families, and this classification is rejected here. The term 'somal' microsclere is used here, although an antiquated terminology, because it does not imply that these microscleres are restricted to any particular region of the sponge, where the terms 'ectosomal' or 'choanosomal' microscleres presume their strict localization.

However, recent phylogenetic molecular studies (Chombard *et al.*, 1998; Chombard, 1998) have suggested the parphyly of the family Geodiidae, and that the concept of Erylidae-Geodidae families have to be reevaluated in a general cladistic revision.

Several genera assigned to Geodiidae have a similar spicule complement and consequently earlier authors considered other characters to differentiate higher taxa, including the aquiferous

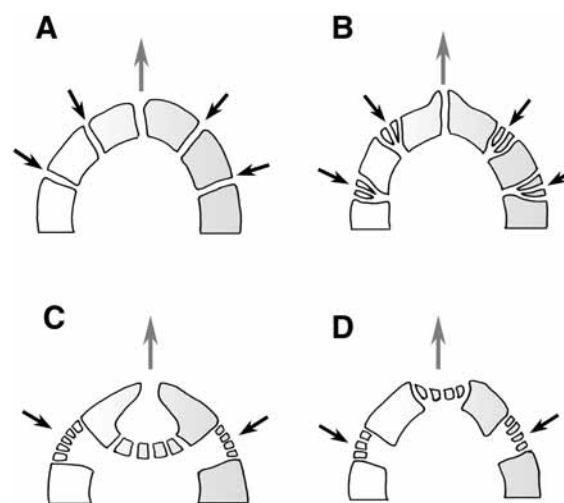


Fig. 1. Schematic representation of the arrangement of incurrent and excurrent canals in the different genera of Geodiidae. A, *Erylus* and *Isops*. B, *Caminus*, *Pachymatisma*, and *Sidonops*. C–D, *Geodia* (*Geodia*) and *Geodia* (*Cydonium*), respectively.

system, and particularly the structure of the inhalant and exhalant orifices and canals as a diagnostic character, which combined with skeleton features, allowed them to define genera. These criteria were not followed by some contemporary authors, such as Hajdu *et al.* (1992) and Hooper & Wiedenmayer (1994), who considered that spicules were more relevant characters indicative of phylogenetic affinities and regarded that differences in aquiferous system structures were simple adaptations to living in particular habitats. This opinion is rejected here because there are some morphological characters, particularly several features of the cortex, that corroborate differences in aquiferous systems between these genera. It is difficult to contemplate that these complex structures are simply ecological adaptations to survive in certain environmental conditions, and not genetically determined. However, as no assessment of the monophyletic status of these genera has yet been attempted

by means of a formal cladistic analysis, it is nevertheless preferable to maintain them as separate genera until other types of characters (e.g., genetic sequences) become available to perform a reliable phylogenetic reconstructions. The types of inhalant and exhalant structures found in members of this family are depicted in Fig. 1.

Most species of Geodiidae have a bathyal distribution, living predominantly on soft bottoms, but some representatives inhabit dark habitats in the littoral and shallow sublittoral zones, such as in caves, crevices, and overhangs.

Previous Reviews

Sollas, 1888; Topsent, 1894d; Lendenfeld, 1903, 1907, 1910a, 1910b; Dendy, 1905, 1916c; Wilson, 1925; de Laubenfels, 1936a; Hooper & Wiedenmayer, 1994; Chombard *et al.*, 1998.

KEY TO GENERA

- | | |
|---|---------------------|
| (1) Both inhalant and exhalant orifices are cribriporal | <i>Geodia</i> |
| Inhalant, exhalant or both orifices are uniporal | 2 |
| (2) Both inhalant and exhalant orifices are uniporal | 3 |
| Inhalant orifices cribriporal, exhalant uniporal | 4 |
| (3) Somal microscleres are euasters of different types | <i>Isops</i> |
| Microrhabds among the somal microscleres | <i>Erylus</i> |
| (4) Microstrongyles among the somal microscleres | <i>Pachymatisma</i> |
| The somal microsclere is an aster or aster-derived form | 5 |
| (5) The somal microsclere is an euaster | <i>Sidonops</i> |
| The somal microsclere is a spherule | <i>Caminus</i> |

ERYLUS GRAY, 1867

Synonymy

Erylus Gray, 1867a: 549; *Stelletta* (in part) Schmidt 1862: 46; *Scutastra* Ferrer-Hernández, 1912: 582.

Type species

Stelletta mammillaris Schmidt, 1862 (by monotypy).

Definition

Geodiidae with short-shafted triaenes (ortho- or plagiotriaenes); sterrasters usually more-or-less flattened (aspidasters). The somal microsclere is a centrotylote microrhabd. Uniporal, inhalant and exhalant orifices.

Diagnosis

Thickly encrusting to massive globular sponges with simple (uniporal) afferent and efferent orifices. Megascleres are triaenes of different types according to different species (plagiotriaenes, orthotriaenes, etc.) and oxeas. Microscleres are microrhabds (ectosomal microscleres) and different types of euasters (in the choanosome).

Previous reviews

Topsent, 1984; Lendenfeld, 1903, 1910b; Dendy, 1916c; Wilson, 1925; Mothes *et al.*, 1999; Adams & Hooper, 2001.

Description of type species

Erylus mammillaris (Schmidt, 1862) (Fig. 2).

Synonymy. *Stelletta mammillaris* Schmidt, 1862: 46. *Erylus mammillaris*; Gray, 1867a: 549.

Material examined. Holotype: BMNH 1867.3.11.32 (slide), LBIM DT2208 (61) (slide) – Adriatic. Comparative material. Specimens of *E. euastrum* (Schmidt, 1868): MNHN CP95-107, CEAB.POR.BIOL Ma1(3,6); CEAB.POR.BIOL Ca43. *Scutastra cantabrica* Ferrer-Hernández, 1912: MNVN (Madrid) holotype and specimen no. 54).

Description. Sponge massive, ovoid or thickly encrusting with rounded lobes, several cm in size, brownish in color in alcohol. Cortex about 500 μm thick. Surface perforated by multiple uniporal orifices; a unique oscule, 2 mm in diameter at the top of each lobe. Megascleres: oxeas curved or sinuous, 750–1500 \times 18–32 μm ; dichotriaenes with rhabdome conical, straight, 532–716 \times 25–44 μm in size, ending in a sharp point; protoclads 90 \times 32–35 μm ; deutero-clads 60–90 μm long. Microscleres: sterrasters, flattened, ellipsoidal or more-or-less elongated, 62–106 \times 29–52 μm in size, with clearly differentiated actines, rough at the end; choanosomal oxyasters, 14–28 μm in diameter, with actines conical, pointed and rough at the end. Somal microrhabds, extraordinarily abundant, 13–24 \times 2–4 μm in size, cylindrical, very rough, occasionally centrotylote. Skeletal arrangement: oxeas slightly radiate at the periphery, confused towards the interior; the triaenes have their cladome below the cortex with the rhabdome directed inwards; cortical layer of sterrasters covered by a crust of somal microrhabds; rough microrhabds and oxyasters throughout the choanosome. Distribution. Adriatic, Mediterranean (Algiers coasts), North Atlantic (Azores).

Remarks. Certain differences in spicule sizes of specimens from the Adriatic and Atlantic have been reported: the dichotriaenes are stronger and the oxyasters are weaker in Atlantic specimens (Topsent, 1928c) than in those from the Adriatic (Sollas, 1888).

Distribution. Mediterranean, Atlantic and Pacific Oceans.

CAMINUS SCHMIDT, 1862

Synonymy

Caminus Schmidt, 1862: 48. *Geodia* (in part) Sollas, 1888: 241.

Type species

Caminus vulcani Schmidt, 1862 (by monotypy).

Definition

Geodiidae with globular sterrasters. The somal microscelere is a spherule (spheraster with reduced actines). Cribriporal inhalant orifices and simple atrial oscules.

Diagnosis

Hemispherical to lobate sponges with a single atrial osculum at the top of each lobe, and cribriporal inhalant ostia. The megascleres are oxeas, slightly curved, with blunt points, often transformed into strongyles, and orthotriaenes. Sterrasters subspherical. The somal microscelere is a spherule. The choanosomal spicule is an oxyaster.

Previous reviews

Sollas, 1888; Topsent, 1894d.

Description of type species

Caminus vulcani Schmidt, 1862 (Fig. 3).

Material examined. Holotype: missing – Adriatic Sea, Sebenico. Neotype (here designated): BMNH 1867.7.26.48 – dry specimen from the type locality, Sebenico. CEAB.POR.BIO.008a, CEAB.POR.BIO.008b, and CEAB.POR.ALB.011b – Mediterranean.

Description. Globular sponge with a single atrial oscule at the top. Surface even, perforated by a network of minuscule orifices (cribriporal ostia). Cortex hard, 1.5–2 mm thick (thicker closer to the sponge base). Megascleres: Strongyles straight or slightly curved, $850\text{--}880 \times 15\text{--}17 \mu\text{m}$; orthotriaenes with rhabdome straight, $480\text{--}572 \times 15\text{--}16.5 \mu\text{m}$, and cladome $320\text{--}360 \mu\text{m}$ in chord length, with long and straight clads. Microscleres: sterrasters, $100\text{--}115 \times 87\text{--}90 \mu\text{m}$ in diameter, subspherical, depressed, with short actines; oxyasters with few, conical actines ($35\text{--}42 \mu\text{m}$ in diameter); spherules, $3\text{--}4 \mu\text{m}$ in diameter, without conspicuous actines or with actines barely differentiated. Skeletal arrangement: radiate at the periphery, confused towards the interior; the triaenes have their cladome lying in the cortex or just below it, with the rhabdome directed inwards; cortical layer of sterrasters covered by a subectosomal crust of spherules; spherules and oxyasters dispersed throughout the choanosome. Distribution. Adriatic, western Mediterranean, 15–40 m depth.

Remarks. As the holotype of this species is missing, we designate here the specimen BMNH 1867.7.26.48 from the type locality (Sebenico) as the neotype.

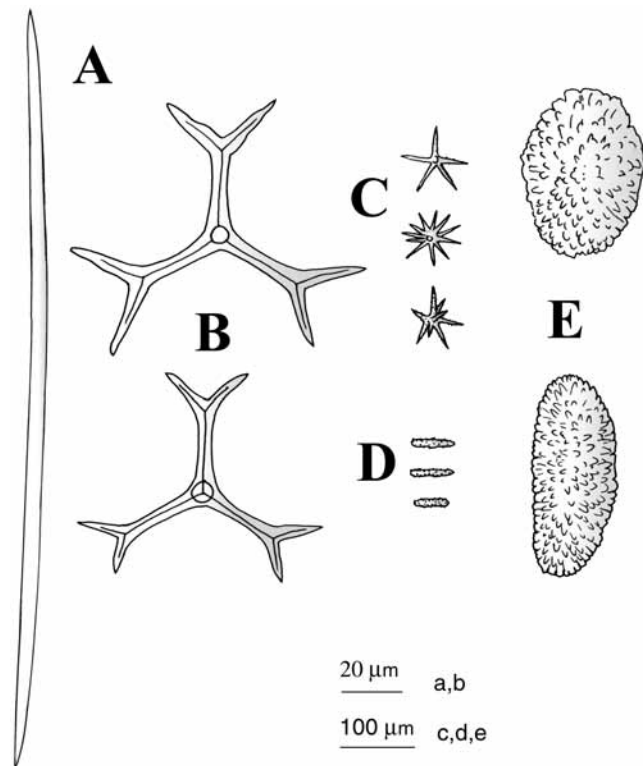


Fig. 2. *Erylus mammillaris* (Schmidt). Spicules from the holotype (BMNH 1867.3.11.32). A, oxea. B, dichotriaenes. C, oxyasters. D, spiny microrhabds. E, flattened sterrasters (aspidasters).

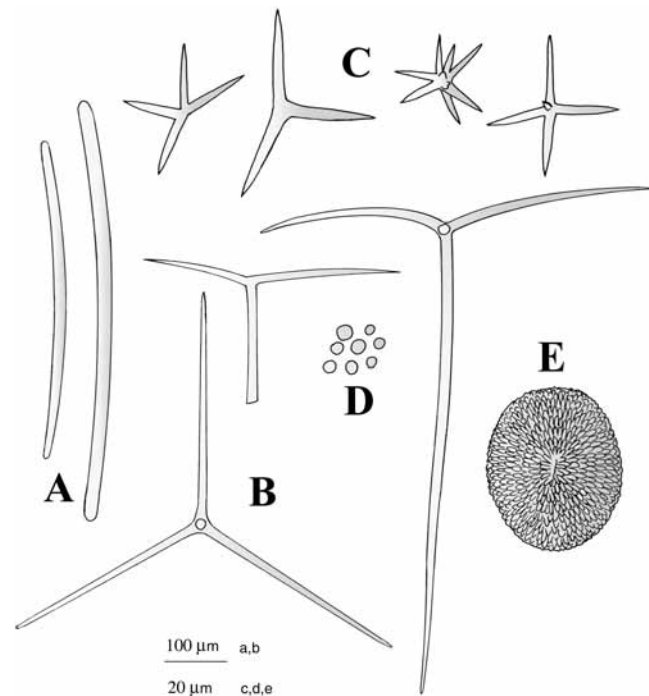


Fig. 3. *Caminus vulcani* Schmidt. Specimen from the Blanes littoral (Mediterranean). A, strongyles. B, orthotriaenes. C, oxyasters. D, spherules. E, sterraster.

Distribution

Atlantic Ocean and Mediterranean.

PACHYMATISMA BOWERBANK, 1842**Synonymy**

Pachymatisma Bowerbank in Johnston, 1842: 244.

Type species

Halichondria johnstoni Bowerbank, 1842 (by subsequent designation).

Definition

Geodiidae with subspherical sterrasters. The somal microsclere is a microrhabd. Cribriporal inhalant orifices and simple oscules.

Diagnosis

Thickly encrusting or irregularly massive growth forms. Surface even. Oscules sparse or arranged in clusters or rows. Cortex conspicuous. Sterrasters located throughout the cortex. Inhalant orifices flow into single inhalant canals, which cross the cortex, and end in subcortical ostia. Microstrongyles (somal microscleres) located at the external part of the cortex and along the walls of canals. Oxyasters and microrhabds sparse within the choanosome.

Previous reviews

Sollas, 1888; Topsent, 1894d; Lendenfeld, 1903.

Description of type species

Pachymatisma johnstoni (Bowerbank, 1842) (Figs 4 and 5).

Synonymy. *Halichondria johnstoni* Bowerbank, 1842 (in Johnston, 1842: 198); *Pachymatisma johnstoni*; Bowerbank, in Johnston, 1842: 244; *Pachymatisma johnstoni*; Bowerbank, 1866: 4, 51. *Pachymatisma normani* Sollas, 1888: 243. *Caminus osculosus* Grube, 1872 (see Koehler, 1986: 53).

Material examined. ? Holotype: BMNH BK 839, No. R2.3.7.9 (177 h) (slides) – dry specimens from the type locality, North Atlantic, Ireland.

Description. Massive sponge, with rounded borders, up to 15 cm thick. Surface smooth, bright, extensively perforated by cribriporal inhalant orifices. Oscula simple, 2–3 mm in diameter, surrounded by a whitish ring, arranged in clusters. Color bluish gray, violet, brown pinkish or reddish in the ectosome, whitish in the choanosome. Cortex up to 1 mm thick. Megascleres:

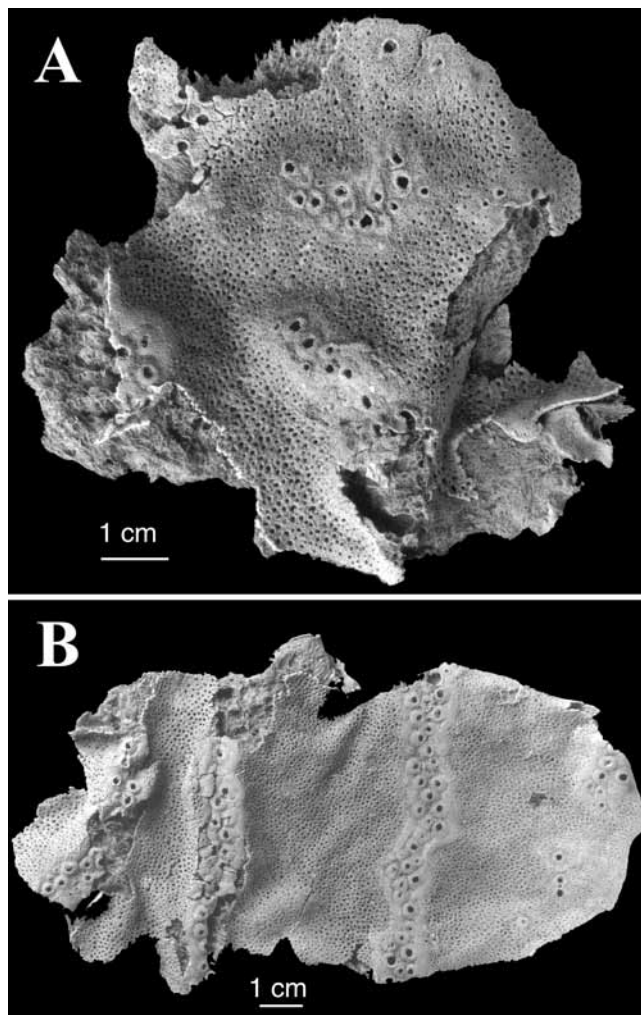


Fig. 4. *Pachymatisma johnstoni* (Bowerbank): dry specimens (BMNH BK 839) showing two different arrangements of oscula.

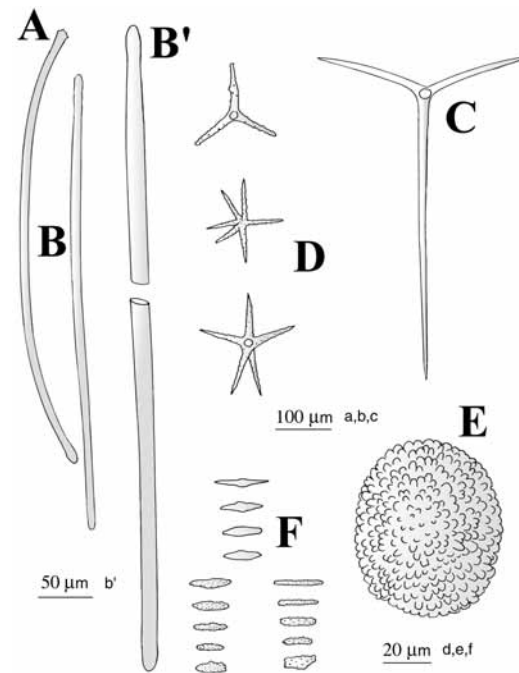


Fig. 5. *Pachymatisma johnstoni* (Bowerbank). Spicules from specimen BMNH R1.3.7.9 (177 h). A, B, B', strongyles. C, orthotriaene. D, rough oxyasters. E, sterraster. F, microrhabds.

strongyles, straight or irregularly curved, $600\text{--}1100 \times 13\text{--}20 \mu\text{m}$; orthotriaenes with a straight rhabdome $440\text{--}700 \times 13\text{--}26 \mu\text{m}$ in size, and clades straight or slightly curved, up to $300 \mu\text{m}$ long. Microscleres: sterrasters ellipsoid in shape, $90\text{--}120 \times 71\text{--}93 \mu\text{m}$; oxyasters $22\text{--}63 \mu\text{m}$ in diameter; microrhabds, $18\text{--}32 \times 2.7\text{--}4.5 \mu\text{m}$ long. Skeletal arrangement: strongyles, radiately arranged at the periphery, confused towards the interior; the triaenes have their cladome in the cortex with the rhabdome directed inwards; cortical layer of sterrasters covered by a subectosomal crust of microrhabds; microrhabds and oxyasters dispersed within the choanosome. Distribution. North Atlantic, Ireland, Norway, England, coasts of France, Portugal, and Spain, intertidal and subtidal.

Remarks. This genus has a spicule complement similar to that of *Caminus*, the main difference being the presence of an ectosomal layer of spiny microrhabds in *Pachymatisma* instead of spherules found in *Caminus*. The cortex also is notably thinner in *Pachymatisma*.

Distribution

Atlantic and Pacific Oceans.

GEODIA LAMARCK, 1815

Synonymy

Cydonium Fleming, 1828: 516. *Pyxitis* Schmidt, 1870: 70. *Geodinella* Lendenfeld, 1903: 117; 1910a: 205. ? *Stellogedia* Czerniavsky, 1880 [1879]: 115 [280]. *Geodistrongyla* Hoshino, 1981: 252.

Type species

Geodia gibberosa Lamarck, 1815 (by monotypy).

Definition

Geodiidae with large oxeas and regular triaenes arranged radially at or near the surface. Globular sterrasters and euasters as microscleres. Inhalant and exhalant conducts are cribriporal.

Diagnosis

Thickly encrusting, massive, or globular sponges. Surface irregularly hispid. Cortex conspicuous, formed by a crust of sterrasters with a layer of euasters in the outer zone. Cladome of the triaenes located at the cortex. Megascleres (oxeas and triaenes) radially arranged at the peripheral zone of the sponge, oxeas more disorganized in arrangement in the interior. Inhalant and exhalant orifices arranged in clusters under a sieve of the cortex (cribriporal).

Previous reviews

Sollas, 1888; Topsent, 1894d, 1918, 1931; Wilson, 1925; Lendenfeld, 1903, 1910a; Bergquist, 1968; Wiedenmayer, 1977b.

Description of type species

Geodia gibberosa Lamarck, 1815 (Fig. 6).

Synonymy. *Geodia gibberosa* Lamarck, 1815: 333; Topsent, 1918: 611; 1931: 3; Hechtel, 1965: 68; Wiedenmayer, 1977b: 178; Van Soest & Stentoft, 1988: 12; *Pyxitis gibberosa*; Schmidt, 1870: 70.

Material examined. Holotype: MNHN (not examined) – tropical Atlantic, Guiana. Other material. *Pyxitis gibberosa* Schmidt: BMNH 1870.5.3.167 – dry fragment. Comparative material. CEAB.POR.BIOL.146 ter, and 212 – specimens of *Geodia cydonium* Jameson. MNHN CP62-11b, CP63-E5, and CP92-88 – specimens of *Geodia barretti* Bowerbank. MMNH CP63-E2 and CP95.110 – specimens of *G. nodastrella* Carter.

Description. Massive, globular lobate sponge, several cm in diameter, with a wide zone where oscula are located. Color whitish outside in dark habitats, dark brown in zones exposed to light, cream inside, both in life and in alcohol. Surface smooth, with several sieve areas bearing ostia $50\text{--}100 \mu\text{m}$ in diameter. Cortex $0.5\text{--}1 \text{ mm}$ thick. Oscula $0.3\text{--}1.2 \text{ mm}$ in diameter, clustered in circular or ovoid, well-delimited areas, $1\text{--}8 \text{ cm}$ wide. Megascleres: oxeas straight or slightly curved, $780\text{--}1900 \times 20\text{--}40 \mu\text{m}$; cortical, fusiform oxeas, $125\text{--}250 \times 2\text{--}4 \mu\text{m}$ in size; orthotriaenes derived from plagiortriaenes (or vice-versa), $420\text{--}900 \times 15\text{--}22 \mu\text{m}$ in size, with clads of $192\text{--}235 \times 13\text{--}16 \mu\text{m}$. Sterrasters spherical, $40\text{--}100 \mu\text{m}$ in diameter; somal spherasters with a large centrum and reduced strongylote rays, $4\text{--}10 \mu\text{m}$ in diameter; choanosomal oxyasters, $10\text{--}30 \mu\text{m}$ in diameter, with rough, conical actines, variable in number, and a centrum up to $5 \mu\text{m}$ in diameter. Skeletal arrangement: radiate at the periphery, confused towards the interior; the triaenes have their cladome in the cortex with the rhabdome directed inwards; cortical layer of sterrasters covered by a subectosomal crust of somal spherasters (the cortex at the pore sieves is devoid of sterrasters); spherasters and oxyasters dispersed within the choanosome. Distribution. Tropical W coast of Africa,

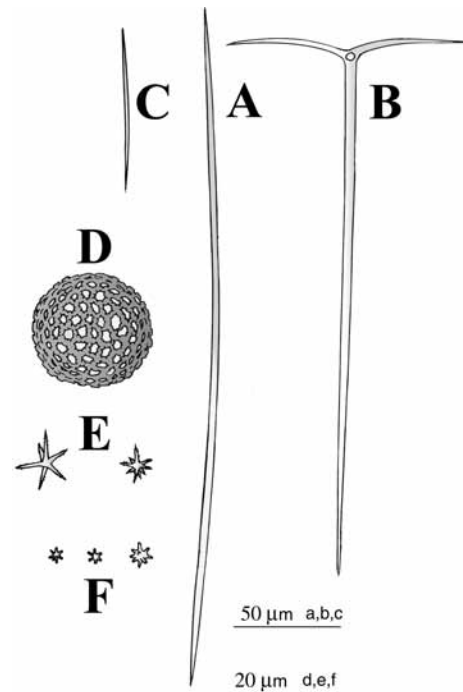


Fig. 6. *Geodia gibberosa* Lamarck, specimen BMNH 1870.5.3.167. A, oxea. B, orthotriaene. C, cortical oxea. D, sterraster. E, choanosomal oxyasters. F, somal spherochiasters.

Florida, Cuba, Antilles, Bermudas, Brazil, St. Thom , common in shallow waters.

Remarks. The genus *Geodia* has been traditionally distinguished from *Cydonium* (type species *C. muelleri* Fleming) by the absence of an exhalant sieve. However, the type species of *Geodia* (*G. gibberosa*) also has a typical exhalant sieve, negating this alleged difference. Furthermore, closer examination of some species of *Geodia* such as *G. barretti* showed that the exhalant cavity corresponds to an invagination of the sponge, which inside contains a cribriporal structure (Boury-Esnault *et al.*, 1994b). Consequently, both genera are clearly synonymous. *Geodistrongyla* Hoshino (type species *G. strongyla* Hoshino, 1981) is also clearly a *Geodia* with stronglyloid ends of actines, and is transferred into synonymy here.

Distribution

Cosmopolitan.

ISOPS SOLLAS, 1880

Synonymy

Isops Sollas, 1880: 396. *Synops* Vosmaer, 1882a: 20. Not *Synops sensu* Sollas, 1886a: 198, 1888: 227, 265. *Caminella* Lendenfeld, 1894: 150.

Type species

Isops phlegraei Sollas, 1880 (by monotypy).

Definition

Geodiidae with uniporal inhalant and exhalant orifices. Sterrasters are globular. The somal microsclere is a euaster.

Diagnosis

Globular sponges with oscules and ostia consisting of simple apertures (uniporal). Cortex relatively thin. Megascleres are oxeas and triaenes with a long rhabdome. Sterrasters subspherical. Somal microscleres are euasters.

Previous reviews

Sollas, 1888; Topsent, 1894d; Lendenfeld, 1903, 1910a.

Description of type species

Isops phlegraei Sollas, 1880 (Fig. 7).

Synonymy. *Isops phlegraei* Sollas, 1880: 396.

Material examined. Holotype: not seen – North Atlantic, Norway, Kors Fjord, 329 m depth. Other material. BMNH 1910.1.1.913 – Norman Collection. Comparative material. MNHN CP63-E1 and CP95-E17 – specimens of *I. pachydermata* Sollas. MNHN CP63-185 – specimen of *I. intuta* Topsent.

Description. Small, subspherical sponge, 2.5 cm in diameter. Brown color in alcohol. Surface hispid due to protruding megascleres. Oscula and ostia simple (uniporal). Cortex about 600 μ m thick. Long oxeas, up to 6000 \times 60 μ m in size.

Plagiotriaenes with rhabdome up to 4000 \times 40 μ m, and clads 500–600 μ m long. Protriaenes with rhabdome up to 7500 \times 72 μ m, and anatriaenes of very different sizes, with a straight rhabdome up to 2550 \times 13–20 μ m and clads of 62–146 \times 4–18 μ m. Sterrasters, subspherical, 90–111 \times 88–110 μ m in diameter with the actines spiny at their point. Spherasters (somal microscleres) with a marked centrum and conical, pointed actines, in two size categories of 5–7 μ m and 11–20 μ m in diameter, respectively; choanosomal oxyasters (also called spherasters by Sollas) with a small centrum, 20–70 μ m in diameter. Skeletal arrangement: layer of sterasters in the cortex under a subectosomal crust of spherasters. Spherasters are also concentrated along the canal walls; chiasters are dispersed within the choanosome; triaenes extend their cladome within the inner layer of the cortex directing their rhabdome inwards; oxeas radiately arranged at the sponge periphery but more confusedly arranged in the interior.

Remarks. Sollas (1888) put into synonymy with *I. phlegraei* two species previously described by Vosmaer (1882a) as *Isops pallida* and *I. sphaeroides*. Both species, however, seem to be characterized by the presence of dichotriaenes and orthotriaenes (instead of protriaenes and plagiotriaenes in *I. phlegraei*), and by oxyasters (instead of the spherasters). Thus, I agree with Lendenfeld (1903) that these two species are not synonyms of *I. phlegraei*.

Distribution

North Atlantic, Indian and Pacific Oceans, and Mediterranean and Red Sea.

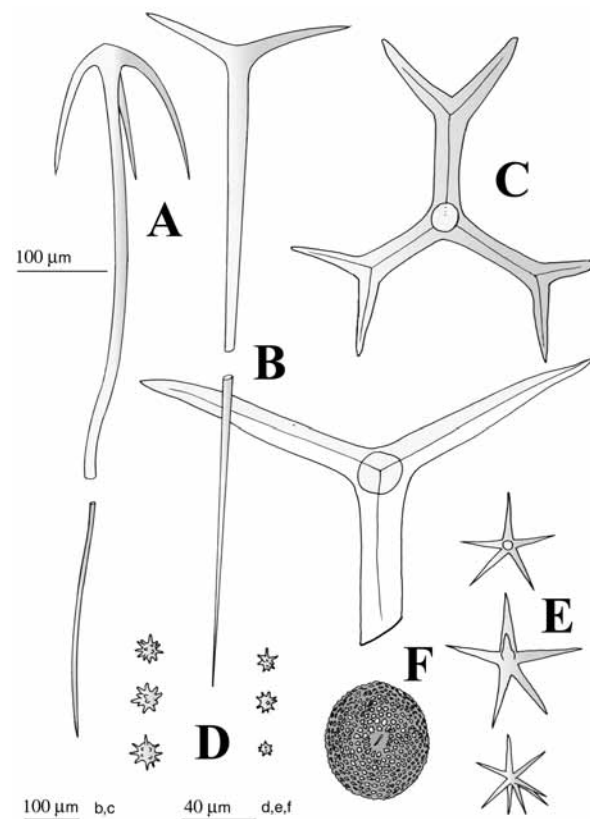


Fig. 7. *Isops phlegraei* Sollas, specimen BMNH 1910.1.1.913, Norman Collection. A, anatriaene. B, protriaene and plagiotriaene. C, dichotriaene. D, somal spherasters. E, choanosomal oxyasters. F, steraster.

SIDONOPS SOLLAS, 1889**Synonymy**

Synops Vosmaer, *sensu* Sollas, 1886a: 198, 1888: 227, 265 (in part). Not *Synops* Vosmaer, 1882a: 20. *Sidonops* Sollas, 1889: 276.

Type species

Synops neptuni Sollas, 1886a (by original designation).

Definition

Geodiidae with triaenes arranged radially at the sponge periphery. Somal microscleres are euasters. Inhalant orifices are cribriporal; exhalant ones are uniporal.

Previous reviews

Lendenfeld, 1903, 1910a; Wilson, 1925.

Description of type species

Sidonops neptuni (Sollas, 1886a) (Fig. 8).

Synonymy. *Synops neptuni* Sollas, 1886a: 198. *Sidonops neptuni*; Sollas, 1889: 276.

Material examined. Holotype: not seen – tropical Atlantic (Pernambuco), 58 m depth, mud. Other material. BMNH 1894.11.16.327.

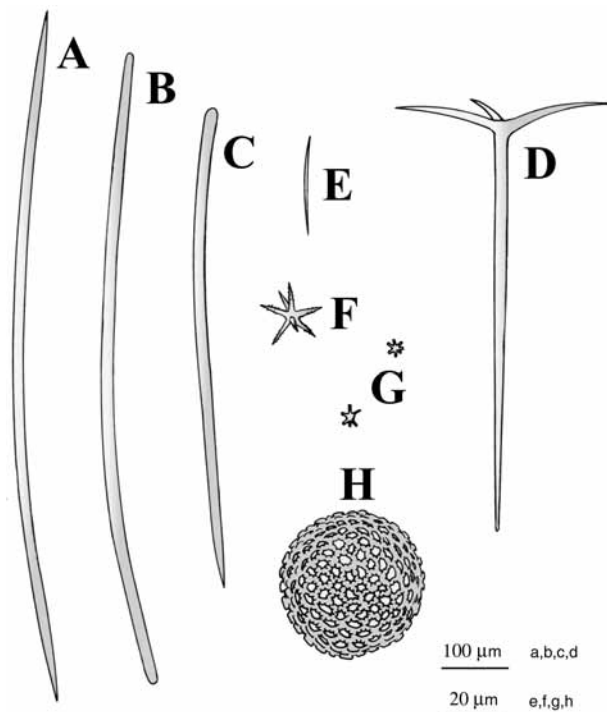


Fig. 8. *Sidonops neptuni* (Sollas), specimen BMNH 1894.11.16.327. A, oxea. B, strongyle. C, style. D, orthotriaene. E, microoxea. F, rough oxyaster. G, spherochiasters. H, sterraster.

Description. Cup-shaped sponge, 40 cm high and from 12 cm (at the base) to 31 cm (at the broadest part) wide, with thick walls, brown in color (dried). Surface corrugated and smooth. Cortex 800 μm thick. Cribriporal, inhalant orifices on the external face of the cup. Oscules simple, spread over the inner side of the cup. Megascleres: oxeas, fusiform, straight or curved with blunt, sharp or rounded ends (strongyles and styles), 1250–1500 \times 17–23 μm ; triaenes are mainly orthotriaenes, with a rhabdome 900–1050 \times 15–20 μm in size, tapering to a sharp point, and a cladome curved outwards, 300–362 μm in chord length, with clads 180 μm long; anatriaenes very scarce (only one was reported from the holotype by Sollas, 1888), 270–380 \times 11–14 μm in size (rhabdome) and 17–21 \times 8–10 μm (clads). Microscleres: sterrasters, spherical, about 45–55 μm in diameter; chiasters (ectosomal microscleres) 5–8 μm in diameter, with short, abruptly truncated, rod-like actines and with a more-or-less marked centrum (spherochiasters); choanosomal oxyasters, 21–28 μm in diameter, with numerous, rough actines, 11–15 μm long. Skeletal arrangement: the layer of sterrasters in the cortex is covered by a subectosomal crust of chiasters. Spherasters and chiasters dispersed within the choanosome; the triaenes extend their cladome within the inner layer of the cortex and direct the rhabdome toward the choanosome; oxeas are radially arranged at the sponge periphery but more disarranged in the interior; occasionally they protrude through the sponge surface, rendering the surface slightly hispid.

Remarks. The genus *Sidonops* Sollas, 1889 was maintained by Lendenfeld (1903) and Wilson (1925) despite the fact that no skeletal characters differentiate it from *Geodia*. The only difference is the arrangement of the exhalant orifices: cribriporal in *Geodia* and uniporal in *Sidonops*.

The diagnosis initially provided by Lendenfeld (1903) for the genus *Geodinella* (type species *G. cylindrica*): “Geodiidae with reduced triaenes arranged radially in the periphery of the sponge and occurring in longitudinal bundles forming an axial skeleton in the interior” was subsequently modified by the same author (1910a) to include other species which did not have an axial skeleton of triaenes but only triaenes distributed in the choanosome (e.g., *G. robusta*). Other authors (e.g., Wilson, 1925; Bergquist, 1968) included in *Geodinella* other species such as *G. sphaerastrosa* (inhalant uniporal, exhalant cribriporal) and *G. vestigifera* Dendy, by ignoring the character “triaenes in the choanosome”. Currently, as a result the only diagnostic character for *Geodinella* is the presence of modified triaenes. Aborted triaenes as those in *Geodinella*, have also been described in some species of *Isops*, *Geodia*, and *Sidonops* and, consequently, this character has no diagnostic value. As the inhalant orifices of *Geodinella* are uniporal and the oscula are cribriporal, this genus becomes synonymous of *Sidonops*.

Distribution

Arctic, Antarctic, E and W Atlantic, Indo-Malayan region and E Pacific.

ACKNOWLEDGEMENTS

I thank M. Bardají from the CEAB for preparing the microscope slides, G. Carreras, and G. Agell for helping in processing drawings and photographs. Clare Valentine, C. Lévi, and R. Desqueyroux-Faúndez kindly loaned holotypes and other museum material.