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# Family Pheronematidae Gray, 1870

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Pheronematidae Gray (Hexactinellida: Amphidiscophora) contains six genera: *Pheronema*; *Platylistrum*; *Poliopogon*; *Schulzeviella*; *Semperella* and *Sericolophus*. The family is well differentiated from other Amphidiscophora by the prevalence of pentactines as choanosomal megascleres and usually by the presence of two-toothed anchorate basalia.
**Keywords:** Porifera; Hexactinellida; Amphidiscophora; Pheronematidae; *Pheronema*; *Platylistrum*; *Poliopogon*; *Schulzeviella*; *Semperella*; *Sericolophus*.

## DEFINITION, DIAGNOSIS, SCOPE

### Synonymy

Pheronematidae Gray, 1870b. Hyalonemadae, in part, Gray, 1857: 279. Hyalonematidae and Hyalonematinae, in part, Schulze, 1886: 57 (only *Pheronema, Poliopogon*); Schulze, 1887a: 381 (only *Pheronema, Poliopogon*); Schulze, 1893: 561; 1904: 181 (only *Pheronema, Poliopogon, Sericolophus*). Meyerinidae Gray, 1872b: 134. Semperellidae, in part, Schulze, 1904: 128 (only *Semperella*). Semperellinae Schulze, 1886: 45; 1887a: 259, 389; de Laubenfels, 1936a: 190. Corythophoridae de Laubenfels, 1936a: 191.

### Definition

Amphidiscophora with most choanosomal megascleres consisting of pentactines.

### Diagnosis

Body varies strongly from a cup-like to conical and bilaterally-symmetrical form, lophophytose, with or without atrial cavity, with common atrial surface or that divided into several areas. Basalia are usually two-toothed spicules often accompanied by diactines, and other prostalia are represented by scepters. Choanosomal skeleton consists predominantly of pentactines and uncinates (often 2–3 kinds) (diactines seem to be absent). Dermalia and atrialia are pinular pentactines, rarely hexactines. Hypodermal and hypoatrial skeleton consists of pentactines similar to choanosomal ones. Amphidiscs are various, usually consisting of three kinds. Microhexactines usually prevail over all their derivatives up to monactines.

### Scope

Six genera are described; another new genus may be required for the sponge described as *Poliopogon mendocino* Reiswig, 1999. It has a peculiar external shape – being thin-walled, funnel-like, with one thin tuft of basalia – but its basalia are only known from underwater photographs and have never been collected. The absence of such an important feature for Pheronematidae from its description does not allow us to resolve this question at present.

### History and biology

Pheronematidae was established for *Pheronema* (Gray, 1870b), initially characterized as "ovate globular or purse-like body, with a large internal cavity and outer walls formed of hexaradiate spicules placed side by side, producing a tessellated surface formed of stars". This inadequate diagnosis, which barely corresponds even to the type genus, subsequently gave rise to a complex history. Schulze (1886, 1887a, 1893) included this family into Hyalonematidae which was divided into two subfamilies Hyalonematinae and Semperellinae. The latter, containing only *Semperella*, was characterized by a conical body deprived of atrial cavity. In 1904 Schulze raised the status of the subfamily to family Semperellidae and incorporated his new genus *Monorhaphis*. However, it was not until 1927 that Pheronematidae was comprehensively defined by Ijima (1927) at which time he provided a new diagnosis and established the scope of genera contained in it: *Pheronema*; *Platylistrum, Sericolophus, Poliopogon* and *Semperella*, with *Monorhaphis* transferred to a separate family. This definition and scope have been retained to the present, with the addition of a new problematic genus *Schulzeviella* included by Tabachnick (1990a).

Among species included in the family body forms vary greatly in shape. Genera of Pheronematidae are defined mainly by their characteristic body forms (Tabachnick & Menshenina, 1999), whereas their spicule morphologies and diversity often do not prove useful for generic identification except for *Sericolophus*. Nevertheless, cup-like, hemispherical or spherical body forms are common for *Pheronema*; a row of bilaterally-symmetrical forms, spoon or fan-like, are known for *Platylistrum, Sericolophus* and *Poliopogon*; a form with osculum overgrown by lateral walls is typical for *Schulzeviella*; and a columnar body with atrial surface divided into several areas separated by dermal areas is known for *Semperella*.

Choanosomal spicules mostly have the form of pentactines which can be accompanied by rare hexactines, tetractines and tauactines, but probably never diactines. However uncinates (monaxone spicules covered with spines, all of which are oriented in the same direction) may be considered as diactines. Rarely, the smallest uncinates, are deprived of spines but in these cases they are usually at least partly rough.

Prostalia basalia are represented by anchorate spicules and monaxones, most likely diactines (it is unclear whether the crooks of *Sericolophus* are diactinal or monactinal). Anchorate spicules

are usually two-toothed anchors, but other forms are also known. It is uncertain whether the four-toothed anchorate spicule, figured together with common two-toothed one by Schulze (1894) belongs to *Pheronema circumpalatum*, but some of the anchorate spicules are four-toothed with two opposite rays being rudimentary. *Pheronema nascaniensis* (Tabachnick, 1990a) has mostly two-toothed basalia but some rare four-toothed, one-toothed and those resembling sceptres with three spined-tooth distally directed at the termination may also be found. More recently a specimen of *Semperella* with most basalia represented by four-toothed spicules having equal tooth length was found (Reiswig, pers. comm.). This character, therefore, now becomes less valuable for the family definition since it shows only the tendency and does not characterize all the family representatives. Some other peculiarities in anchorate spicule construction are known in *Sericolophus*, which often has one-tooth spicules or with a club-shaped termination. The teeth of anchorate spicules may have serrated margins as in *Semperella cucumis* (Schulze, 1894) or *Sericolophus*. Sometimes the serration involves large portions of the tooth so the entire spicule becomes multi-toothed shaped, as figured by Reiswig (1992). Prostalia basalia of Pheronematidae are never twisted and do not form an apical cone or compact columella as that of Hyalonematidae. Other prostalia are represented by sceptres and monaxones (diactines). They are usually located on the dermal surface or in the vicinity of the osculum but sometimes they are located on the atrial area (*Sericolophus*).

Finally, the absence of acanthophores is also a noteworthy feature of Pheronematidae, contrasting the family with Hyalonematidae.

### Differences with similar families

The definition of this family clearly differentiates it from two other families of Amphidiscophora: Hyalonematidae and Monorhaphididae.

### Previous reviews

No modern review of this family has been made since Ijima (1927). Major works connected with the descriptions of pheronematid hexactinellids concern only the early expedition reports: 'Challenger' (Schulze, 1886, 1887a), 'Valdivia' (Schulze, 1904) and 'Siboga' (Ijima, 1927), and a special revision of this family but based on old data by Schulze (1893).

### Distribution

Low and temperate latitudes, depth 90–4789 m.

## KEY TO GENERA

(1) Body is more-or-less radially-symmetrical ..... 2
Body is bilaterally-symmetrical ..... 4
(2) Atrial areas are represented by several units separated from each other by dermalia, deprived of atrial cavity, body is elongate (columnar in shape) ..... ***Semperella***
Atrialia is a common surface ..... 3
(3) Atrial cavity is enclosed with a sieve-plate formed by overgrown walls ..... ***Schulzeviella***
Atrial cavity is open (sponge is cup-like with osculum) or expanded (sponge is hemispherical or spherical) ..... ***Pheronema***
(4) Basalia in a broad tuft, usually short; the body is evenly distributed from the lower part (deprived of even pedunculate part) ..... ***Poliopogon***
Basalia in a compact tuft; the body has a well recognizable pedunculate part ..... 5
(5) Body is spoon-like ..... ***Platylistrum***
Body with thin marginalia flexed backwards, covering part of dermal surface; crooks (monaxones with wavy shafts and spherical distal end) are present together with common one-toothed anchors in the basalia ..... ***Sericolophus***

## *PHERONEMA* LEIDY, 1868

### Synonymy

*Pheronema* Leidy, 1868: 9. *Labaria* Carter, 1873c: 234; 1873a: 275; Higgin, 1875: 385; Marshall, 1875: 142; Marshall, 1876: 113; Marshall & Meyer 1877: 275.? [*Callisphaera*] sensu Schulze, 1887a [*nomen nudum*].

### Type species

*Pheronema annae* Leidy, 1868 (by monotypy).

### Definition

Pheronematidae with cup-like, hemispherical or spherical body; basalia are usually in several separate tufts or one broad and loose tuft.

### Diagnosis

Body is cup-like, hemispherical or spherical. Prostalia lateralia or oscularia may be absent. Basalia are usually in several separate tufts or in one broad and loose tuft. Choanosomal, hypodermal and hypoatrial spicules are mainly pentactines. Uncinates are represented by three types. Prostalia lateralia are usually scepters. Prostalia basalia are usually two-toothed anchors, rarely together with oxyoidal monaxones. Dermalia, atrialia and canalaria are pinular pentactines, rarely hexactines. Microscleres are various amphidiscs and microhexactines, micropentactines, rarely microstauractines.

### Description of type species

*Pheronema annae* Leidy, 1868 (Fig. 1).

***Synonymy.*** *Pheronema annae* Leidy, 1868: 9. *Pheronema* [*cathae*] (*nomen nudum* – 3 specimens stored in the USNM under this name were identified by de Laubenfels but never published).

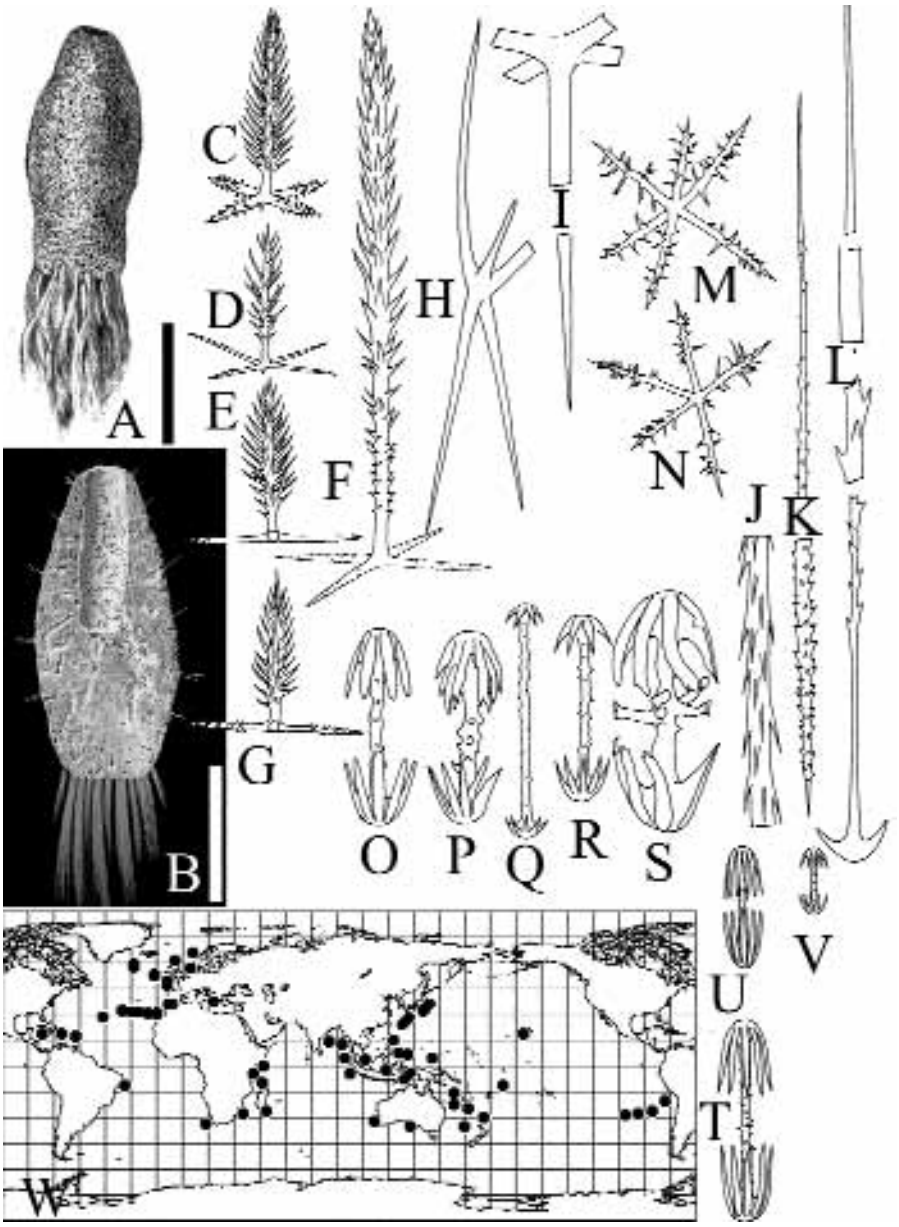


**Fig. 1.** *Pheronema annae*. A, external shape after Leidy (1868) (scale 50 mm). B, external shape after Schulze (1887a) (scale 50 mm). C–E, dermal pinular pentactines (250×). F–G, atrial pinular pentactines (250×). H–I, choanosomal pentactines (250×). J, macrouncinate (250×). K, mesouncinate (250×). L, anchorate basalia (250×). M, microhexactine (250×). N, micropentactine (250×). O–S, macramphidiscs (125×) T–V, mesamphidiscs (250×). C–O, T, V, USNM (kt1165). P, USNM (kt1164). Q–S, U, USNM (kt1168). W, distribution of *Pheronema*.

***Material examined.*** Syntypes: MANSP (not seen), off St. Cruz Island, depth 324–511 m (no holotype designation was made by Leidy, 1868). Other material. USNM 22280 (3 specimens, kt1151; kt1152; kt1153) – *P. "cathae"* (de Laubenfels no. 33921), Johnson-Smithsonian Deep Sea Expedition, N of Puerto Rico, 18°32.00′N, 66°21.15′W. USNM 22253 (*P. annae* (identified by de Laubenfels, no. 33922, 25 specimens) – same locality, 18°31.20′N, 66°16.20′W. USNM 22260 (33819) – same locality, 18°30.30′N, 66°01.45′W, depth 540 m.

***Description.*** Sponges are ovoid with vast atrial cavity, rigid. The specimen described by Schulze (1887a) is 110 mm long and about 50 mm in maximum diameter, the osculum is about 13 mm in diameter, the atrial cavity is 58 mm deep. Prostalia lateralia and oscularia are absent in the specimen figured by Leidy (1868) and are represented by sparse tufts which protrude from the wall surface at about 8 mm in the specimen investigated by Schulze (1887a). Prostalia basalia are located in several tufts at the lower end of the body, they protrude at 20–45 mm. Spicules. Choanosomal skeleton is composed of pentactines (as well as hypodermalia and hypoatrialia), rarely stauractines and hexactines. They have rays 0.2–6.8/0.02–0.21 mm with smooth surface and conically pointed terminations. Uncinates are of two kinds. The macrouncinates are several mm, in length and 0.007–0.011 mm in diameter. The small uncinates correspond to mesouncinates of other Pheronamatidae. They are 0.350–0.760/0.002–0.008 mm. Prostalia lateralia may be represented by diactines or sceptres. Basalia are two-toothed anchors which are smooth in the proximal part and spiny in the distal part. They have shafts about 40 mm long

and 0.015–0.046 mm in diameter. Dermal and atrial spicules are pinular pentactines (rarely hexactines). The pinular ray of dermal pentactine is 0.011–0.365/0.003–0.007 mm with relatively long spines, its termination is finely pointed and does not protrude farther than the last spines. Tangential rays of dermal pentactines are 0.019–0.072/ 0.003–0.004 mm, with conically pointed terminations and are entirely or partly (in the distal part) covered with short spines. Atrialia are larger. Atrial pentactines have pinular rays 0.031–0.502/ 0.005–0.011 mm, covered with relatively short spines, and terminations are conically pointed or slightly lanceolate. Tangential rays of atrial pentactines are 0.019–0.080/ 0.003–0.004 mm long being conically pointed and less spiny than the dermal ones. Microscleres. Amphidiscs are represented by three kinds. Total length of macramphidiscs is 0.160–0.334 mm, umbel length 0.038–0.114 mm, umbel diameter 0.049–0.118 mm. They have tuberculated shafts. Some rare macramphidiscs (kt1164; kt1156) have deformed umbels where the teeth are irregularly distributed or the teeth are small and short (kt1168). Mesamphidiscs are less numerous than the other types of amphidiscs or in some specimens they are very rare. Total length of mesamphidiscs 0.041–0.156 mm, umbel length 0.015–0.076 mm, umbel diameter 0.013–0.068 mm. Shafts of mesamphidiscs are covered with numerous short spines. Total length of micramphidiscs 0.010–0.037 mm, umbel length 0.004–0.027 mm, umbel diameter 0.004–0.025 mm. Shafts of micramphidiscs are rough. Micropentactines and microhexactines have rays covered with numerous relatively long spines, with rays 0.026–0.131/0.003–0.005 mm.

***Remarks.*** Unfortunately the original description of Leidy (1868) is so poor that the type species is virtually unrecognisable, and the type material has not yet been located. However, Schulze (1887a) made a much more careful description of the type species, including re-examination of some of the syntypes, making the type species, and concept of the genus, perfectly known.

The genus presently contains 20 described species (including two subspecies) and one previously known species requiring division into several subspecies.

*Leiobolidium* and [*Callisphaera*] were included in *Pheronema* as junior synonyms by Schulze (1887a), whereas *Leiobolidium* is now considered to be a synonym of *Hyalonema* (Reiswig, 2000). [*Callisphaera*] (cited by Schulze, 1887a) is a mystery. No other record of this genus or any material attributed to it is known, and is probably a manuscript name that was never published. It is declared here a *nomen nudum*.

Most species of *Pheronema* have a cup-like body, whereas hemispherical or spherical body shapes occur in several species from the Indo-West Pacific: *P. semiglobosum*, *P. megaglobosum* (Tabachnick, 1988), *P. nascaniensis* (Tabachnick, 1990a), *P. hemisphaericum* (Gray, 1873a), *P. globosum* with two subspecies – *P. globosum globosum* (Schulze, 1887a) and *P. globosum kagoshimensis* (Okada, 1932). All of these have spinous microuncinates, where the tangential rays of pinular pentactines are always slightly deviated to the opposite of the pinular ray side. Since these genera seem to be very close apart from these few stated differences it might be appropriate to differentiate them into a separate subgenus *Pheronema* (*Labaria*). It is certainly not appropriate to recognise *Labaria* at the generic level – given that it does not have a body form specifically different from other species of *Pheronema*, and given the existence of a species with an intermediate body form (*P. raphanus* (Schulze, 1894)) – whereas their recognition at the subgeneric level may eventually be appropriate.

Anchorate basalia are usually represented by bidentate spicules with spiny or smooth shafts. But *P. raphanus* has four-toothed spicules with two large teeth (opposite) and two rudimentary or the same with serrated margin. Diactines with oxyoidal terminations seem to be absent among the basalia in all the representatives of *Pheronema*.

Amphidiscs are represented from 1 to 3 kinds in various species. The most outstanding types occur in *P. conicum* (Lévi & Lévi, 1982) where amphidiscs in the vicinity of dermal and atrial surface were different (Tabachnick & Lévi, 2000). Its amphidiscs are represented by two types: macramphidiscs and micramphidiscs. Dermal macramphidiscs are usually 'normal' but atrial macramphidiscs vary strongly, with some having one umbel normally developed while the other has a deformed upper surface where the shaft protrudes over the surface, and lacks some teeth. Other amphidiscs have one umbel reduced, and at the end with the shaft elongated some teeth are situated in an irregular manner, often finger-like. Such spicules were described in *Hyalonema thomsonis* by Schulze (1905). Other deformed macramphidiscs have the form of paradiscs. This type of spicule was previously known only for the family Hyalonematidae, in *Hyalonema (Paradisconema)* (Ijima, 1927). The next deformed form, hemidiscs, have the umbels different in size (length and diameter). This type of amphidisc was previously known only from the fossil order Hemidiscosa common in Late Cretaceous (Schrammen, 1924a). Another type of deformed macramphidiscs has the umbels with teeth which meet, overlap and even fuse to each other at the equator similar to some barrel-shaped amphidiscs in *Monorhaphis chuni* (Schulze, 1904). Micramphidiscs in *P. conicum* are usually regular in shape and size but sometimes they display peculiar deformations. Sometimes umbels are different – one is pileate or spherical while the other is conically ended. Sometimes some teeth of one umbel have different lengths, and the spicule is nearly a paradisc. The shafts are usually covered with tubercles or rarely they have widening at the middle. Some tubercles on shafts are long and similar to the tooth-like structures seen on some atrial macramphidiscs.

It is probable that specimens of *P. carpenteri* collected off Brazil and described by Schulze (1887a), and subsequently removed from *P. carpenteri* by Reiswig (1995), belong to *P. annae*. Alternatively, these specimens may constitute a new species intermediate between *P. carpenteri* and *P. annae* which is distributed in the central Atlantic.

**Distribution**

Low and temperate latitudes, depth 90–4789 m.

## *PLATYLISTRUM* SCHULZE, 1904

**Synonymy**

*Platylistrum* Schulze, 1904: 59.

**Type species**

*Platylistrum platessa* Schulze, 1904 (by monotypy).

**Definition**

Pheronematidae stalked with spoon-like body and a single rather compact tuft of basalia.

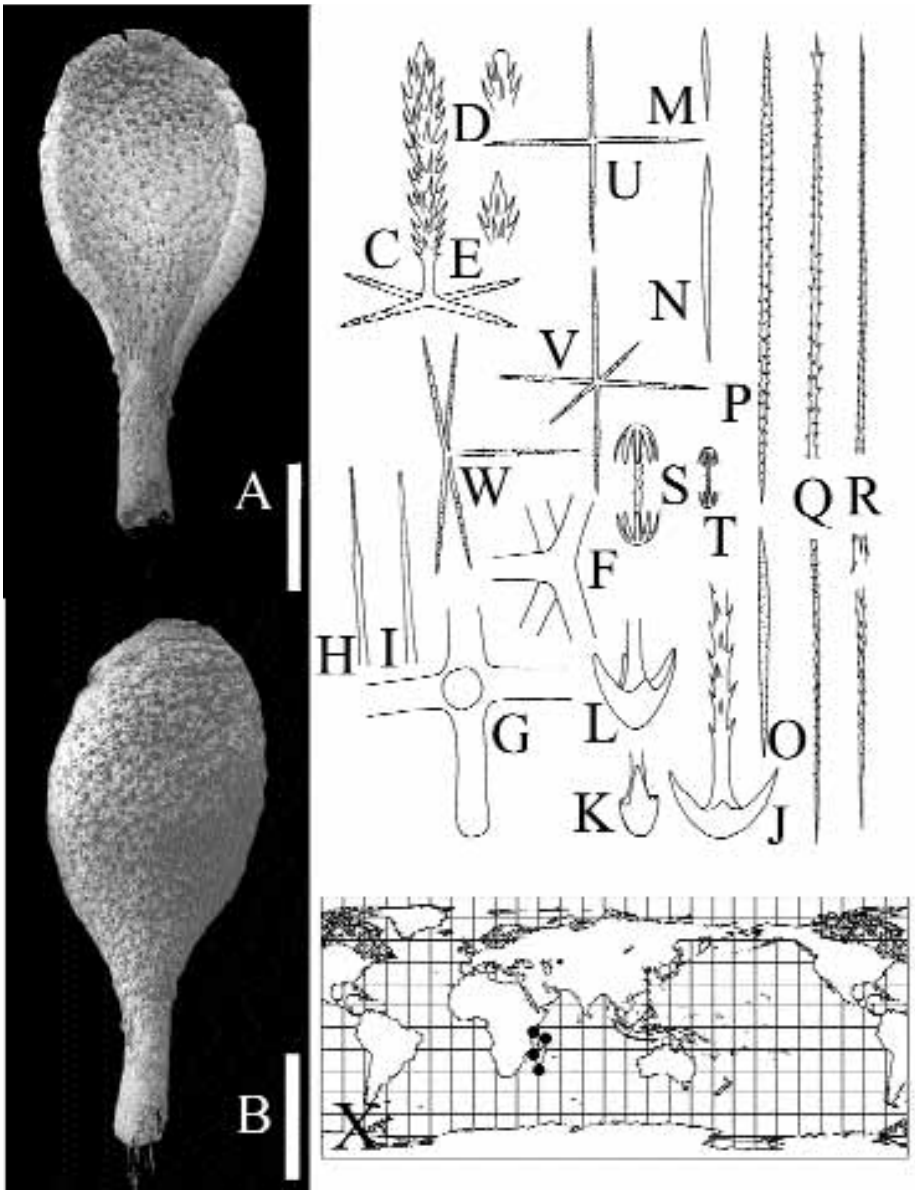


**Fig. 2.** *Platylistrum platessa*. A, view from atrial side after Schulze (1904) (scale 50 mm). B, view from dermal side after Schulze (1904) (scale 50 mm). C, dermal or atrial pentactine (220×). D–E, terminations of the pinular ray of dermal or atrial pentactine (220×); F–G, choanosomal pentactines (60×). H–I, their terminations (60×). J, anchorate basalia with two well distinguished teeth (110×). K, same from the lateral side (110×). L, anchorate basalia with three well distinguished teeth (110×). M–O, microuncinates (220×). P, mesouncinate (220×). Q, sceptre (220×). R, macrouncinate (220×). S–T, amphidiscs (220×). U, microstauractine (220×). V, microhexactine (220×). W, micropentactine (220×). C–E, J–W, from Schulze (1904). F–I, from BMNH 1908.09.24.042. X, distribution of *Platylistrum*.

## Diagnosis

Body is spoon-like. Dermalia are situated on the stalk and on the prominent surface while atrialia is slightly depressed being situated on the concave surface. Basalia are represented by a single rather compact tuft which starts from the peduncle. Choanosomal, hypodermal and hypoatrial spicules are mainly pentactines. Uncinates may be divided into three kinds: macrouncinates, mesouncinates and microuncinates. Prostalia lateralia are scepters. Prostalia basalia are monaxones (probably diactines) and four-toothed anchorate basalia (usually two opposite teeth are large and the other pair is rudimental). Dermalia and atrialia are pinular pentactines, rarely hexactines. Microscleres are amphidiscs (one kind) and microhexactines, micropentactines and microstauractines.

## Description of type species

*Platylistrum platessa* Schulze, 1904 (Fig. 2).

***Synonymy.*** *Platylistrum platessa* Schulze, 1904: 59.

***Material examined.*** Syntype: BMNH 1908.09.24.042 – 'Valdivia', 3°38.8′S, 40°16.0′E, depth 863 m. Other material. BMNH 1926.09.03.095 – off S Africa (Natal). IORAS 5/2/1358, 5/2/1341 – 'Vityaz-II'-17, 12°31.5′–25.04′S, 48°05.5′–08.0′E, depth 700 m. IORAS 5/2/1365 – 24°58.3′–25°05.1′S, 35°40.3′–34.1′E, depth 965 m. IORAS 5/2/1357, 5/2/1364, 5/2/1344, 5/2/1353 – 25°06.3′–10.0′S, 35°24.0′–23.5′E, depth 660–680 m. IORAS 5/2/1417 – 25°13.9′–18.0′S, 35°32.1′–27.5′E, depth 980–1000 m. IORAS 5/2/1355, 5/2/1354 – 32°45.0′–42.2′S, 45°31.2′–31.2′E, depth 1700 m. IORAS 5/2/390.8.0, 5/2/390.8.1,

5/2/390.8.2, 5/2/390.8.3 – 'Akademic Kurchatov'-36, 12°29.7′S, 48°05.3′E, depth 670 m.

***Description.*** External shape as for genus, 40–600 mm long, 32–280 mm wide and 8–60 mm thick. The narrowing peduncle is always well recognizable. Basalia protrude from it at 15–40 mm. Spicules. Choanosomal skeleton is composed of pentactines (as well as hypodermalia and hypoatrialia), rarely stauractines and tauactines, with rays 0.4–4.1/0.014–0.120 mm, which have smooth surface and are conically pointed, rarely rounded or clavate terminations. Uncinates are of three kinds. Microuncinates are 0.045–0.113/ 0.002–0.004 mm. Usually they are smooth or sometimes partly rough, always with a widening in the middle. Mesouncinates 0.18–0.71/ 0.005–0.008 mm are covered with numerous relatively short spines. Macrouncinates 0.94–2.25/0.005–0.009 mm are covered with spines. Prostalia lateralia are sceptres which have usual shape for Pheronematidae, about 0.83/0.005 mm. Basalia are monaxones, probably diactines, and anchors. Monaxones are up to 120 mm long, 0.05–0.25 mm diameter. Anchors are partly smooth, partly covered with spines, with shafts about 40 mm long, 0.038–0.075 mm diameter and four-toothed terminations with two opposite teeth usually rudimental (the former with the only tooth rudimentary is figured by Schulze (1904)). Dermal and atrial pinular pentactines (rarely hexactines) are nearly identical but some dermal spicules have rays longer than the atrial ones. Terminations of pinular rays of these spicules are a little longer than the last spines, being conical rounded or slightly clavate. Pinular pentactines with clavate terminations are most common in 5/2/1355. Tangential rays are conically pointed, smooth at base and rough or spiny in the distal half of the ray. Pinular ray of dermal pentactine is 0.068–0.559 mm long, tangential rays are 0.030–0.118 mm long. Pinular ray of atrial pentactine is 0.068–0.342 mm long, 0.014–0.029 mm diameter, tangential rays are 0.027–0.285 mm long, 0.005–0.008 mm diameter. Microscleres. Amphidiscs are of one kind which corresponds in size to mesamphidiscs of other Amphidiscophora. Some small amphidiscs were found in three specimens (5/2/1357; 5/2/1344; 5/2/1341). They have the shape of common mesamphidiscs (both have spiny shafts and equal umbel proportions). Since no gaps between these small amphidiscs and mesamphidiscs were found they are considered to belong to a single size-class with large size range. Total length of mesamphidiscs is 0.014–0.126 mm, umbel length 0.004–0.038 mm, umbel diameter 0.005–0.029 mm. Microhexactines, micropentactines and microstauractines are present in nearly equal proportion. They have spiny rays 0.024–0.176/0.002–0.003 mm.

***Remarks.*** The genus contains only the type species, which is unusual in having amphidiscs corresponding to mesamphidiscs of other Amphidiscophora.

### Distribution

W Indian Ocean, depth 660–1700 m.

## *POLIOPOGON* THOMSON, 1873

### Synonymy

*Poliopogon* Thomson, 1873: 174 (Not *Poliopogon mendocino* Reiswig, 1999: 500).

### Type species

*Poliopogon amadow* Thomson, 1873 (by monotypy).

### Definition

Pheronematidae with a fan-like body in which the concave side represents the atrial cavity. Basalia are in relatively broad tufts and include some monaxones with clavate distal ends and two-toothed anchors.

### Diagnosis

Body is fan-like in which the concave side represents the atrial cavity. Basalia are gathered in relatively broad tufts. Choanosomal, hypodermal and hypoatrial spicules are pentactines, rarely stauractines and tauactines. Uncinates usually consist of only one type. Prostalia are sceptres and basalia which include some oxyoidal monaxones and two-toothed anchors. Dermalia and atrialia are pinular pentactines and rare hexactines. Microscleres are amphidiscs (from one to three kinds) and combinations of microhexactines and pentactines (in some species also stauractines, diactines, monactines and spheres).

### Description of type species

*Poliopogon amadow* Thomson, 1873 (Fig. 3).

***Synonymy.*** *Poliopogon amadow* Thomson, 1873: 174.

***Material examined.*** Holotype. BMNH 1887.10.20.105 – 'Challenger', 25°24′N, 20°14′W, depth 2800 m. Fragments of holotype. BMNH 1887.10.20.102, 1887.10.20.103, 1887.10.20.104 – same details. Holotype of *P. amadow pacifica*. IORAS 5/2/197 – 'Akademic Mstyslav Keldysh'-9, 14°09.05′–08.50′N, 155°54.4′–53.0′E, depth 3800–4270 m. Other material. *P. amadow amadow*. IORAS 5/2/1325 – 'Akademic Mstyslav Keldysh'-15, 23°20.68′–20.64′N, 45°03.00′–01.37′W, depth 3200–3000 m. IORAS 5/2/1326 – 23°52.70′–53.80′N, 46°12.77′–10.50′W, depth 3350 m. IORAS 5/2/1266, 5/2/1270 – 'Vityaz II'-2, 29°56.1′N, 28°13.0′W, depth 2480–2550 m. MNHN (p444; p443) – 'Faranaut', 15°01.42′N, 44°55.50′W, depth 4022–3360 m.

***Description.*** Major portion of the holotype is a fan or semi-involute plate, 400 mm long and wide, with walls about 30–50 mm thick. Basalia are loose and situated on the lower edge. Other specimens examined are tongue-like. Specimen MNHN (p443) is about 170 mm in length and 90 × 50 mm in horizontal section with distinguishable prostalia marginalia; specimen MNHN (p444) is over 130 mm long, 75 × 20 mm in horizontal section; specimen 5/2/1326 is 200 mm long and about 100 × 50 mm in horizontal section, and its basalia protrude at about 30 mm. Spicules. Choanosomal skeleton is composed of pentactines (as well as hypodermalia and hypoatrialia) with rays 0.38–1.50/ 0.02–0.10 mm. Rays have conically pointed terminations. Uncinates are of two kinds. Macrouncinates are several mm long, 0.015–0.030 mm diameter, covered with short spines or small tubercles. The second type of uncinates corresponds to the mesouncinates of other Amphidiscophora, 0.525–0.900/ 0.005–0.010 mm, covered with sparse short spines. Prostalia are represented by basalia and sceptres. Basalia are two-toothed anchors and monaxones with clavate distal ends. Anchors have smooth shafts several mm long, 0.023–0.030 mm diameter. Monaxones with clavate distal ends are about 40 mm long, 0.13–0.26 mm diameter. Dermal and atrial pinular pentactines are nearly identical in size and shape. The termination of pinular ray is conically pointed and projects not far beyond the last spines. The tangential rays and the ray directed inside the body have conically pointed terminations, with rays covered by short spines in the distal

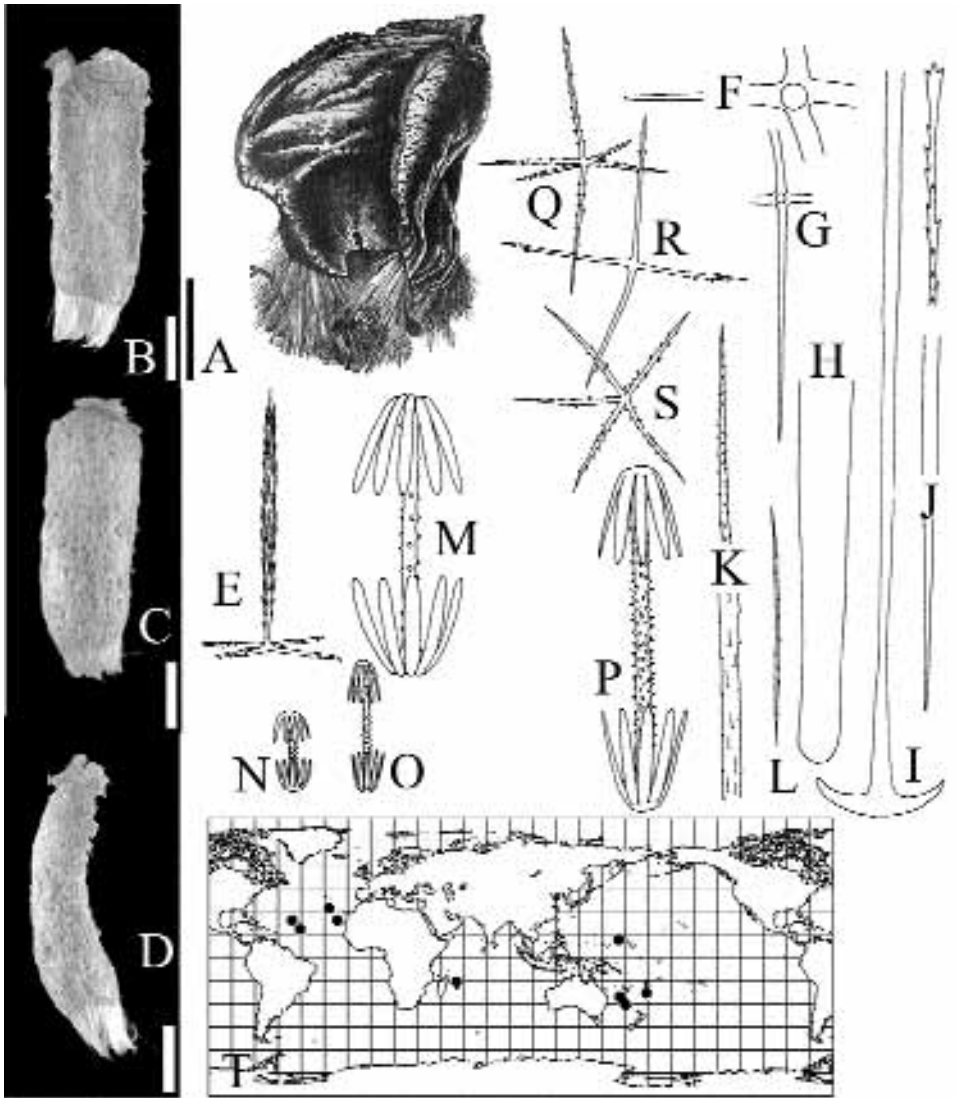


**Fig. 3.** *Poliopogon amadow*. A, holotype from Schulze (1885). B, view from atrial side IORAS 5/2/1326 (scale 50 mm). C, view from dermal side IORAS 5/2/1326 (scale 50 mm). D, view from lateral side IORAS 5/2/1326 (scale 50 mm). E, dermal pentactine (110×). F–G, choanosomal pentactines (33×). H, basal monaxone with clavate distal end (33×). I, anchorate basalia (33×). J, sceptre (220×). K, macrouncinate (220×). L, mesouncinate (220×). M, macramphidisc (220×). N, mesamphidisc (450×). O–P, micramphidiscs (450×). Q, microhexactine (220×). R, microstauractine (220×). S, micropentactine (220×). E, I, from Schulze (1887a). F–H, J–S, holotype. T, distribution of *Poliopogon*.

half. Tangential rays of these spicules often have different length and some are slightly irregularly curved. The pinular ray of the dermal pentactine is 0.118–0.958 mm long, tangential rays are 0.038–0.137 mm long. The pinular ray of the atrial pentactine is 0.110–0.448 mm long, tangential rays are 0.038–0.106 mm long. Pinular rays are 0.005– 0.011 mm in diameter, and tangential rays are 0.005–0.008 mm in diameter. Microscleres. Two kinds of amphidiscs are clearly distinguishable. Total length of macramphidiscs is 0.129–0.266 mm, umbel length 0.046–0.087 mm, umbel diameter 0.042–0.080 mm. They have tuberculated shafts. Other amphidiscs are barely differentiated from each other having similar shape and forming a continuous series of size ranges. Conditionally they are divided into mesamphidiscs and micramphidiscs. Total length of mesamphidiscs is 0.038–0.141 mm, umbel length 0.011–0.048 mm, umbel diameter 0.012–0.039 mm. Total length of micramphidiscs is 0.020–0.050 mm, umbel length 0.007–0.022 mm, umbel diameter 0.005–0.016 mm. Both have shafts covered with dense spines. Rare hexadiscs were found in a single specimen (5/2/1266). Microhexactines, micropentactines and rare microstauractines have spiny rays, 0.065–0.278/0.003–0.004 mm.

***Remarks.*** Five species of this genus are described. The sponge described by Reiswig (1999) as *Poliopogon mendocino* does not belong to the genus *Poliopogon* but is either more closely related to *Pheronema* or more probably requires a new genus.

Although the holotype of the type species is not marked as such in the BMNH collection, and it consists of a smaller fragment than described by Schulze (1887a), it is considered here to be the holotype given that the species was known only from a single specimen prior to now. Other BMNH material of this species is probably fragmented from the holotype.

The fan-like body shape is seen in all specimens and species of this genus except for the holotype of one new species from off New Caledonia (Tabachnick & Lévi, 2000). In section this sponge is depicted as a square with sides of one opposite pair convex and the

other concave, as in some *Semperella*, while paratypes of this species are fragments with a similar tongue-like shape of other specimens.

Most known species of *Poliopogon* have one type of uncinate spicule whereas one undescribed species collected off Madagascar has microuncinates in addition to the common macrouncinates.

The curiosities raised in the discussion of the body form of this genus originate from the problem that the figure of *P. amadow* by Schulze (1887a) is poor and inadequate whereas that in Schulze (1885) is quite correct and corresponds to the external shape of all known representatives. That is why Ijima (1927) talks about a plate-like body form instead of fan-like or baseball-glove-like.

Reinvestigation of *P. amadow* and *P. amadow pacifica* (Tabachnick, 1988) provides further comparative morphological information that allows us to supplement the features which distinguish them. The macramphidiscs in *P. amadow pacifica* are smaller; their shafts are less tuberculated; micro-haloactinoidal spicules (microhexactines and micropentactines) and tangential rays of pinular dermal and atrial spicules have less spiny rays; the pinular ray of dermal and atrial pentactines is often slightly widened toward the termination.

### Distribution

Central Atlantic, Central Pacific, E Indian Ocean, depth 700–4270 m.

## *SCHULZEVIELLA* TABACHNICK, 1990

### Synonymy

*Schulzeviella* Tabachnick, 1990a: 161.

### Type species

*Poliopogon giagas* Schulze, 1886 (by monotypy).

### Definition

Pheronematidae with conical body in which the atrial cavity is closed-off by marginal walls overgrowing the osculum, basalia include some monaxones with clavate distal ends in addition to two-toothed anchors.

### Diagnosis

The body is conical and the atrial cavity is closed-off by marginal walls overgrowing the osculum. Choanosomal, hypodermal and hypoatrial spicules are pentactines. Uncinates may be divided into two kinds: macrouncinates and microuncinates. Prostalia are sceptres and basalia which include some monaxones with clavate distal ends in addition to two-toothed anchors. Dermalia and atrialia are pinular pentactines and some hexactines. Microscleres are amphidiscs (two kinds) and microhexactines, together with rare pentactines and stauractines.

### Description of type species

*Schulzeviella giagas* (Schulze, 1886) (Fig. 4).

***Synonymy.*** *Poliopogon gigas* Schulze, 1886: 67; 1887a: 257; 1893: 567; Ijima, 1927: 9. *Schulzeviella gigas spinosum* Tabachnick, 1990a: 161. *Pheronema gigas* Reiswig 1990; 743; Dawson, 1993: 55.

***Material examined.*** Holotype: BMNH 1887.10.20.107 – 'Challenger', 29°45′S, 178°11′W, depth 1150 m. Holotype of *S. gigas spinosum*. IORAS 5/2/1033 – 'Professor Shtockman'-18, 19°31.4′–34.1′S, 80°13.2′–15.4′W, depth 850–900 m.

***Description.*** The holotype is a tubular fragment about 600 × 550 mm in section and 350 mm high with walls about 100 mm thick. The other specimen is a complete conical sponge slightly damaged from the lateral side, about 600 mm long and thickest at the base 260 × 130 mm. The atrial cavity is enclosed inside without any osculum. The walls are 40–100 mm thick. Basalia are represented by a dense brush of corresponding spicules which protrude about 30 mm from the lower part of the conical body. Numerous large canals are situated between dermal and atrial surfaces. Spicules. Choanosomal skeleton is composed of pentactines (as well as hypodermalia and hypoatrialia) with rays several mm long, 0.023–0.083 mm diameter. These rays have conically pointed, sometimes rounded or clavate terminations. Uncinates are of two kinds. Microuncinates are 0.053–0.224/0.008–0.023 mm, smooth, with a widening in the middle. Macrouncinates are over 1.5 mm long, 0.006–0.012 mm diameter, usually covered with long spines but sometimes the smallest are covered with short spines situated in the vicinity of one termination while the remainder of the surface is smooth. Prostalia are represented by basalia and sceptres. Basalia are two-toothed anchors (sometimes deformed) and monaxones with clavate distal ends. Anchors have smooth shafts several mm long, 0.007–0.011 mm diameter. Monaxones with clavate distal ends are 5–60/0.060–0.083 mm. Sceptres are of usual shape for Pheronematidae being 0.019–0.023 mm in diameter. Dermal and atrial pinular pentactines (sometimes hexactines) are nearly identical in size and shape. The termination of the pinular ray is conically pointed and projects not far beyond the last spines. Tangential rays and the ray directed inside the body have conically pointed or rounded terminations, usually covered with short spines in the distal half but sometimes smooth or entirely covered with short spines. The pinular ray of dermal pentactine is 0.068–0.365 mm long, tangential rays are 0.038–0.125 mm long. The pinular ray of atrial pentactine is 0.084–0.365 mm long, tangential rays are 0.030–0.148 mm long. Pinular rays are 0.005–0.011 mm in diameter, and tangential rays are 0.008–0.015 mm in diameter. Microscleres. Amphidiscs are of two kinds which correspond in size to macramphidiscs and micramphidiscs of other Amphidiscophora. Total length of macramphidiscs 0.099–0.247 mm, umbel length 0.032–0.099 mm, umbel diameter 0.038–0.076 mm. They have shafts covered with numerous spines. Total length of micramphidiscs 0.016–0.052 mm, umbel length 0.005–0.022 mm, umbel diameter 0.004–0.015 mm. They have shafts covered with rare spines. Microhexactines and rare micropentactines and microstauractines have spiny rays 0.076–0.189/0.003–0.004 mm.

***Remarks.*** The genus contains only the type species. The first suggestion to create a new genus, or to place *Poliopogon gigas* in *Pheronema*, was made by Ijima (1927) in a short footnote. Unfortunately, Ijima did not elaborate as to why he proposed this notion, and moreover he did not formally undertake this revision. Tabachnick (1990a) proposed *Schulzeviella* to receive the holotype and a new specimen.

Reconstruction of its body shape shows that when intact the species may have been an oval sponge in which the atrial cavity is entirely enclosed inside the body (no osculum is present in

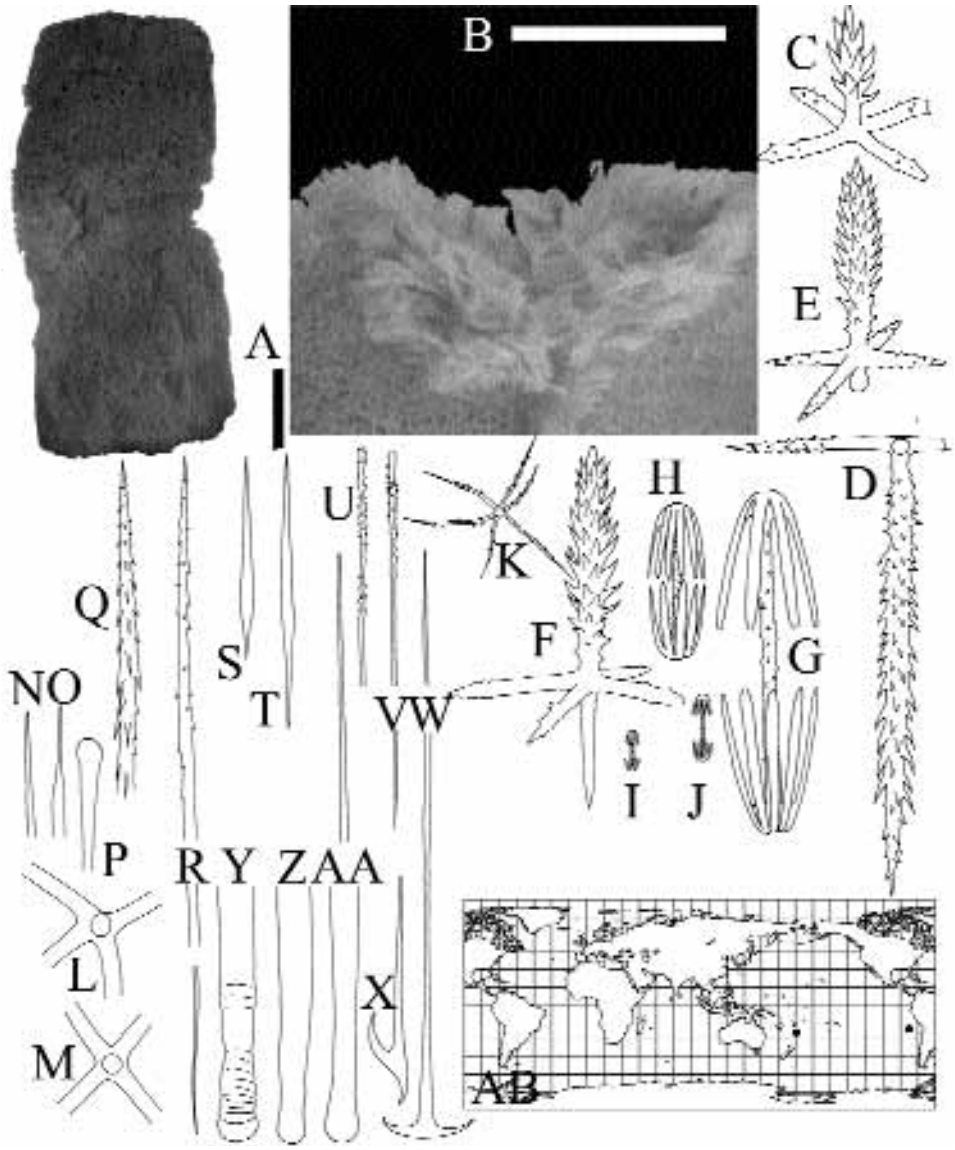


**Fig. 4.** *Schulzeviella giagas*. A, holotype IORAS 5/2/1033 (scale 100 mm). B, view of the oscular sieve-plate holotype IORAS 5/2/1033 (scale 100 mm). C–E, dermal pinular pentactines (240×). F, dermal pinular hexactine (240×). G–H, macramphidiscs (240×). I–J, micramphidiscs (240×). K, microhexactine (240×). L–M, choanosomal pentactines (30×). N–P, terminations of choanosomal pentactines (30×). Q–R, macrouncinates (185×). S–T, microuncinates (185×). U–V, sceptres (30×). W–X, anchorate basalia (30×). Y–AA, basal monaxones with clavate distal ends (30×). C–AA, holotype. AB, distribution of *Schulzeviella*.

preserved material). This body shape easily derives from the primitive tubular ancestral form by the overgrowth of the osculum by marginal walls. Intermediate body forms, with large atrial cavities and small oscula, are known among species of the closely related genus *Pheronema*. If this interpretation is correct it is worth distinguishing this bauplan as a separate genus since all genera of Pheronematidae are characterized by their specific body forms. If this interpretation is not correct then this species probably sits best with *Pheronema* (following Reiswig, 1990). The feature supporting its recognition as a separate genus is the presence of monaxones with clavate distal ends among basalia (in addition to two-toothed anchors). Such monaxones are unknown among species of *Pheronema* although they are common in some species in other genera of Pheronematidae. The basalia which are relatively very short resemble a dense brush. The amphidiscs correspond to macramphidiscs and micramphidiscs of other Amphidiscophora.

Reinvestigation of the holotype of both the nominal species and subspecies led Tabachnick (1990a) to initially emphasize their differences through creation of a new subspecies taxon. Differences observed between this material concerned the absence of smooth microhexactines in *S. gigas spinosum*, and the variability in form and dimensions of amphidiscs in each subspecies. Spicule dimensions showed similar variation in sizes as well as forms of amphidiscs. However, the smooth microhexactines described for *S. gigas spinosum* are very rare spicules but are found in both subspecies, and hence *S. gigas spinosum* is here assigned into full synonymy with the nominotypical taxon.

**Distribution**

S Pacific Ocean, depth 850–1153 m.

## *SEMPERELLA* GRAY, 1868

### Synonymy

*Semperella* Gray, 1868d: 373. *Hyalothauma* Herklots & Marshall, 1868: 435. *Meyerella* Gray, 1872b: 76. *Meyerina* Carter, 1872b: 375; 1873c: 349.

### Type species

*Hyalonema schulzei* (Semper, 1868) (by monotypy).

### Definition

Pheronematidae with elongate body (columnar or club-like in shape); deprived of atrial cavity with several everted atrial areas represented by units separated from each other by dermalia.

### Diagnosis

The body is elongate (columnar in shape); deprived of atrial cavity, with the everted atrial areas represented by several units separated from each other by dermalia. Basalia are gathered in a compact short tuft. Choanosomal, hypodermal and hypoatrial spicules are mainly pentactines. Uncinates of one to three kinds: macrouncinates, sometimes mesouncinates and microuncinates. Prostalia are sceptres and basalia. Basalia consist of anchors and oxyoidal monaxones. Dermalia and atrialia are pinular pentactines, rarely hexactines. Microscleres are amphidiscs (from one to three kinds) and combinations of holactinoidal spicules: microhexactines, micropentactines, microstauractines, micromonactines and rarely microdiactines.

### Description of type species

*Semperella schulzei* (Semper, 1868) (Fig. 5).

***Synonymy.*** *Hyalonema schulzei* Semper, 1868: 29. *Semperella schulzei* Gray, 1868d; Marshall, 1875: 212; Schulze 1886: 67; 1887a: 259. *Hyalothauma ludekingii* Herklots & Marshall, 1868: 435. *Meyerella claviformis* Gray, 1872b: 76. *Meyerina claviformis* Carter, 1872b: 375; 1873c: 349.

***Material examined.*** Holotype: not seen, off the Philippines, depth 90–1200 m. Other material. MNHN HCL 188 – Biocal, 'Jean Charcot', 22°47.30–47.35′S, 167°14.30–14.50′E, depth 440–450 m. MNHN HCL 181 – 22°45.14–46.09′S, 167°12.12–13.80′E, depth 380 m. MNHN HCL 182 – Musorstom 4, 'Vauban', 18°58.00′S, 163°10.50′E, depth 580 m. MNHN HCL 453 – 22°09.00′S, 167°12.20′E, depth 470–480 m. MNHN HCL 183, HCL 184, HCL 185 – 18°59.30′S, 163°17.50′E, depth 370 m. MNHN HCL 186 – Musorstom 5, 'Coriolis', 19°53.74′S, 158°38.30′E, depth 355 m. MNHN HCL 191, HCL 192, HCL 193, HCL 194 – Musorstom 6, 'Alis', 20°55.66′S, 167°22.34′E, depth 410 m. MNHN HCL 195 – 20°40.60′S, 167°03.75′E, depth 437 m. MNHN HCL 196 – 20°40.20′S, 167°03.95′E, depth 461 m. MNHN HCL 197 – 20°47.35′S, 167°05.70′E, depth 390 m. MNHN HCL 198 – 20°48.29′S, 167°09.11′E, depth 420 m. MNHN HCL 189 – 20°23.54′S, 166°12.57′E, depth 420 m. MNHN HCL 190 – 20°38.05′S, 167°06.65′E, depth 490 m. MNHN HCL 199 – Musorstom 7, 14°14.50′S, 178°11.50′W, depth 280–370 m. MNHN HCL 200 – 13°21.30′S, 176°08.30′W, depth 335–340 m. MNHN HCL 201 – 22°29.30′S, 166°22.70′E, depth 375–550 m. MNHN (p1244) – off New Caledonia. WAM 118–82 – 'Soela', 18°20–19′S, 118°00–01′E, depth 320 m. WAM 108–82 (fr809.1; fr809.2) – 18°22–23′S, 117°56–54′E, depth 316–309 m. WAM 98–82 (fr811; fr812; fr813) – 18°54–55′S, 117°02–00′E, depth 306–300 m. USNM 22141 – 'Albatross', 32°31.10′N, 128°33.20′E, depth 255 m. USNM 22144 (kt1373; kt1374) – 32°26.30′N, 128°36.30E, depth 250 m. USNM 22145 (kt1375; kt1376) – 30°58.30′N, 130°32.00′E, depth 90 m. USNM 22145 (kt1008) – 'Challenger'. BMNH 1887.10.20.109 – 'Challenger', off Little Ki Island, Indonesia, depth 252 m. BMNH 1887.10.20.108 – off Cebu, Philippines. BMNH 1872.10.14.003, BMNH b756, BMNH 1898.12.19.025 – off the Philippines. ZMA POR 9436 – 'Snellius II', 6°23.70′S, 120°26.70E, depth 200–300 m. MNHN (p3017; p3018) – 'Baruna Jaya 1', 5°17′S, 132°50′E, depth 315–394 m. MNHN (p3012) – 6°05′S, 132°44′E, depth 268–210 m.

***Description.*** Body conical or club-like, slightly widening towards the upper end, straight or sometimes curved. Atrialia represented by several longitudinally directed thin bands situated at corresponding ridges. These may branch dichotomously or may be interrupted by the dermal surface thus having the shape of dotted, longitudinally directed areas. The dermal surface is intact over most of the sponge surface. The body of small specimens is usually square in transversal section, atrial surface is represented by four ridges situated along the facets. In large specimens the body in transversal sections is usually square in the lower and upper part while in the middle it is polygonal (penta- or hexagonal). Body 90–510 mm long, 15–104 mm maximal diameter. Basalia are located in a broad tuft, corresponding to the entire basal diameter and protrude 20–80 mm from the surface. Prostalia lateralia are rare, occasionally distributed on the surface in several groups, usually more abundant on the upper end. Prostalia lateralia protrude at several mm from the sponge surface usually at the upper end. Spicules. Choanosomal spicules are pentactines, sometimes hexactines and stauractines. They often have curved rays of different lengths, 0.114 mm up to several mm in length, 0.006–0.175 mm in diameter. Their terminations are conically pointed or rounded. Two types of uncinates are present. Macrouncinates are several mm long, 0.008–0.015 mm in diameter. In some specimens they have typical amphidiscophoran shape whereas in others the spines from the termination of the uncinate are chela-like. Mesouncinates vary between specimens, represented by thick or thin forms. The former are 0.004–0.009 mm in diameter with many short spines, whereas the latter are 0.001–0.002 mm in diameter with rare minute spines. Prostalia lateralia are rare sceptres 1.0–15.0/0.006–0.038 mm. Prostalia basalia are two-toothed (Schulze, 1887a) or four-toothed anchors (two large and two rudimentary; Lévi & Lévi, 1982) about 40 mm long and 0.005–0.084 mm in diameter. Their shafts are covered with spines in the distal part but smooth proximally. Dermalia and atrialia are pinular pentactines. Previous descriptions of this species did not differentiate these spicules whereas careful preparation shows that dermalia are pentactines with short pinular rays whereas atrialia have long ones. Due to the close position of dermal and atrial surfaces the corresponding spicules are often mixed. The pinular ray of dermal pentactines is spindle-like in shape, its termination is conically pointed and protrudes only a short distance from the last spines. Tangential rays of dermal pentactines are smooth, often with rare spines close to their terminations which are rounded or conically pointed. Atrial pentactines have the pinular rays long with relatively short spines, their terminations are conically pointed or in some specimens rounded and protrude not far beyond the last spines. The tangential rays have the shape similar to that of

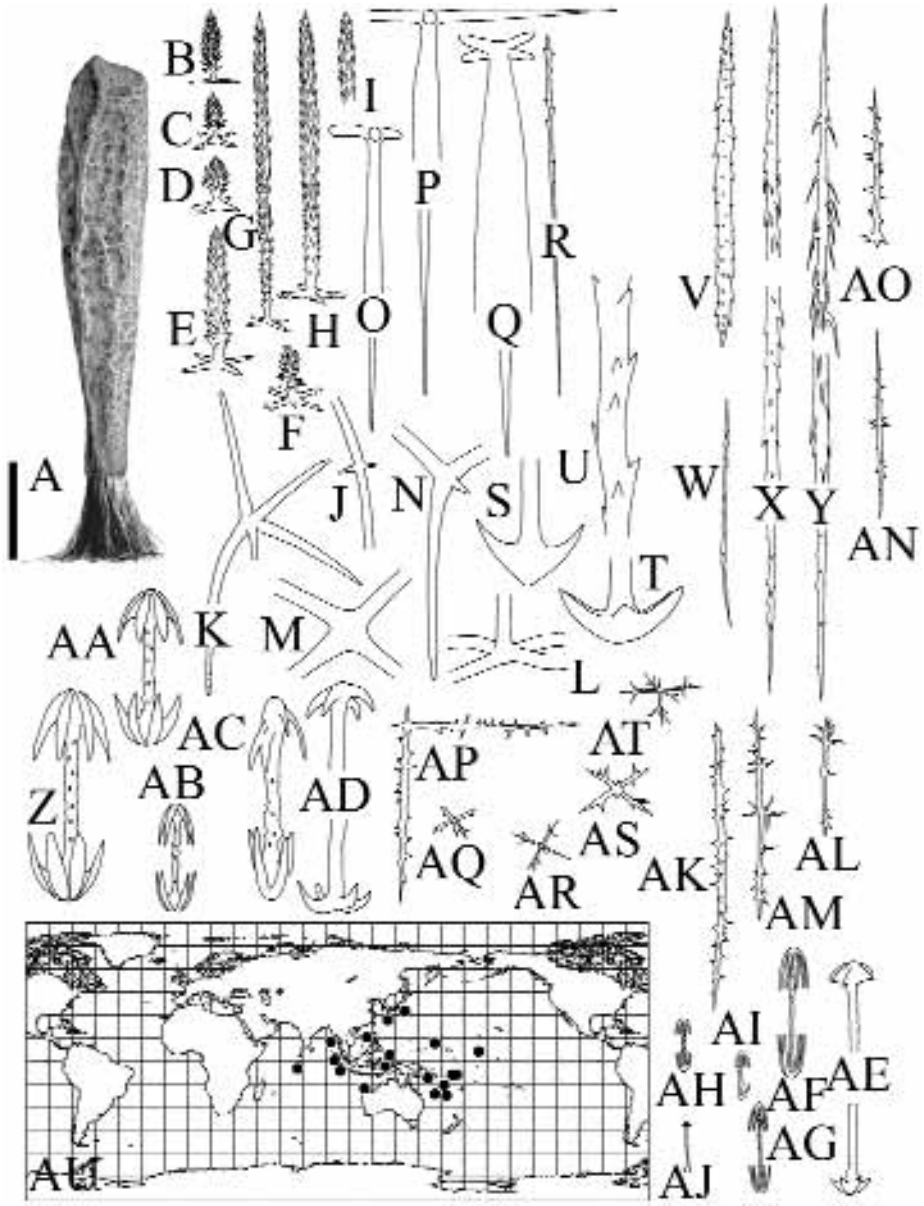


**Fig. 5.** *Semperella schulzei*. A, external shape after Marshall & Meyer (1877) (scale 100 mm). B–F, dermal pentactines (250×). G–H, atrial pentactines (100×). I, termination of dermal pentactine (100×). J, choanosomal stauractine with two rudimental rays (100×). K–L, choanosomal pentactines (100×). M, choanosomal stauractine (100×). N, choanosomal stauractine with one rudimentary ray (100×). O–Q, hypodermal or hypoatrial pentactines (100×). R, sceptre (200×). S–T, anchorate basalia (100×). U, shaft of anchor (100×). V, thick mesouncinate (200×). W, thin mesouncinate (200×). X–Y, macrouncinates (200×). Z–AE, macramphidiscs (200×). AC, abnormal macramphidisc. AD–AK, rare macramphidiscs. AF–AG, mesamphidiscs (200×). AH–AI, micramphidiscs (400 ×). AJ, microtylodisc (400×). AK–AL, microdiactines (200×). AM–AN, microstauractines with four rudimental rays. AO, micromonactine (200×). AP, paratropal microdiactine (200×). AQ–AR, micropentactines (200×). AS-AT, microstauractines (200×). B–C, G, U, AL, USNM 22145 (kt1376). D, MNHN (p3018). E–F, AH–AI, BMNH 1898.12.19.025. H–I, M, WAM 108–82 (fr809.1). J, K–L, N–O, BMNH 1887.10.20.108. P, MNHN HCL190. Q, V, ZMA POR 9436. R, MNHN HCL 186. S, from Schulze (1887a). T, X–AB, AG, from Lévi & Lévi (1982). W, AJ, MNHN HCL 185. X, MNHN HCL181. Y, BMNH 1872.10.14.003. AC, BMNH 1887.10.20.109. AD–AF, MNHN HCL 194. AK, AN, USNM 22141. AM, AO–AS, USNM 22145 (kt1375). AT, USNM (kt1008). AU, distribution of *Semperella*.

dermal pentactines. The pinular ray of dermal pentactines is 0.027–0.380/0.002–0.015 mm, their tangential rays are 0.015–0.084/0.002–0.008 mm. The pinular ray of atrial pentactines is 0.091–0.638/0.006–0.023 mm, their tangential rays are 0.011–0.087/0.003–0.008 mm. Hypodermalia and hypoatrialia differ from choanosomal spicules usually being pentactines with the longest ray directed inside the body and tangential rays short and equal in length, 0.091–0.418/0.011–0.076 mm. The ray directed inside the body is 1.0–4.6/0.011–0.099 mm, widening some distance from the base to 0.011–0.152 mm in diameter. The terminations of tangential rays are rounded or conically pointed, smooth. The terminations of the ray directed inside the body is conically pointed, smooth or sometimes rough. Microscleres. Three kinds of amphidiscs are usually present. Macramphidiscs and mesamphidiscs are differentiated only by their respective size differences between various species. Mesamphidiscs are rare or

absent completely in some specimens (BMNH 1872.10.14.003; BMNH 1898.12.19.025; BMNH (b756)). Both macramphidiscs and mesamphidiscs have shafts with numerous tubercules. Total length of macramphidiscs is 0.093–0.448 mm, umbel length 0.026–0.152 mm, umbel diameter 0.022–0.167 mm. In one specimen (MNHN HCL 194) rare macramphidiscs are present with smooth shafts and four chela-like teeth on each umbel. Total length of macramphidiscs is 0.312–0.357 mm, umbel length 0.030–0.038 mm, umbel diameter 0.084–0.091 mm. Total length of mesamphidiscs is 0.041–0.319 mm, umbel length 0.008–0.106 mm, umbel diameter 0.005–0.122 mm. Micramphidiscs have rough shafts. Total length of micramphidiscs is 0.010–0.029 mm, umbel length 0.004–0.009 mm, umbel diameter 0.004–0.009 mm. In one specimen (MNHN HCL194) micramphidiscs are relatively large, 0.011–0.084 mm long, umbel length 0.004–0.030 mm, umbel diameter 0.004–0.030 mm. Rare, abnormal amphidiscs are present with three umbels on the tauactine shaft or amphidiscs with reduced and irregular teeth. Holactinoidal microscleres consist of spiny microhexactines, micropentactines, microdiactines and sometimes microstauractines and other derivatives up to micromonactines. The spines are usually very long. Rays are 0.033–0.372/0.002–0.010 mm. Microstauractines are rare and 1.5–2 times longer than those of analogous common spicules.

***Remarks.*** The genus presently contains nine species. The body form, with several longitudinally directed atrial areas, is also known for *S. schulzei, S. alba* (Tabachnick, 1988) and *Semperella abyssalis* (Tabachnick & Lévi, 2000). The columnar body with atrial surface consists of numerous rounded atrial spots separated by dermal area, also known for *S. cucumis* (Schulze, 1905) and *S. crosnieri* (Tabachnick & Lévi, 2000). The form with the rounded atrial spots bent inwards, forming numerous atrial cavities with corresponding oscules, is reported for *S. stomata* (Ijima & Okada, 1938) and possibly for *S. spirifera* (Schulze, 1904).

No notable morphological differences were detected between widely dispersed populations. Occasionally differences in measurements of some spicules were recorded between specimens, attributed to intra-specific variability and not warranting recognition of subspecies taxa. Nevertheless, three specimens from closely adjacent localities off Indonesia (MNHN p3012; p3017; p3018) are more similar in their spicule dimensions than to specimens from more distant localities. Greatest variations were observed in size differences between macramphidiscs and mesamphidiscs, thickness of the mesouncinates, form of dermal and atrial pentactines.

### Distribution

Indo-West Pacific, depth 90–4732 m (Fig. 5).

## *SERICOLOPHUS* IJIMA, 1901

### Synonymy

*Sericolophus* Ijima, 1901: 128; 1927: 25; de Laubenfels 1936a: 190; Schulze: 1904. *Corythophora* Hernandez, 1932a: 100; de Laubenfels, 1936a: 191. *Hernandeziana* Strand, 1932: 134.

### Type species

*Hyalonema reflexum* Ijima, 1894 (by monotypy).

### Definition

Pheronematidae with spoon-like body, thin marginalia flexed backwards covering part of dermal surface. Basalia in a compact long tuft represented by ‘crooks’ (spicules with wavy shafts and clavate termination) and anchorate basalia (one-toothed, two-toothed, discoidal and multi-toothed terminations).

### Diagnosis

The body is spoon-like with thin marginalia which is flexed backwards covering part of dermal surface. Basalia are in a compact long (sometimes slightly twisted) tuft. Choanosomal, hypodermal and hypoatrial spicules are mainly pentactines. Uncinates may be divided into two or three kinds: macrouncinates, microuncinates and sometimes mesouncinates. Prostalia are scepters and basalia. Basalia are represented by ‘crooks’ (spicules with wavy shafts and clavate termination) and anchorate basalia (one-toothed, two-toothed, discoidal and multi-toothed terminations). Dermalia and atrialia are pinular pentactines, rarely hexactines. Microscleres are amphidiscs (one or two kinds), microhexactines and sometimes micropentactines, microstauractines and micromonactines, rarely microasters.

### Description of type species

*Sericolophus reflexus* (Ijima, 1894) (Fig. 6).

***Synonymy.*** *Sericolophus reflexus* Ijima, 1901: 128. *Hyalonema reflexum* Ijima, 1894: 366; 1902b: 692; Gravier, 1899: 422; Schulze, 1899: 114; 1900: 19; 1902: 18. *Sericolophus equinus* (*lapsus calami*) Schulze, 1904: 186. *Corythophora ijimae* Hernandez, 1932a: 100; de Laubenfels, 1936a: 191. *Hernandeziana ijimae* Strand, 1932: 134.

***Material examined.*** Holotype: not seen, Sagami Bay, Japan, 594–1265 m depth. Other material. MNHN (Deyrolle n 45; p1395) – off Japan (specimen identified by Ijima). BMNH 1925.1.01.685; 1921.11.05.005; 1921.11.05.005; 1921.11.05.006a; 1898.12.19.015 – off Japan. BMNH (b470; b471) – ‘Challenger’. ZMA POR 5103 (two fragments) – ‘Siboga’, 1°58.5′N, 124°41.0′E, depth 1264 m. IORAS 5/2/2004; 5/2/2005; 5/2/2006, off Japan. USNM (kt 1383; kt1384; kt1385; kt1386; kt1387) – ‘Albatross’, 30°34′N, 129°19.30′E, depth 805 m. USNM (kt1379; kt 1380; kt1381; kt1382) – ‘Albatross’, 30°34.00′N, 129°22.00′, depth 805 m. USNM (kt1378) – ‘Albatross’, 34°04.20′N, 137°49.40′E, depth 918 m. USNM (kt1367) – off Japan.

***Description.*** External shape spoon-like, 30–200 mm long. Prostalia basalia tuft is 40–200 mm long, 4–10 mm in diameter. Prostalia lateralia consist of short sceptres irregularly located mostly on the atrial surface which protrude 3–5 mm from the surface. Spicules. Choanosomal, hypodermal and hypoatrial spicules are pentactines, rarely hexactines and tauactines, with conically pointed or rounded, smooth or rough terminations. Rays are 0.3–1.5/0.015–0.023 mm in dimension. Uncinates consist of three types: macrouncinates are covered with numerous spines being several mm in length and 0.004–0.009 mm in diameter. Mesouncinates are rare and similar to macrouncinates in shape, about 0.2/0.004 mm. Microuncinates are 0.061–0.104/0.002–0.004 mm, spindle-like in shape, smooth from one side and rough or short-spiny from another side or entirely smooth. Sceptres are typical for the family, several mm long and about 0.01 mm in diameter. Basalia consist of three kinds of spicules: anchors, oxyoidal

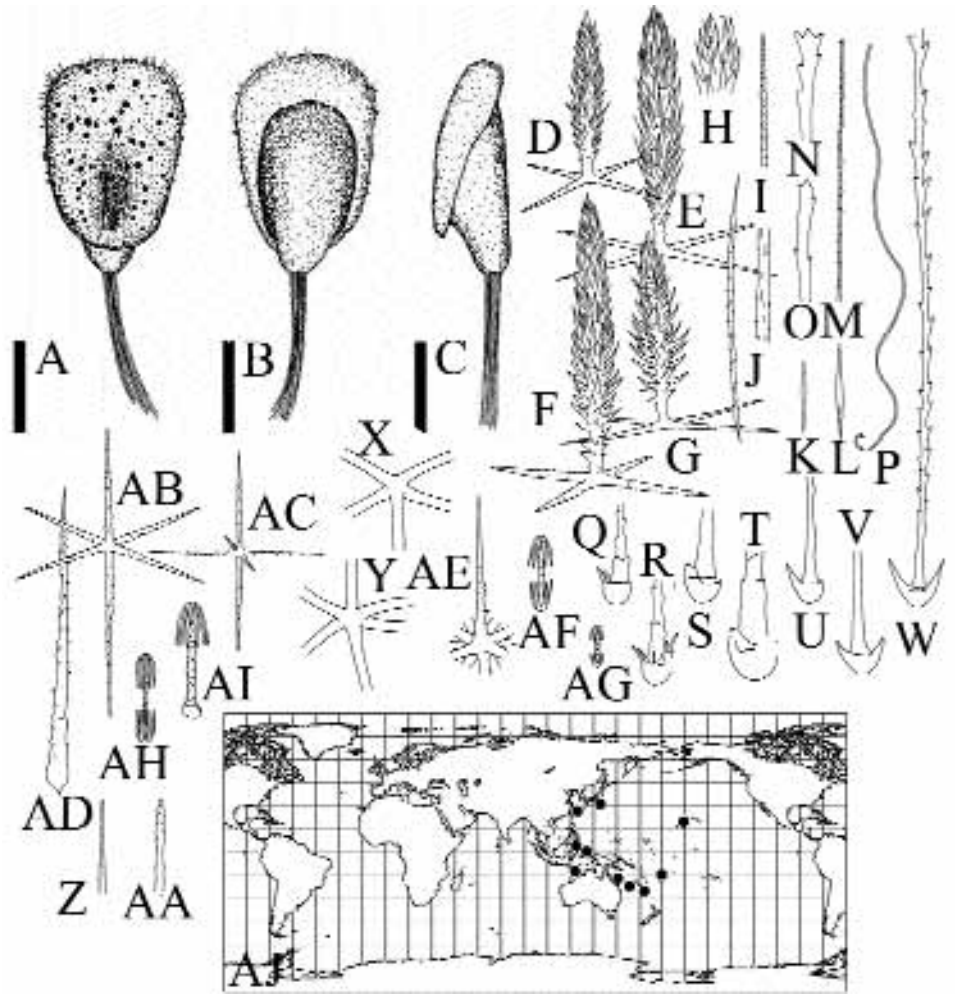


**Fig. 6.** *Sericolophus reflexus*. A, view from dermal side (scale 20 mm). B, view from atrial side (scale 20 mm). C, view from lateral side (scale 10 mm). (A–C, redrawn from Ijima & Okada, 1938). D–E, dermal pinular pentactines (180 ×). F–G, atrial pinular pentactines (180×). H, termination of pinular ray (180×). I, macrouncinate (180×). J, mesouncinate (180×). K–L, microuncinates (180×). M, sceptre (10×). N–O, distal ends of sceptre (180×). P, crook (50×). Q–W, anchors (50×). X, choanosomal pentactine (80×). Y, choanosomal hexactine (80×). Z–AA, terminations of choanosomal spicules (80×). AB–AC, microhexactines (160×). AD, micromonactine (160×). AE, microaster (160×). AF, mesamphidisc (160×). AG, micramphidisc (160×). AH, micramphidisc (320×). AI, tylodisc (320×). D–G, M, P, W, AB–AC, AF–AG, from Ijima & Okada (1938). H–K, AE, AH, BMNH 1921.11.05.005. N–O, Q–U, from Reiswig (1992). X–Y, MNHN (p1395). AD, BMNH 1921.11.05.006a. AI, BMNH 1925.1.01.685. AJ, distribution of *Sericolophus*.

monaxones and 'crooks'. Anchors have distal ends, as described above for the genus, with spiny shafts in the distal part, 0.015–0.046 mm in diameter. 'Crooks' are also of typical morphology for the genus, 0.006–0.008 mm in diameter. Oxyoidal monaxones are 0.046– 0.304 mm in diameter. Dermal and atrial spicules are pinular pentactines, rarely hexactines. Dermal and atrial spicules are similar in shape and size. The pinular ray is spindle-like in shape, its termination does not protrude far beyond the last spines and is usually conically pointed but sometimes rounded or clavate. The shaft of the pinular ray is 0.005–0.014 mm in diameter. Tangential rays are rough, conically pointed, 0.005–0.007 mm in diameter. The pinular ray of dermal pentactines is 0.114–0.388 mm long, tangential rays are 0.053–0.091 mm long. The pinular ray of atrial pentactines is 0.114–0.228 mm long, tangential rays are 0.046–0.099 mm long. Microscleres. Amphidiscs consist of two kinds corresponding to mesamphidiscs and micramphidiscs of other Amphidiscophora. Mesamphidiscs are rare or absent in some specimens. Both types of amphidiscs are similar to each other in shape. Their shafts are covered with numerous small spines. Total length of mesamphidiscs is 0.054–0.077 mm, umbel length 0.016–0.025 mm, umbel diameter 0.011–0.022 mm. Total length of micramphidiscs is 0.031–0.047 mm, umbel length 0.010–0.016 mm, umbel diameter 0.007–0.014 mm. A single tylodisc was also found in specimen BMNH 1925.1.01.685. Microhexactines predominate over other types of spicules consisting of asters, pentactines and monactines. Some hexactines have one ray about 1.5 times longer than others. Rays are 0.076–0.144/0.004–0.006 mm, covered with minute spines.

***Remarks.*** The genus contains five species. The diagnosis presented here is modified slightly from Reiswig (1992) based on data from new species (Tabachnick & Lévi, 2000).

The synonymy of *S. reflexus* and *Hernandeziana ijimae* was proposed by Reiswig (1992). It is very probable that *S. reflexus* is endemic to waters in the vicinity of Japan. Specimens collected off

Indonesia by the 'Siboga' Expedition, and from an unknown locality collected by the 'Challenger' Expedition, are highlighted in this revision. All these specimens are very similar, differing only in their maximal length of the pinular ray of dermal pentactines, which was the longest in Indonesian specimens, verifying the homogeneity of *S. reflexus* as defined here.

### Distribution

NW, E Central and S Central Pacific ocean (Fig. 6), depth 590–4732 m.

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