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Research article

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New sponge species from Seno Magdalena, Puyuhuapi Fjord and Jacaf Canal (Chile)

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Marco Bertolino and Gabriele Costa equally contributed to the paper and are first co-authors.

Abstract. Until now, only 177 species of sponges (Porifera) have been reported for Chilean coastal waters. Here we describe recent scuba diving surveys undertaken to improve our knowledge of the diversity of the sponge fauna of the Seno Magdalena, Puyuhuapi Fjord and Jacaf Canal in Chilean Patagonia. Despite these relatively harsh environments, our study yielded 23 species of Demospongiae, nine of which are new to science and described here: *Hymerabdia imperfecta* Bertolino, Costa & Pansini sp. nov., *Axinella cylindrica* Bertolino, Costa & Pansini sp. nov., *Axinella coronata* Bertolino, Costa & Pansini sp. nov., *Biemna aurantiaca* Bertolino, Costa & Pansini sp. nov., *Biemna erecta* Bertolino, Costa & Pansini sp. nov., *Biemna typica* Bertolino, Costa & Pansini sp. nov., *Scopalina cribrosa* Bertolino, Costa & Pansini sp. nov., *Rhizaxinella strongylata* Bertolino, Costa & Pansini sp. nov. and *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov. One species, *Hymedesmia (Stylopus) lissostyla* (Bergquist & Fromont, 1988), is reported for the first time for Chile.

Keywords. Chilean fjords, Porifera, taxonomy, benthos.

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Introduction

The southern tip of South America is of particular interest for ecological and biogeographic studies of marine organisms. The relative proximity of Antarctica makes this subantarctic coast a transitional zone between South America, Antarctica and the temperate Pacific area (Escribano *et al.* 2003).

The subantarctic inner shelf of southern Chile (41–55° S) is characterized by a complex system of fjords, channels, gulf, estuaries and bays, each affected by local physical processes that strongly modulate biological productivity (Iriarte *et al.* 2014). Patagonian fjords are influenced by saline subantarctic surface waters and freshwater input from the continent; these waters interact to form modified subantarctic waters characterized by sharp vertical and horizontal salinity gradients (Iriarte *et al.* 2014 and references therein). These fjords can, therefore, be considered transitional marine systems where marked contrasts in marine biodiversity and distribution can be observed (Escribano *et al.* 2003).

The fjords of Chilean Patagonia cover an area of nearly 240 000 km² in one of the least densely populated areas of the country (1–8 inhabitants per 10 km²) (Pantoja *et al.* 2011). In the last three decades, however, the influence of anthropogenic activities on these mostly pristine terrestrial and aquatic ecosystems has increased. Exploitation of the natural resources of the region (fisheries, tourism) and the expansion of commercial salmon and mussel farming (Pantoja *et al.* 2011) are increasing the pressure on these fragile fjord ecosystems, and they now require enhanced scientific surveillance and protection.

The coastal waters of Chilean Patagonia host more than 1700 species of benthic animals (Häussermann & Försterra 2009). The biodiversity of filter-feeding organisms is of particular interest given the high levels of primary productivity and complex physico-chemical processes occurring in these ecosystems. For example, filter-feeding cnidarians (such as hydrozoans and anthozoans) have been extensively studied in Chilean fjords in recent decades because of their role within the benthic community and subsequent ecological importance (Försterra & Häussermann 2003; Häussermann 2006; Häussermann & Försterra 2007a, 2007b; Sinniger & Häussermann 2009).

On the other hand, sponges have long been studied in Patagonia since the historical campaigns of the nineteenth and twentieth centuries, such as: H.M.S. Alert (1876–1880) (Ridley 1881), H.M.S. Challenger (1873–1876) (Ridley & Dendy 1887), S.Y. Belgica (1897–1899) (Topsent 1901) and the extensive sponge collections of Thiele (1905). Desqueyroux & Moyano (1987), in their biogeographic analysis of the Chilean coast, listed 94 sponge species, a very limited number considering the latitudinal extent (more than 500 km) and intricate morphology of the Chilean coast (Hajdu & Desqueyroux-Faúndez 2008). This knowledge has recently been improved by scuba diving surveys and the list of Chilean Porifera now encompasses 177 species (Carvalho *et al.* 2007, 2011; Esteves *et al.* 2007; Hajdu & Desqueyroux-Faúndez 2008; Lee *et al.* 2008; Azevedo *et al.* 2009; Willenz *et al.* 2009, 2016; Lopes *et al.* 2011; Hajdu *et al.* 2006, 2013; Fernandez *et al.* 2016; Bertolino *et al.* 2019; Costa *et al.* 2020). However, this number remains relatively low considering the huge extent of the Patagonian coastline (Försterra 2009), suggesting that further surveys of this important benthic taxon may be fruitful.

The aim of the present work is to document the diversity of sponge fauna in Seno Magdalena, Puyuhuapi Fjord and Jacaf Canal (Chile) (Fig. 1) and thus to improve the understanding of benthic communities more generally in these coastal waters.

Material and methods

The study area is located within the Aysen Region of northern Chilean Patagonia (Fig. 1). The study focussed on Seno Magdalena, Puyuhuapi Fjord and Jacaf Canal (Fig. 1). Puyuhuapi Fjord – located in the Chilean XI region – extends to a length of 90 km and a maximum width of 7 km (Fig. 1). The mouth of the fjord connects to the larger Moraleda Channel, which opens into the Pacific Ocean, while the head of the fjord consists of a large bay, around 2 km wide, close to Puyuhuapi village. Within the COPAS Sur Austral Program, one area of focus is a sampling program designated to improve our knowledge of the richness of the Porifera in this area from the qualitative point of view.

Sampling was conducted in August 2016 through scuba diving. Twelve sites were chosen with depths of sampling ranging between 5 and 30 m. Sponges were mainly collected from rocky substrates and photographed *in situ* with a Canon Digital IXUS 900 Ti (Fig. 1; Table 1). The specimens were fixed in 70% ethanol and processed by standard methods for sponge identification (Rützler 1978). Taxonomic decisions were made according to the revision of Demospongiae of Morrow & Cárdenas (2015) and the classification present in the World Porifera Database (WPD) (van Soest *et al.* 2020). Length and width of at least 30 spicules per type were measured for each species/specimen collected. Minimum, mean (in parentheses) and maximum values of spicule dimensions are reported. For a Scanning Electron Microscope (SEM) Vega3 TESCAN type LMU analyses, dissociated spicules and dried tissues were transferred onto stubs, and then sputter coated with gold. The type specimens of any proposed new species were entrusted to the Museo Civico di Storia Naturale G. Doria of Genoa (collection acronym MSNG). Spicule slides and the other examined specimens (paratypes) are deposited in the sponge collection of the Dipartimento di Scienze della Terra dell'Ambiente e della Vita (DISTAV), Università degli Studi di Genova. All the specimens collected during the campaign were marked by the code CILE number.

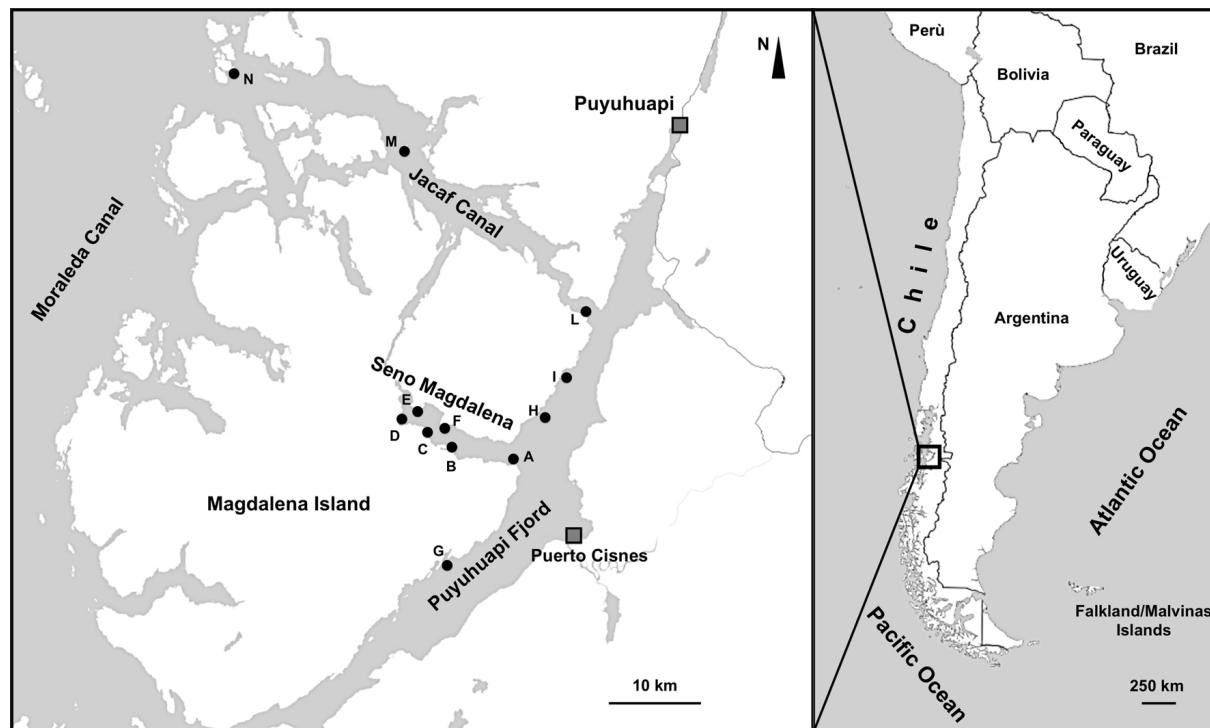


Fig. 1. Study area with twelve sampling sites (A–I, L–N).

Table 1. Sampling sites with descriptions.

| | SITES | COORDINATES | DESCRIPTIONS | DEPTH |
|----------------|----------------------------------|------------------------------|---|--------|
| Seno Magdalena | A | 44.669581° S 72.798496° W | Rocky slope covered by coralline algae and debris at the entrance of a channel | 0–31 m |
| | B | 44.650167° S 72.890850° W | Rocky cliff interrupted by large submarine detrital heights | 0–32 m |
| | C | 44.631113° S 72.929130° W | Rocky wall and detritus slope | 0–32 m |
| | D | 44.614863° S 72.958312° W | Vertical wall, ending at a depth of 20 m on a rocky bottom that slopes down to 32 m | 0–32 m |
| | E (Punta Tabla) | 44.613885° S 72.941490° W | Rocky cliff | 0–35 m |
| | F (Punta Angostura) | 44.631235° S 72.904239° W | Rocky cliff and debris slope | 0–32 m |
| | G | 44.763254° S 72.891581° W | South side of a rocky slope covered by coralline algae and debris | 0–20 m |
| Other Sites | H (Bouy W) | 44.609000° S 72.757667° W | Vertical rocky wall with debris slope | 0–30 m |
| | I (Bouy W) | 44.580650° S 72.730850° W | Vertical rocky wall with debris slope | 0–30 m |
| | L Canal Jacaf (Ite Carlos) | 44.522694° S 72.693722° W | Rocky wall ending on a debris bottom inside the channel located between the coast and the island | 0–24 m |
| | M Canal Jacaf | 44.345000° S 72.951528° W | Rocky walls ending on a debris bottom inside the channel located between the coast and the island | 0–24 m |
| | N Canal Jacaf | 44.271194° S 73.209222° W | Rocky walls ending on a debris bottom inside the channel located between the coast and the island | 0–24 m |

Results

In total, the survey collected 44 specimens of demosponges belonging to 23 species (Table 2), with nine species that are new to science: *Hymerhabdia imperfecta* Bertolino, Costa & Pansini sp. nov., *Axinella cylindrica* Bertolino, Costa & Pansini sp. nov., *A. coronata* Bertolino, Costa & Pansini sp. nov., *Biemna aurantiaca* Bertolino, Costa & Pansini sp. nov., *B. erecta* Bertolino, Costa & Pansini sp. nov., *B. typica* Bertolino, Costa & Pansini sp. nov., *Scopalina cribrosa* Bertolino, Costa & Pansini sp. nov., *Rhizaxinella strongylata* Bertolino, Costa & Pansini sp. nov., *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov. One species, *Hymedesmia (Stylopus) lissostyla* (Bergquist & Fromont, 1988) was reported for the first time in Chile. *Axinella cylindrica* was the species with the largest number of specimens (4) and was recorded at four sites (Table 2). The site with the largest number of collected specimens (14) and species was site E in Seno Magdalena. The geographical distribution of the collected and described species is shown in Table 2.

Table 2 (continued on the next page). List of species with the number of specimens collected at each site and their previously known distribution. Total number of specimens is also given for each site. * = new record for the Chilean fjord region.

| Species | Sites | | | | | | | Distribution | | | | | | |
|---|-------|---|---|---|---|---|---|--------------|---|---|---|---|-------------------|--|
| | A | B | C | D | E | F | G | H | I | L | M | N | outside fjords | outside Chile |
| <i>Hymerabdia imperfecta</i> Bertolino, Costa & Pansini sp. nov. | | | | | 1 | 1 | | | | | | | | |
| <i>Axinella crinita</i> Thiele, 1905 | | | | | | | 2 | 1 | | | | | x | |
| <i>Axinella cylindrica</i> Bertolino, Costa & Pansini sp. nov. | | | | | 1 | 1 | 1 | | | | | | 1 | |
| <i>Axinella coronata</i> Bertolino, Costa & Pansini sp. nov. | | | | | 1 | 1 | 1 | | | | | | | |
| <i>Eurypon miniaceum</i> Thiele, 1905 | | | | | | | | 3 | | | | | x | Antarctica |
| <i>Bienna chilensis</i> Thiele, 1905 | | | | | | | | | | | | | x | Antarctica |
| <i>Bienna lutea</i> Bertolino, Costa & Pansini, 2018 | | | | | | | 1 | | | | | | | |
| <i>Bienna typica</i> Bertolino, Costa & Pansini sp. nov | | | | | | | 1 | | | | | | | |
| <i>Bienna erecta</i> Bertolino, Costa & Pansini sp. nov | | | | | | | 1 | | | | | | | |
| <i>Bienna aurantica</i> Bertolino, Costa & Pansini sp. nov | | | | | | | | 1 | | | | | x | |
| <i>Cliona chilensis</i> Thiele, 1905 | | | | | | | | | 1 | | | | x | |
| <i>Clionaopsis platei</i> (Thiele, 1905) | | | | | | | | | 1 | | | | x | |
| <i>Amphilectus americanus</i> (Ridley & Dendy, 1887) | | | | | | | | | 1 | 2 | | | | |
| <i>Hymedesmia (Stylopus) tissostyla</i> (Bergquist & Fromont, 1988) * | | | | | | | | | 2 | 1 | | | | |
| <i>Latrunculia (Latrunculia) circula</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | | | | | | | | | | 1 | | | x | |
| <i>Clathria (Thalysias) amabilis</i> (Thiele, 1905) | | | | | | | | | | 1 | 1 | | x | Argentina |
| <i>Myxilla (Burtonanchora) araucana</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | | | | | | | | | | | 1 | | x | |
| <i>Myxilla (Ectyomixilla) chilensis</i> Thiele, 1905 | | | | | | | | | | | 1 | | x | Antarctica, Brazil, South Africa |

Table 2 (continued). List of species with the number of specimens collected at each site and their previously known distribution. Total number of specimens is also given for each site.

| Species | Sites | | | | | | | Distribution | | | | | |
|---|-------|---|---|---|----|---|---|--------------|---|---|---|---|-------------------|
| | A | B | C | D | E | F | G | H | I | L | M | N | outside fjords |
| <i>Neopodospongia tipecomarenii</i> Hajdu, Desqueyroux-Faïndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | | | | 1 | | | | | | 1 | | x | |
| <i>Scopalina cribrosa</i> Bertolino, Costa & Pansini sp. nov | 1 | | | | 1 | | | | | | 1 | | |
| <i>Rhizaxinella unica</i> Bertolino, Costa & Pansini sp. nov | | | | | 1 | | | | | | | x | |
| <i>Tethya papillosa</i> (Thiele, 1905) | | | | | 1 | | | | | | | | |
| <i>Darwinella pronzatoi</i> Bertolino, Costa & Pansini sp. nov. | | | | | 1 | | | | | | | | |
| Total specimens collected at each site | 1 | 4 | 3 | 6 | 14 | 1 | 2 | 5 | 3 | 2 | 1 | 2 | |

Results

Class Desmospongiae Sollas, 1885

Subclass Heteroscleromorpha Cárdenas, Pérez & Boury-Esnault, 2012

Order Agelasida Hartman, 1980

Family Hymerhabdiidae Morrow, Picton, Erpenbeck, Boury-Esnault, Maggs & Allcock, 2012

Genus *Hymerhabdia* Topsent, 1892

Hymerhabdia imperfecta Bertolino, Costa & Pansini sp. nov.

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Fig. 2; Table 3

Etymology

The new species is named after the presence of imperfect rhabdostyles.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena E; 44.613885° S, 72.94149° W; depth 30 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 63; MSGN 60889.

Paratype

CHILE – Puerto Cisnes • 1 specimen; Seno Magdalena F (Punta Angostura); 44.6312,35° S, 72.904239° W; depth 25 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 43; DISTAV.

Description

HABITUS. Encrusting, 5 mm thick and 5 cm long (Fig. 2A). Surface rugose and hispid, with visible canals converging towards oscules. Colour in life bright orange (Fig. 2A). Consistency of live specimens friable.

SKELETON. Choanosomal skeleton formed by bundles of long styles and tylostyles with heads embedded in basal layer of rhabdostyles and sinuous sub-tylostyles.

SPICULES. Megascleres: Smooth styles, long and thin, sometimes with modified heads (Fig. 2B), 800–(888.33)–1000 µm long and 5–(7.16)–10 µm thick. Smooth tylostyles 410–(552.5)–700 µm long and 15–(18.9)–25 µm thick (Fig. 2C). Rather short rhabdostyles with heads variable in shape and with pointed or round extremities (Fig. 2D), 140–(252.42)–415 µm long and 7.5–(9.75)–12.5 µm thick. Rhabdostyles often sinuous or modified into oxeas or strongyles (Fig. 2E).

Habitat

Species lives on a rocky cliff at a depth of 25–30 m; Chilean fjords.

Remarks

Out of the nine species of *Hymerhabdia* previously described around the world (Table 3), none have been recorded along Chilean coasts. The only species of this genus from the Southern Hemisphere is *Hymerhabdia oxeata* (Dendy, 1924) recorded at a depth of 183 m in northern New Zealand. *Hymerhabdia imperfecta* sp. nov. differs from *H. oxeata* in having a red colour whereas in *H. oxeata* the colour is dark brown. As to spicules, *H. oxeata* has oxeas whereas the new species has tylostyles and rhabdostyles that are not present in *H. oxeata*. Moreover, the styles of the new species are much larger (Table 3). A comparison with the other 8 species of *Hymerhabdia* (from the Atlantic Ocean and the Mediterranean Sea reported in Table 3) shows remarkable differences in presence or absence of spicules (oxeas, rhabdostongyles, toxostongyles) and in their shape and size.

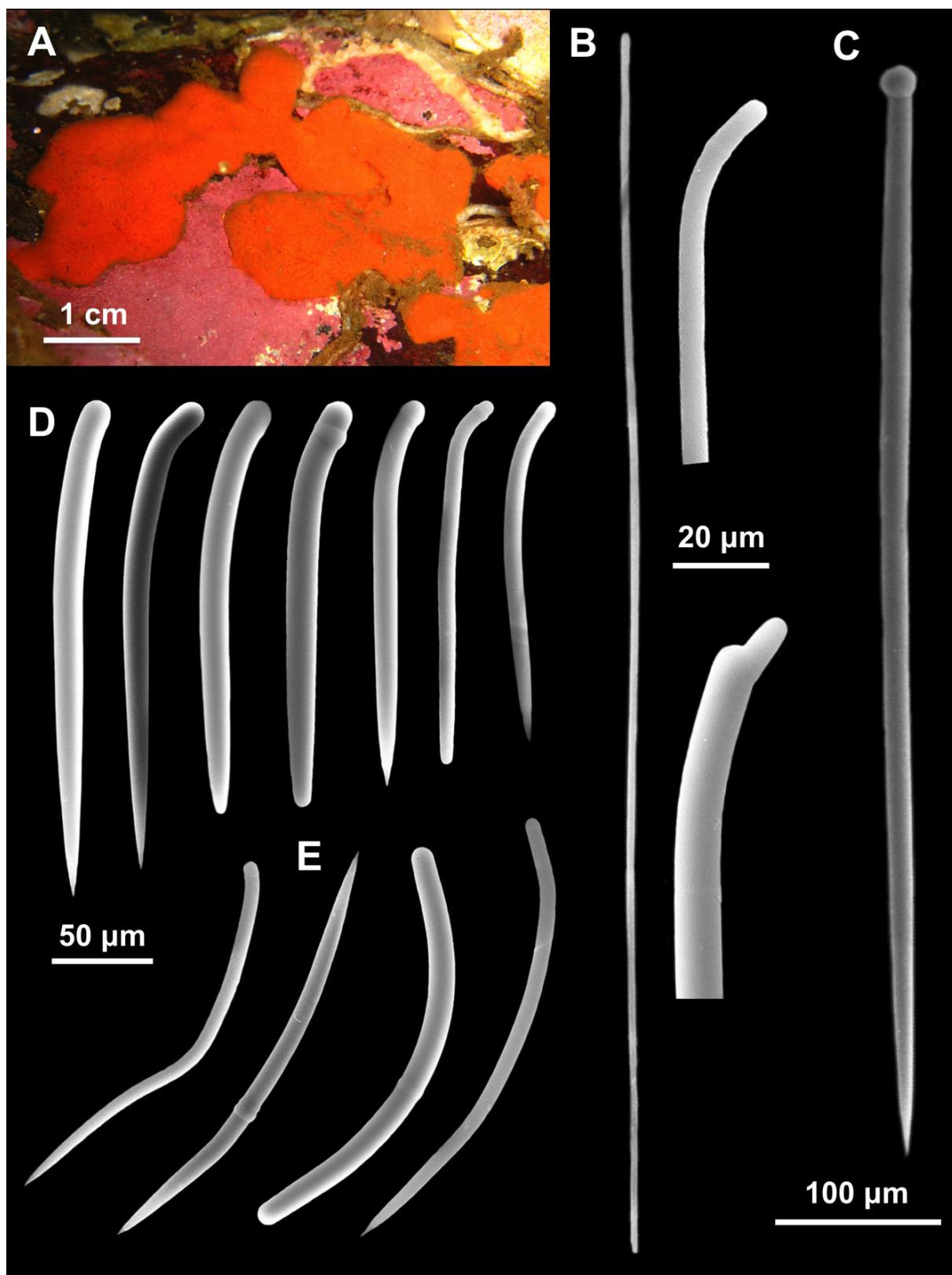


Fig. 2. *Hymerhabdia imperfecta* Bertolino, Costa & Pansini sp. nov., holotype (CILE 63; MSGN 60889). **A.** The holotype in life. **B.** Smooth styles. **C.** Smooth thicker tylostyles. **D.** Rhabdostyles. **E.** Rhabdostyles are often sinuous or modified in oxeas or strogyles.

Table 3 (continued on the next page). Morphological characters and distribution of the species of *Hymenhabdia* Topsent, 1892 of all the world. The distribution refers to that present in the World Porifera Database (van Soest et al. 2020).

| Species | | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|--|---------------------------|-----------------------------|---|---------|---|---|--------------|
| <i>Hymenhabdia imperfecta</i> Bertolino, Costa & Pansini, sp. nov. | Encrusting | Bright red | Hispid | Friable | Styles: 800–(888.33)–1000 × 5–(7.16)–10 Tylostyles: 410–(552.5)–700 × 15–(18.9)–25 Rhabdostyles: 140–(252.42)–415 × 7.5–(9.75)–12.5 | | Chile |
| <i>Hymenhabdia contracta</i> Sarà & Siribelli, 1960 | Encrusting | Golden yellow | — | — | Tylostyles: 512–1600 × 6.2–10 Rhabdostyles: 102–152 × 5–7.5 Rhabdostyngles: 37.5–55 × 7.5–10 | Mediterranean Sea | |
| <i>Hymenhabdia intermedia</i> Sarà & Siribelli, 1960 | Encrusting | Brownish yellow | Hispid | — | Styles I: 510–1480 × 10.5–17 Styles II/Rhabdostyles: 130–250 × 3.5–7 Strongyles: 168–190 × 3.5–7 | Mediterranean Sea, Celtic Sea | |
| <i>Hymenhabdia kobluki</i> van Soest, 2017 | Microlobate encrusting | Dull yellow to beige | Microhispid, no oscules are visible | Firm | Styles I: 632–1176 × 12–36 Styles II: 498–570 × 24–31 Styles III: 264–387 × 9–18 Oxes: 264–424 × 9–(14.9)–19 | Guyana Shelf, Bonaire, Colombian Caribbean | |
| <i>Hymenhabdia oxeynta</i> (Dendy, 1924) | Encrusting | Dark brown | Hispid | — | Oxes: 270 × 12 Styles: 289–1037 × 12.7–34 | New Zealand | |
| <i>Hymenhabdia oxytrunca</i> Topsent, 1904 | Encrusting | Brown, grey | Hispid | — | Styles I: 350–610 × 8–20 Styles II: 260–550 × 7–18 Rhabdostyles I: 180–350 × 6–7.5 Rhabdostyles II: 170–290 × 7–7.5 Oxes: 480–670 × 13–15 | Mediterranean Sea, Azores, Canaries | |
| <i>Hymenhabdia pori</i> Tsuramai, 1969 | Encrusting | Orange/red or yellow/orange | Hispid or papillate | Soft | Styles I: 755–1550 × 13–20 Styles II: 224–600 × 13–17 Strongyles: 207–1080 × 17–22 Strongyles/Toxostyngles: 196–380 × 6.7–11 | Mediterranean Sea | |
| <i>Hymenhabdia reichi</i> Tsuramai, 1969 | Encrusting | Orange/red or yellow/orange | Hispid/pointed papillate | — | Styles: 400–720 × 4.4–10 Strongyles: 280–520 × 6–9 Oxes I: 400–600 × 3.5–11 Oxes II: 100–130 × 2.2–4.4 | Mediterranean Sea | |

Table 3 (continued). Morphological characters and distribution of the species of *Hymenhabdia* Topsent, 1892 of all the world. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (µm) | Distribution |
|--|------------|--------|---------|-------------|--|---|
| <i>Hymenhabdia topsentii</i> Lévi, 1952 | Encrusting | Red | Hispid | — | Styles I: 1600 × 12–13 Styles II: 350–500 × 15–30 Styles III: 20–350 × 4–12 Oxeas: 160–320 × 8–18 | Atlantic Ocean |
| <i>Hymenhabdia typica</i> Topsent, 1892 | Encrusting | — | Hispid | — | Styles and Tylostyles: 650–800 × 10 Rhabdostyles: 80–120 × 8–10 | Mediterranean Sea, Celtic Sea, Azores, Canaries |

Order Axinellida Lévi, 1953
Family Axinellidae Carter, 1875
Genus *Axinella* Schmidt, 1862

Axinella cylindrica Bertolino, Costa & Pansini sp. nov.

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Figs 3–4; Table 4

Eymology

The new species is named after the body shape.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena B; 44.650167° S, 72.89085° W; depth 20 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 1; MSGN 61493.

Paratypes

CHILE – Puerto Cisnes • 1 specimen; Seno Magdalena D; 44.614863° S, 72.958312° W; depth 18 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky bottom by scuba diving; CILE 37; DISTAV • 1 specimen; Seno Magdalena E; 44.613885° S, 72.941490° W; depth 15 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 23; DISTAV • 1 specimen; Seno Magdalena D; 56.616666° S, 72.716666° W; depth 20 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky wall by scuba diving; CILE 81; DISTAV.

Description

HABITUS. All of the specimens have a regular cylindrical shape (5–7 cm high, ca 1 cm in diameter) (Fig. 3A). Surface lightly hispid, consistence firm. Colour in life bright yellow (Fig. 3A).

SKELETON. Skeleton formed by network of thin ascending plurispicular fibres forming quadrangular meshes with abundant spongin (Fig. 3B). Choanosome differentiated in axial compressed region (Fig. 3D) and extra-axial plumoreticulate part (Fig. 3C–D). Ectosome formed by erect spicule brushes, hispidating sponge surface, supported by terminal part of choanosomal ascending fibres (Fig. 3C–D).

SPICULES. Megascleres: Styles smooth, straight or slightly curved, with regular, round heads (Fig. 4A), 700–(832.5)–960 µm long and 20–(25.2)–32.5 µm thick in holotype. Rhabdostyles smooth with pronounced basal bend (Fig. 4B), 240–(296.5)–435 µm long and 15–(17)–20 µm thick in holotype. Oxeas smooth, more or less folded, 197.5–(346)–425 µm long and 12.5–(18.7)–22.5 µm thick in holotype. The thinnest ones are almost straight or slightly flexuous (Fig. 4C). Measurements of spicule of all collected specimens (holotype and paratypes) are reported in Table 4.

Habitat

This species lives on a rocky cliff covered by coralline algae, at a depth between 15 and 20 m.

Remarks

We have recorded two new species of the genus *Axinella* and have therefore chosen to make a single discussion after their description.

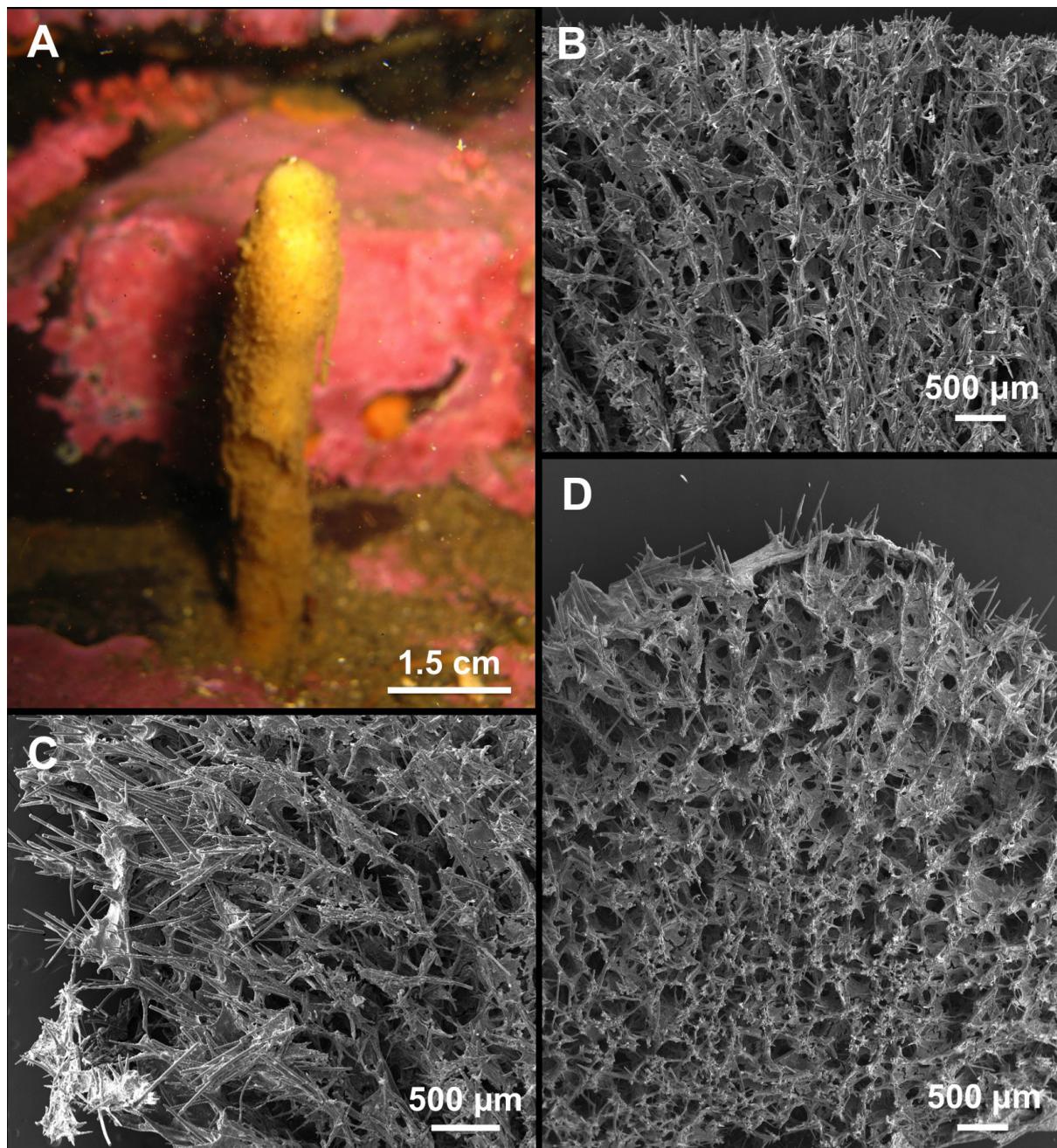


Fig. 3. *Axinella cylindrica* Bertolino, Costa & Pansini sp. nov., holotype (CILE 1; MSGN 61493). **A.** The holotype in life. **B.** Skeleton formed by a network of thin ascending plurispicular fibres. **C.** Extra-axial pumoreticulate skeleton. **D.** Skeleton differentiated in two regions, axial compressed reticulated and extra-axial plumoreticulate.

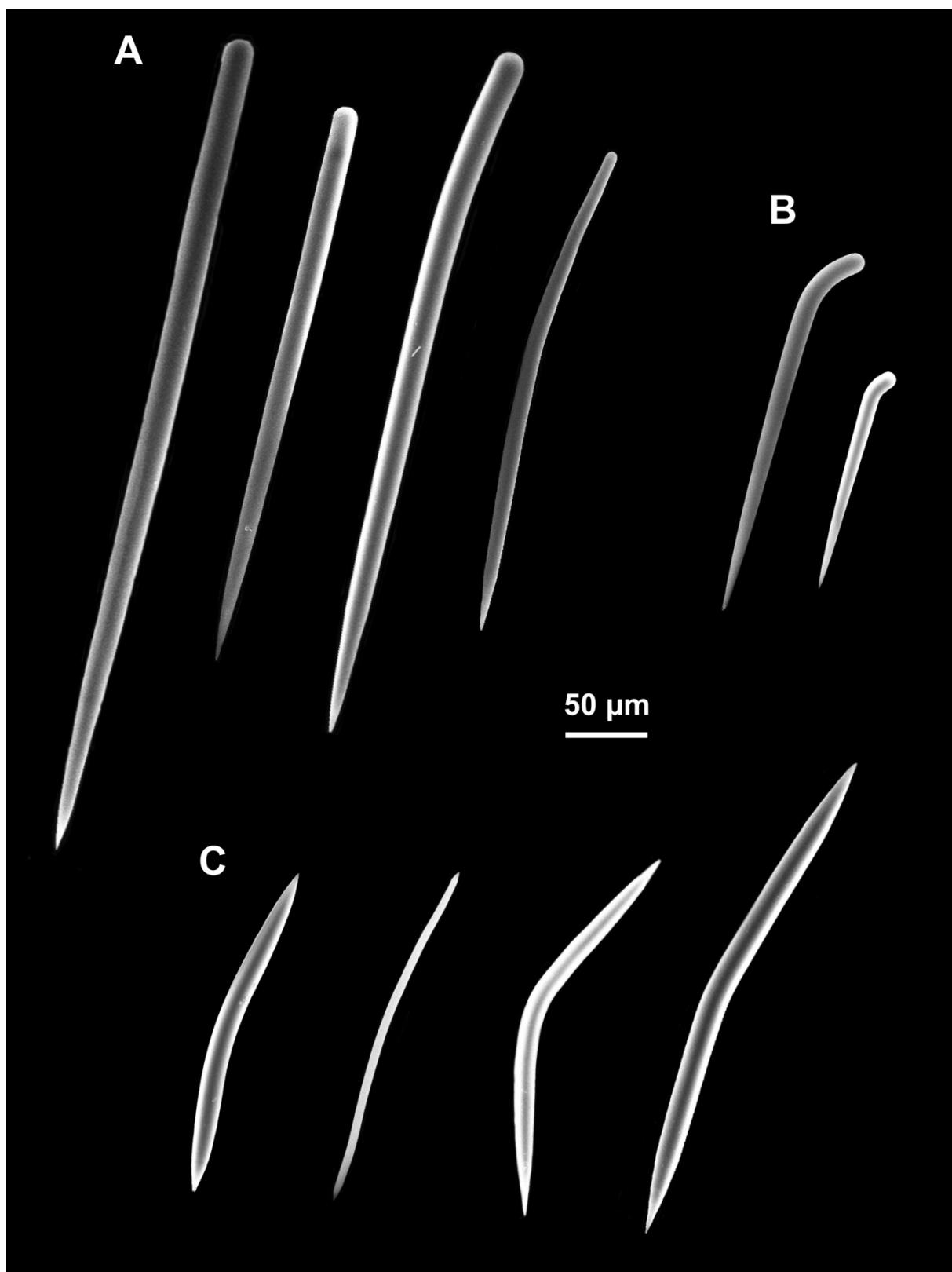


Fig. 4. Spicules of *Axinella cylindrica* Bertolino, Costa & Pansini sp. nov., holotype (CILE 1; MSGN 61493). **A.** Smooth styles. **B.** Rhabdostyles. **C.** Oxeas.

Table 4. Comparison of spicule dimensions (in μm) among specimens of *Axinella cylindrica* Bertolino, Costa & Pansini sp. nov.

| Specimens | Styles | Rhabdostyles | Oxeas |
|---------------------|---|--|---|
| CILE 1 | 700–(832.5)–960 \times | 240–(296.5)–435 \times | 197.5–(346)–425 \times |
| Holotype | 20–(25.2)–32.5 | 15–(17)–20 | 12.5–(18.7)–22.5 |
| (MSGN 61493) | | | |
| CILE 23 | 513–(686.6)–1005 \times 21–(26.2)–29 | 238–(323.5)–451 \times 13–(19)–26 | 283–(399.5)–492 \times 16–(20)–29 |
| CILE 37 | 360–(614.7)–930 \times 2.5–(20)–30 | 117.5–(253.4)–390 \times 12.5–(17.9)–22.5 | 182.5–(345.3)–425 \times 5–(17.9)–22.5 |
| CILE 81 | 204–(620.6)–887 \times 8–(13.6)–23 | 194–(274.4)–418 \times 5–(14.3)–21 | 224–(393.2)–612 \times 10–(17.4)–26 |

Axinella coronata Bertolino, Costa & Pansini sp. nov.

urn:lsid:zoobank.org:act:29550A2F-F048-40D5-B473-906EB62DC478

Figs 5–6; Table 5

Etymology

The new species is named after the crown of thin styles surrounding single tylostyles.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena B; 44.650167° S, 72.89085° W; depth 20 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 22; MSGN 61494.

Paratypes

CHILE – Puerto Cisnes • 1 specimen; Seno Magdalena E (Punta Tabla); 44.613885° S, 72.94149° W; depth 22 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky cliff by scuba diving; CILE 9; DISTAV • 1 specimen; Seno Magdalena C; 44.631113° S, 72.929130° W; depth 25 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky wall by scuba diving; CILE 15; DISTAV.

Description

HABITUS. Fan shaped sponge, 2 cm high, very thin (2 mm maximum), with short basal stem. Surface very hispid with tufts of macroscleres coming out from surface (Fig. 5A–B). Consistency hard but friable. Colour in life bright yellow (Fig. 5A–B).

SKELETON. Plumose, formed by multi-spicular primary tracts, radiating from axis towards surface (Fig. 5C–D), ending in single tylostyle surrounded by crown of thin styles that projects slightly through sponge surface (Fig. 5E–F).

SPICULES. Megascleres: Tylostyles slightly curved (Fig. 6A), 1300–(1962)–2200 μm long and 10–(17.42)–25 μm thick. Long, smooth and thin styles, with shaft slightly thickened in distal third (Fig. 6B), 1200–(1500)–1800 μm long and 2.5–(3.3)–5 μm thick. Styles to tylostyles or subtylostyles more or less bent near head as true rhabdostyles (Fig. 6C), 460–(505)–590 μm long and 10–(15.62)–20 μm thick. Thin and sinuous styles, with round heads and slightly rounded points (Fig. 6D), 460–(556.5)–600 μm long and 2.5–(3.5)–5 μm thick.

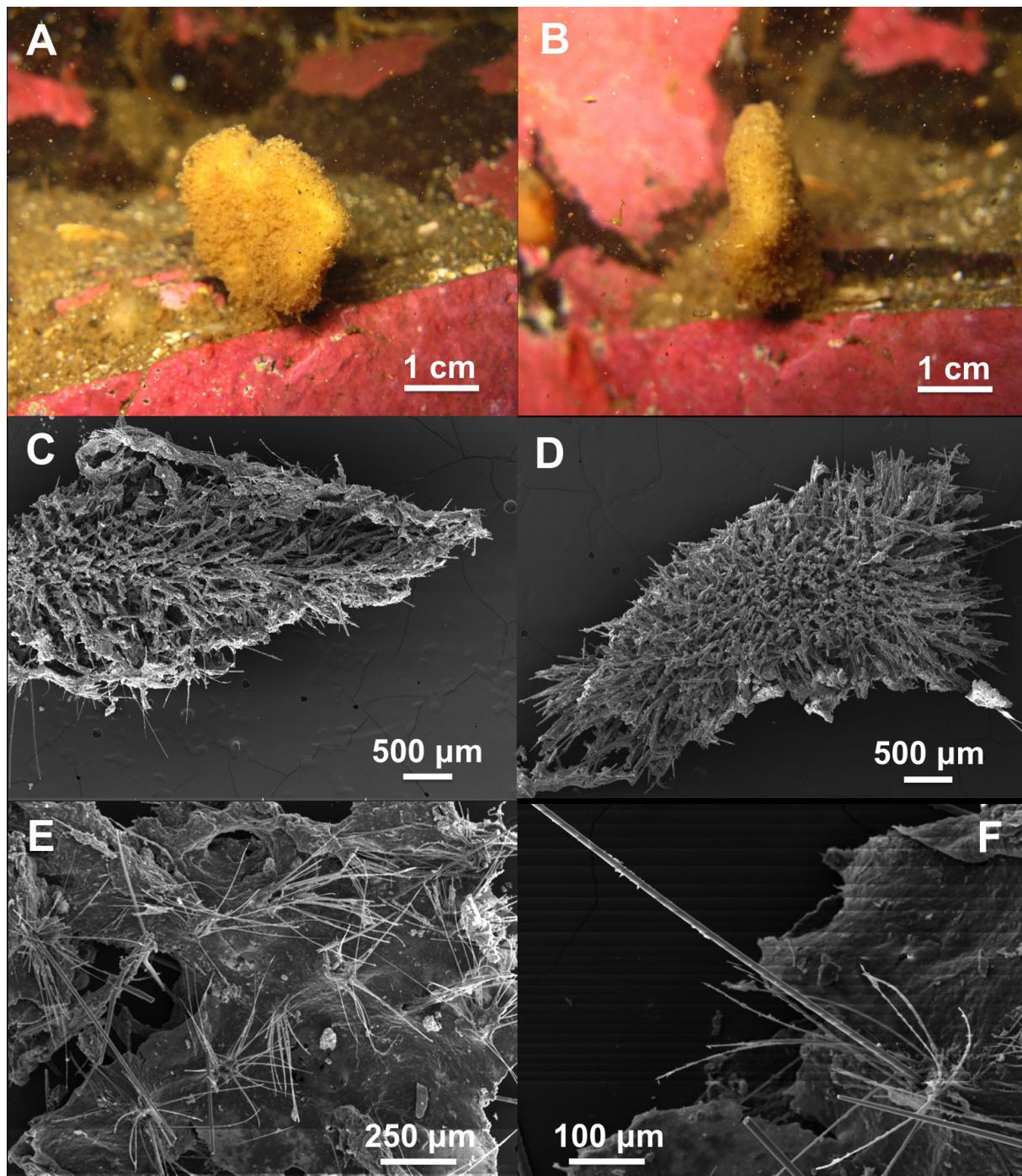


Fig. 5. *Axinella coronata* Bertolino, Costa & Pansini sp. nov., holotype (CILE 22; MSGN 61494). **A–B.** The holotype in life. **C.** Plumose multisicular skeleton. **D.** Cross section of the skeleton. **E.** Ectosome. **F.** Magnification of a single tylostyle, surrounded by a crown of thin styles.

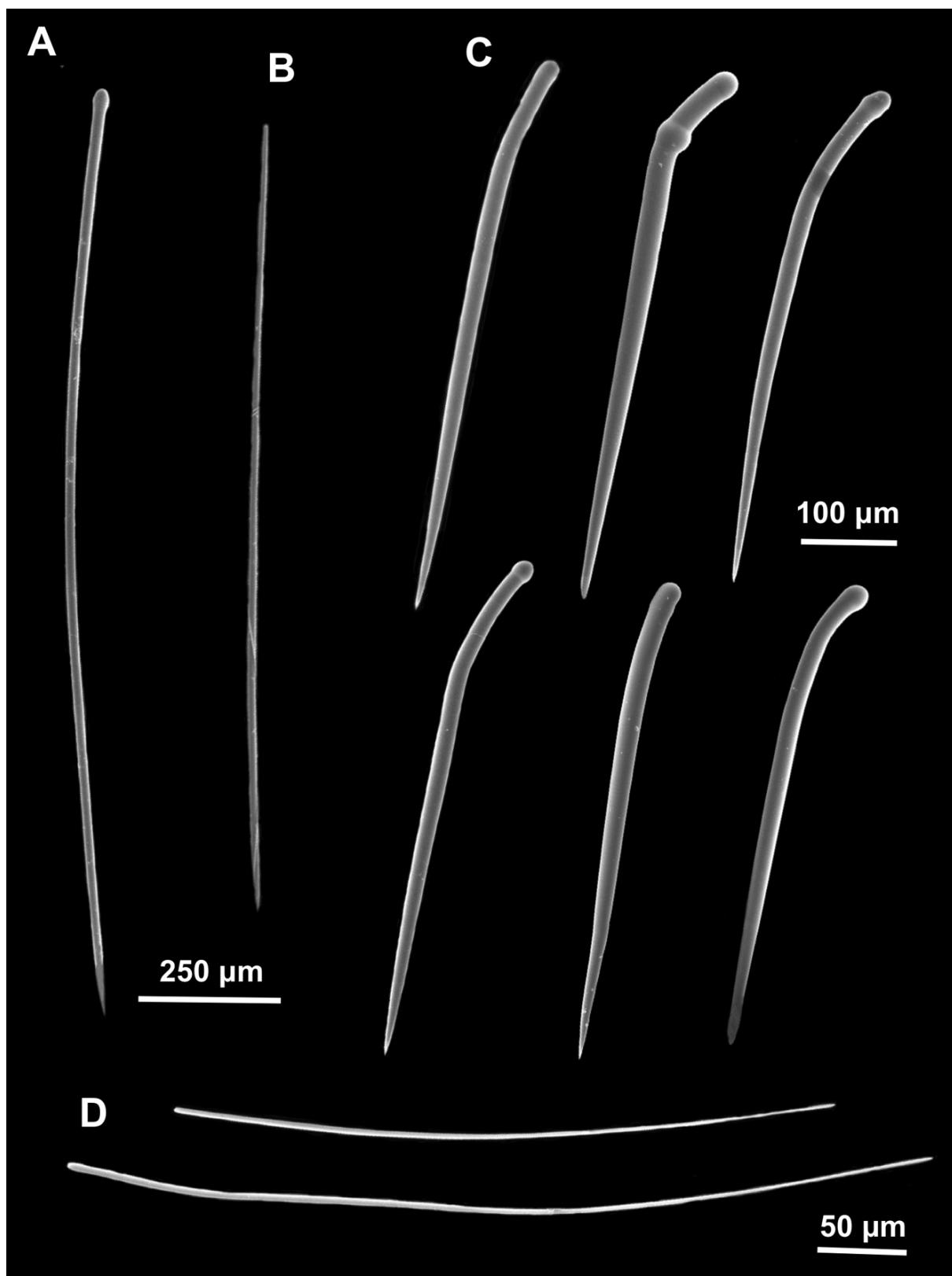


Fig. 6. Spicules of *Axinella coronata* Bertolino, Costa & Pansini sp. nov., holotype (CILE 22; MSGN 61494). **A.** Tylostyles. **B.** Styles. **C.** Styles bend near the head similar to rhabdostyles. **D.** Thin and sinuous styles.

Table 5 (continued on the next two pages). Morphological characters and distribution of the two new species and the other species of *Axinella* Schmidt, 1862 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest et al. 2020).

| Species | | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|--|---|-----------------------|-------------------|---------------------|---|----------------------------|---|
| <i>Axinella cylindrica</i> Bertolino, Costa & Pansini sp. nov. | Regular cylindrical shape, 7 cm high | Bright yellow | Lightly hispid | Firm | Styles: 700–(832.5)–960 × 20–(25.2)–32.5 Rhabdostyles: 240–(296.5)–435 × 15–(17)–20 Oxeas: 197.5–(346)–425 × 12.5–(18.7)–22.5 (Holotype measure) | | Chilean Fjords |
| <i>Axinella coronata</i> Bertolino, Costa & Pansini sp. nov. | Fan shaped, 2 cm high | Bright yellow | Very hispid | Hard but friable | Tylostyles: 1300–(1962)–2200 × 10–(17.42)–25 Styles: 460–(505)–590 × 10–(15.62)–20 Thin sinuous styles: 460–(556.5)–600 × 2.5–(3.5)–5 | | Chilean Fjords |
| <i>Axinella antarctica</i> (Koltun, 1964) | Globular, slightly elongated, 5.5 cm high | Brown | — | — | Oxeas: 500–1300 × 21–50 μm Straight or sinuous styles: 980–2400 × 30–52 | | Antarctica, New Zealand |
| <i>Axinella arvensis</i> (Hentschel, 1912) | Ramified, 17 cm high | Orange | — | — | Oxeas: 336–440 × 13–21 Styles: 336–440 × 13–21 | | East African coral coast, Banda Sea, Southeast Papua New Guinea, North, Northwest Australian coast |
| <i>Axinella austroliensis</i> Bergquist, 1970 | Ramified | Light red | Hispid | — | Oxeas: 140–400 × 9–16 Styles: 120–130 × 1.5–16 | | New Zealand |
| <i>Axinella brondstedi</i> Bergquist, 1970 | Erect, irregularly lump-shaped | Light yellowish | Hispid | — | Oxeas: 400 × 6 | | New Zealand |
| <i>Axinella corrugata</i> (George & Wilson, 1919) | Lamellated, corrugated | Bright orange, red | Hispid | Firm | Styles sometimes modified to oxeas Styles I: (stout) 400–700 × 10–12 Styles II: (slender) 400–500 × 3–8 | | Gulf of Mexico, Caribbean Sea, Southern Atlantic Sea (Brazil) |
| <i>Axinella crassa</i> (Carter, 1885) | Sub-stipitate, flabellate | Wax yellow | — | Firm, resilient | Oxeas: 1524 × 10.4 | | Southeast Australia |
| <i>Axinella crinita</i> Thiele, 1905 | Arborescent, very ramified | Brown | — | Soft | Styles I: 600–750 × 20–25 Styles II: 200–250 × 10–15 Subtylostyles: 400–500 × 2 | | Chilean coasts |

Table 5 (continued). Morphological characters and distribution of the two new species and the other species of *Axinella* Schmidt, 1862 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|---|---|--|---|---------------------------------|---|---|
| <i>Axinella elegans</i> (Dendy, 1924) | Cylindrical stalk base, dichotomising above in two places, 4.2 cm high | White after preservation | — | Flexible and elastic | Styles I: 550 \times 15 Styles II: 270 \times 12 Oxeas: 270 \times 12 | New Zealand |
| <i>Axinella globula</i> Brøndsted, 1924 | Hemispherical shape | Grey | Very hispid | — | Styles: 250–400 \times up to 22 | New Zealand |
| <i>Axinella kirki</i> Dendy, 1897 | Massive hemispherical with short conical process | Yellowish/grey | Rugose | — | Oxeas Styles Strongyles up to 1000 \times 9 | South Australia |
| <i>Axinella lesueuri</i> Topsent, 1932 | Arborescent | — | — | — | Styles I: 90–110 \times 5.5–7.5 Styles II: 160–180 \times 4–5 Oxeas: 160–180 \times 4–5 | Australia |
| <i>Axinella lifouensis</i> Lévi & Lévi, 1983 | Fan-shaped with cylindrical stalk base | — | Hispid | — | Styles I: 2300–2500 \times 25–35 Styles II: 400–750 \times 12–25 Oxeas: 300–1100 \times 20–25 | New Caledonia |
| <i>Axinella loribellae</i> Alvarez & Hooper, 2009 | Fan-shaped, thin lamellae, 1–5 mm thick, single or bifurcate, 3 cm high and 4 cm wide | Burnt orange alive, brown in alcohol | Smooth, velvety, marked irregularly with ribs | Flexible, easy to tear, rubbery | Styles: 196.3–(274.6±47.7)–352.9 \times 8.33–(13.5±2.7)–18.3 Sinuous strongyles: 103.6–(190.1±74)–396.3 \times 6.01–(10.3±1.9)–13.09 Oxeas: 148.5–(226.8±63.6)–440.2 \times 4.8–(8.7±2.1)–12.9 | Northern Australia between Darwin Harbour and the Wessel Is. |
| <i>Axinella meloniformis</i> Carter, 1885 | Globular | Yellow, red, orange | Corrugated | Firm | Oxeas: 635 \times 17 | Southeast Australia (Port Phillip Heads Marine National Park) |
| <i>Axinella natalensis</i> (Kirkpatrick, 1903) | Cup-shaped | Pale yellow | — | — | Styles: 450–1200 \times 12–13 Oxeas: 300 \times 12 | Southeast Africa (Natal) |

Table 5 (continued). Morphological characters and distribution of the two new species and the other species of *Axinella* Schmidt, 1862 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|--|---|--|--|---|--|---|
| <i>Axinella pilifera</i> Carter, 1885 | Lobate | Orange, brown | — | Soft | Oxeas I: 275 \times 7–8.4 Oxeas II: 330 \times 8 | Southeast Australia (Port Phillip Heads Marine National Park) |
| <i>Axinella plumosa</i> (Lévi & Lévi, 1983) | Plumose with peduncle | Light grey | — | — | Oxeas I: 80–150 \times 8–12 Oxeas II: 250–400 \times 8–12 | New Caledonia |
| <i>Axinella profunda</i> Ridley & Dendy, 1886 | Stipitate, branching dichotomously in one plane | Yellowish grey | Hispid | — | Oxeas: 84–550 \times 20–37 | North and South Pacific Abyssal Province |
| <i>Axinella richardsoni</i> Bergquist, 1970 | Long growing, concave lamella, lobate | Dull orange | Hispid | Firm, compressible | Styles: 232–392 \times 12–20 Oxeas: 208–435 \times 6.9–20 | New Zealand |
| <i>Axinella sinoxea</i> Alvarez & Hooper, 2009 | Single or multiple fans, 4–6 mm thick, 8–14 cm long and up to 30 cm wide, on common stalk; erect, uniplanar with digitate to irregular margins or bifurcate tips | Orange, pale yellow or beige with light pink tinge alive; brown-grey in alcohol | Smooth, but slightly rough to touch | Soft, floppy, flexible, slightly, compressible | Thick Styles: 159–245 \times 7–17 Thin Styles: 97–201 \times 2–6 Raphids: 192.9 (227.2 \pm 14.9)–249.6 \times 0.8 (2 \pm 0.6)–3 | Common in the vicinity of East Point Sponge Gardens, Darwin Harbour, deep water in Western Australia |
| <i>Axinella symbiotica</i> Whitelegge, 1907 | More or less flabellate, with a series of irregular terminal branches, 18 cm height | Yellowish grey | Rather brittle, harsh to the touch | Slightly compressible | Styles: 200–250 \times 10–15 Curved styles/Strongyles: 250–300 \times 15–20 Oxeas: (very scarce and may not belong to the sponge) | New South Wales, Australia |
| <i>Axinella torquata</i> Brøndsted, 1924 | Lump shape | Corrugate | Slightly hispid | — | Styles: 170–520 \times up to 12 Oxeas: 325–570 \times up to 14 | New Zealand |
| <i>Axinella villosa</i> Carter, 1885 | Digitiform | — | Hispid | — | Oxeas: 330 \times 10.6 | Southeast Australia (Port Phillip Heads Marine National Park) |

Habitat

Recorded on rocky cliffs and walls covered by coralline algae, at a depth between 20 and 25 m.

Remarks

The attribution of *A. cylindrica* sp. nov. and *A. coronata* sp. nov. to the genus *Axinella* Schmidt, 1862 is based on the skeleton architecture characterised by a choanosomal skeleton differentiated in the axial (compressed or vaguely reticulated) and extra-axial (plumoreticulated) regions. The only species of this genus present on the Chilean coast is *A. crinita* Thiele, 1905. This species differs from the two newly described species in external shape (very ramified with cylindrical branches (Desqueyroux 1972)), absence of rhabdostyles (present in *A. cylindrica* sp. nov.) and presence of long thin styles with curved head (absent in *A. coronata* sp. nov.). In Table 5, the other geographically close species of *Axinella* and other species recorded in the Southern Hemisphere are reported. All of these species differ from *A. cylindrica* sp. nov. and *A. coronata* sp. nov. in the external morphology, and the type and size of spicules. Moreover *A. cylindrica* sp. nov. differs from all the other species in the presence of rhabdostyles (Table 5).

Order Biemnida Morrow, 2013
Family Biemnidae Hentschel, 1923
Genus *Biemna* Gray, 1867

Biemna aurantiaca Bertolino, Costa & Pansini sp. nov.
[urn:lsid:zoobank.org:act:DD1D8BC5-DCF9-4294-9FA4-80FFD911417C](https://doi.org/10.1186/1878-0090-20-147)
Figs 7–8; Table 6

Etymology

The new species is named after its orange colour.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena G; 44.763254° S, 72.891581° W; depth 15 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky slope by scuba diving; CILE 20; MSGN 61497.

Paratype

CHILE – Puerto Cisnes • 1 specimen; same collection data as for holotype; CILE 6; DISTAV.

Description

HABITUS. Cushion-shaped sponge, almost spherical, 3.5 cm in diameter and ca 2 cm thick. Canal system visible, converging towards round flush oscula. Surface slightly hispid, colour in life bright orange (Fig. 7A–B). Consistency soft and friable.

SKELETON. Plumoreticulate choanosome (Fig. 7C) with spongin fibres cored by bundles of spicules typical of Biemnidae. Sponge surface appears slightly hispid due to single protruding spicules (Fig. 7C).

SPICULES. Megascleres: Smooth sinuous styles, with regular, round heads (Fig. 8A), 700–(842.5)–920 µm long and 2.5–(4.8)–7.5 µm thick. Tylostyles sometimes slightly bent near head (Fig. 8B), 120–(269.25)–380 µm long and 5–(12.9)–20 µm thick. Microscleres: two categories of raphids; I, long and thin raphids, curved or slightly sinuous, 105–(129.5)–200 µm long, with microspined extremities (Fig. 8C); II, short and thick raphidoid microxeas with small scattered spines (Fig. 8D), 27.5–(35.6)–40 × 2 µm long. C-shaped sigmas with microspined extremities, divided into two size categories: sigmas I, 130–(160.8)–170 µm long and × 5–(5.7)–7.5 µm thick (Fig. 8E); sigmas II, 12.5–(13.12)–17.5 µm long (Fig. 8F).

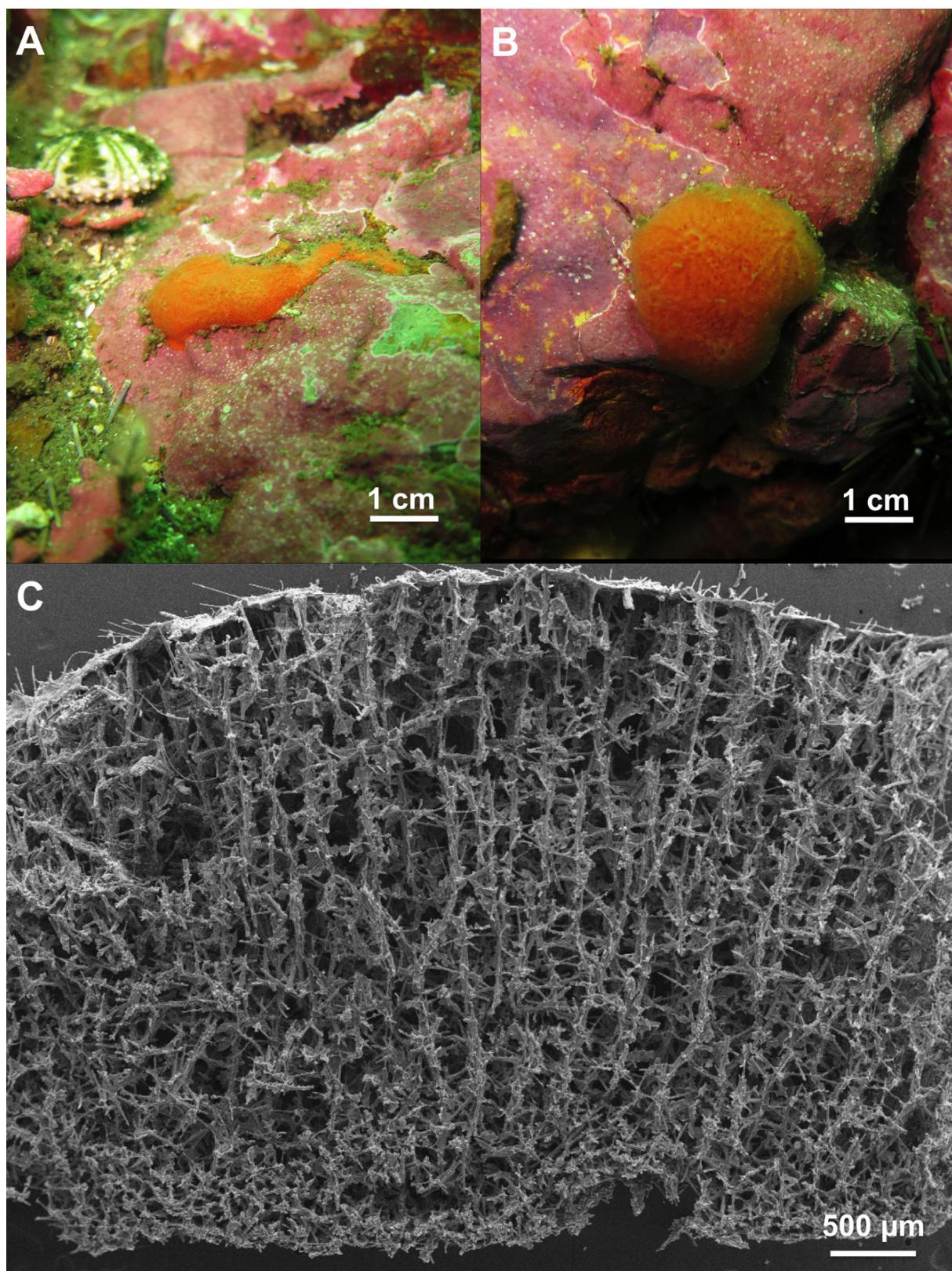


Fig. 7. *Biemna aurantiaca* Bertolino, Costa & Pansini sp. nov., holotype (CILE 20; MSGN 61497). **A–B.** The holotype in life. **C.** Plumoreticulate skeleton.

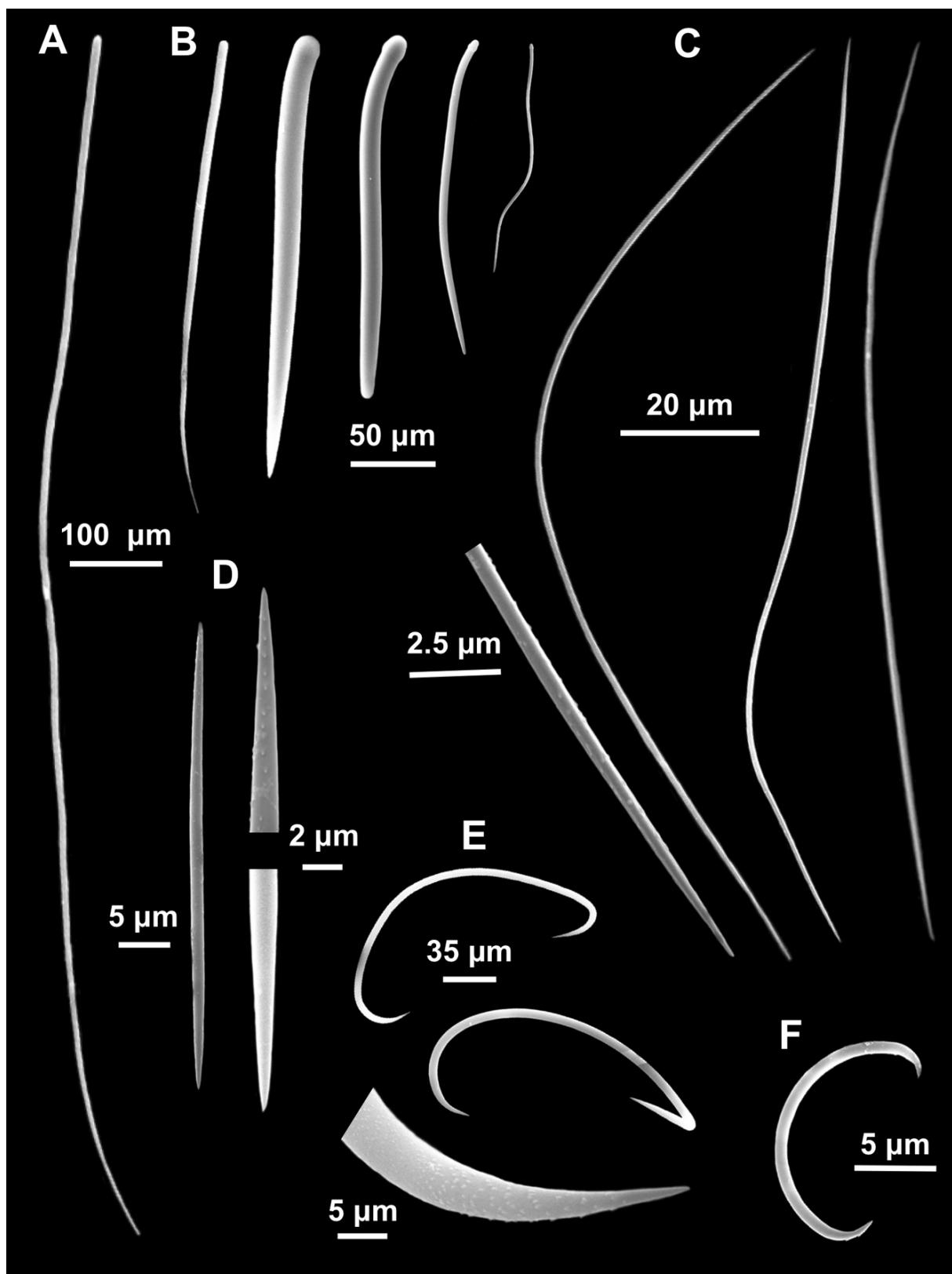


Fig. 8. Spicules of *Biemna aurantiaca* Bertolino, Costa & Pansini sp. nov., holotype (CILE 20; MSGN 61497). **A.** Sinuous styles. **B.** Tylostyles. **C.** Raphids I. **D.** Raphids II. **E.** Sigma I. **F.** Sigma II.

Habitat

Species lives at a depth of 20 m on a vertical wall.

Remarks

We have recorded three new species of the genus *Biemna* and have therefore decided to make combined remarks after their description.

Biemna erecta Bertolino, Costa & Pansini sp. nov.

[urn:lsid:zoobank.org:act:F0A045BB-EE04-4239-94C8-C3025A29B450](http://lsid:zoobank.org:act:F0A045BB-EE04-4239-94C8-C3025A29B450)

Figs 9–10; Table 6

Etymology

The new species is named after its growth form.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena D; 44.614863° S, 72.958312° W; depth 20 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a vertical wall by scuba diving; CILE 74; MSGN 61496.

Description

HABITUS. Fan-shaped lamellar sponge, about 3 mm thick and 3.5 cm long, with basal peduncle. Surface very hispid caused by megascleres protruding from surface. Colour in life pale yellow, tending to orange (Fig. 9A–B). Consistency soft, compressible and friable in dry state.

SKELETON. Plumose skeleton formed by dense fibres of spicules whose extremities protrude through surface of sponge, resulting in hispid appearance (Fig. 9C). Choanosome differentiated into two regions composed of axial compressed and extra-axial plumose fibres (Fig. 9D–E). Basal peduncle formed by ascending central fibres with radial spicules (Fig. 9F).

SPICULES. Megascleres: Styles smooth and sinuous, with regular round heads (Fig. 10A), 1810.5–(2033.3)–2295 µm long and 15–(17.5)–20 µm thick; tylostyles/subtylostyles slightly curved near the head (Fig. 10B), 350–(607.5)–960 µm long and 10–(18.75)–30 µm thick. Microscleres: Two categories of raphids; I, sinuous and thin raphids (Fig. 10C), 87.5–(115)–167.5 µm long; II, short and thick raphids, with small scattered spines, similar to raphidoid microxeas, 23.4–(36.55)–42.5 µm long and 2 µm thick (Fig. 10D). C-shaped sigmas with microspined extremities clearly divided into two size categories: sigmas I, (Fig. 10E), 140–(159.5)–180 µm long and 5–(5.7)–7.5 µm thick; and sigmas II, (Fig. 10F), only 10–(14.5)–17.5 µm long.

Habitat

Species lives on a vertical wall at a depth of 20 m.

Remarks

We have recorded three new species of the genus *Biemna* and have therefore decided to make combined remarks after their description.

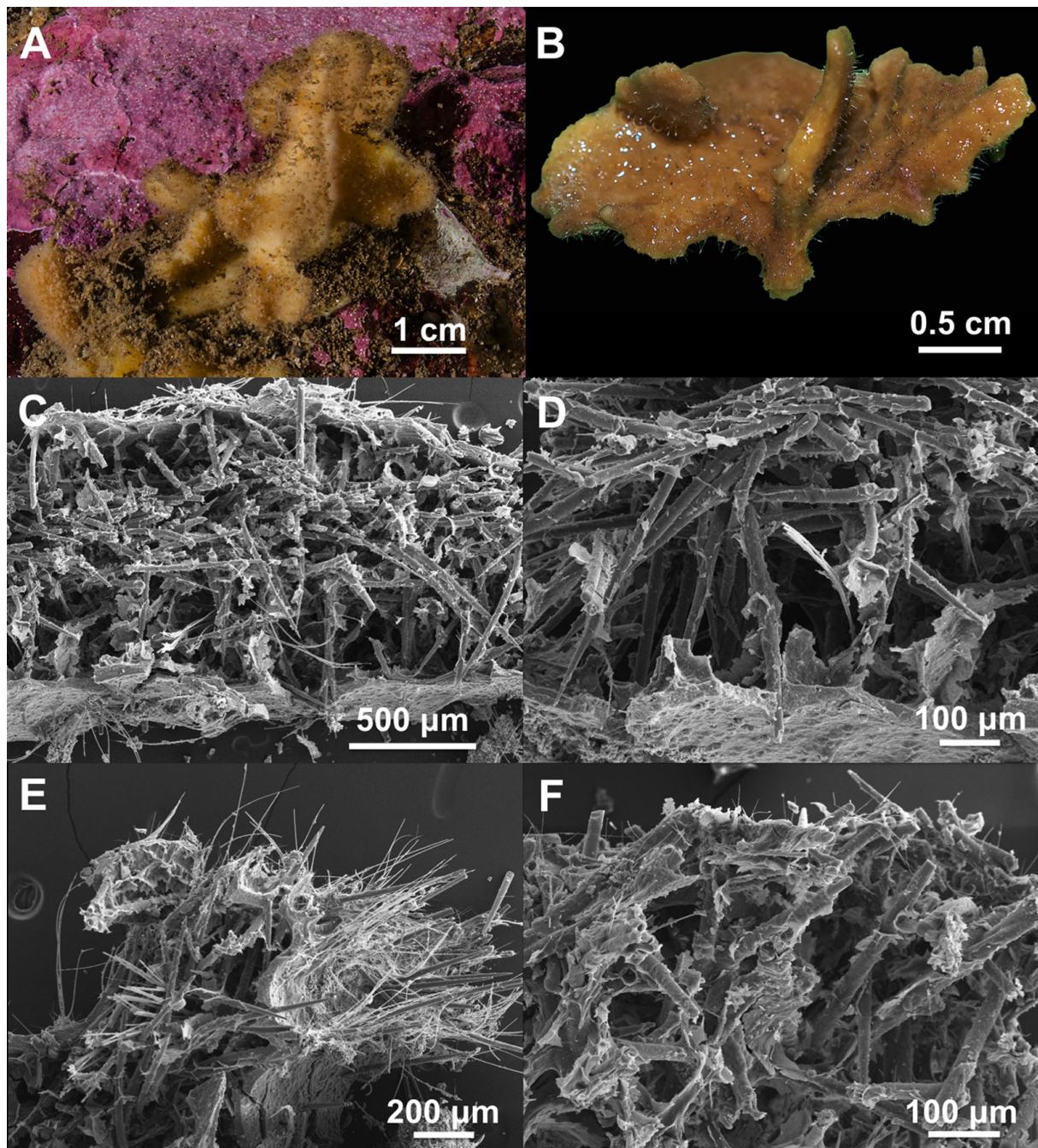


Fig. 9. *Biemna erecta* Bertolino, Costa & Pansini sp. nov., holotype (CILE 74; MSGN 61496). **A–B.** The holotype in life. **C.** Plumose skeleton. **D–E.** Choanosome. **F.** Basal peduncle skeleton.

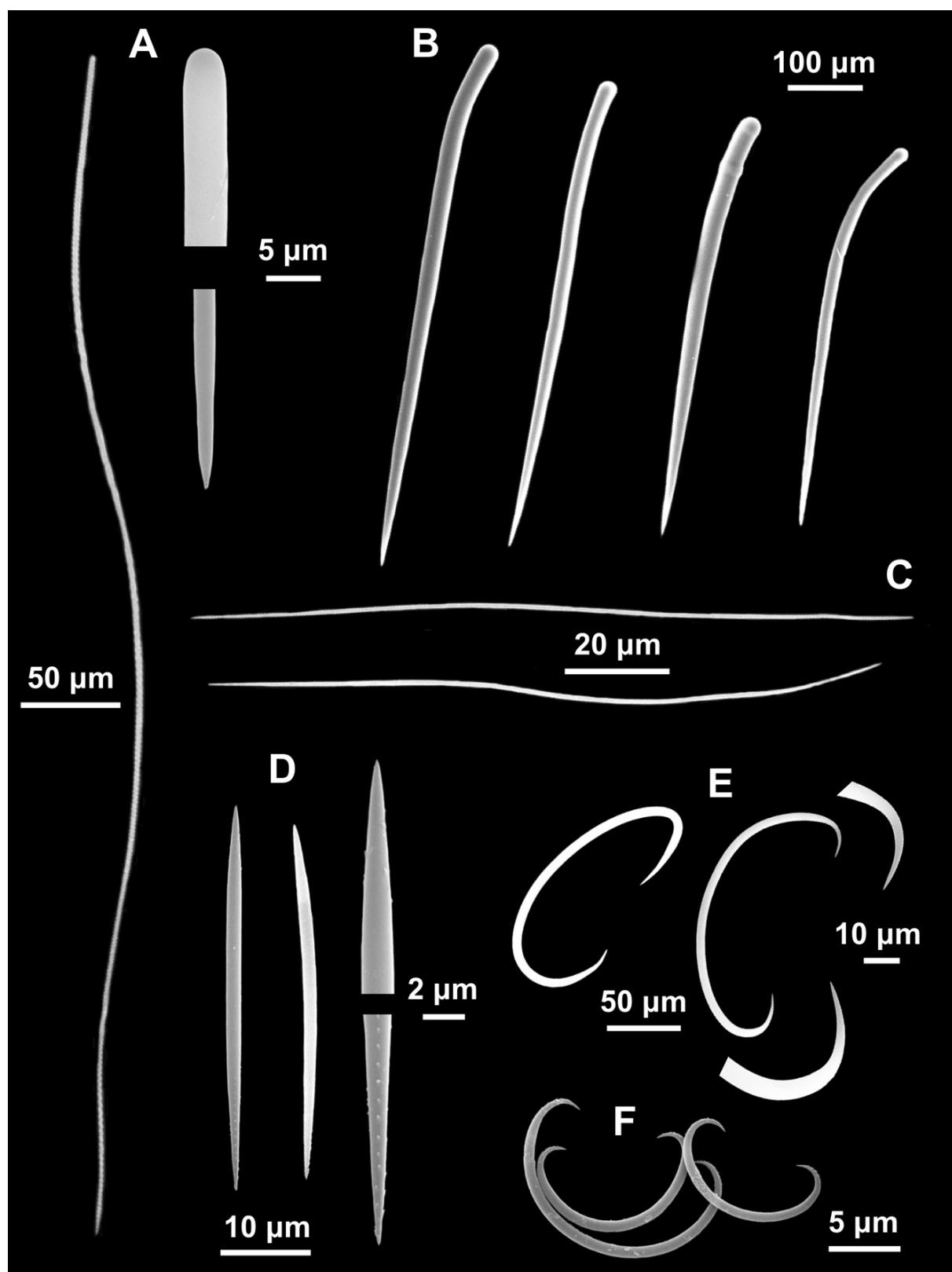


Fig. 10. Spicules of *Biemna erecta* Bertolino, Costa & Pansini sp. nov., holotype (CILE 74; MSGN 61496). **A.** Styles. **B.** Tylostyles/subtylостyles. **C.** Raphids I. **D.** Raphids II. **E.** Sigma I. **F.** Sigma II.

Biemna typica Bertolino, Costa & Pansini sp. nov.
urn:lsid:zoobank.org:act:00C6E35C-E9FE-4F3D-A752-1A91D11BAC1C
Figs 11–12; Table 6

Etymology

The new species is named after its spicule complement typical of the genus.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena G; 44.763254° S, 72.891581° W; depth 15 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky slope by scuba diving; CILE 28; MSGN 61495.

Description

HABITUS. Massive, cushion shaped sponge, rather regular, ca 2 cm long and 2 cm thick, with very hispid surface. Colour in life bright red, remaining unchanged out of the water. Sponge compressible and friable (Fig. 11A).

SKELETON. Structure typical of Biemnidae, plumose and with variable development of spongin fibres (Fig. 11B). Choanosome plumoreticulate, with spongin fibres covered by bundles of spicules (styles) and oxeote spicules that – protruding through sponge surface – make it hispid. Ectosomal skeleton composed of brushes of megascleres (Fig. 11C–D).

SPICULES. Megascleres: Styles I smooth, straight, slightly sinuous and thin, with regular, round heads (Fig. 12A), 1275–(1450.8)–1632 µm long and 5.2–(6.5)–7.8 µm thick; styles II smooth, curved and very thin (Fig. 12B), 293.6–(340.3)–365.22 µm long and 2–(2.25)–2.5 µm thick; styles III straight, curved or doubly bent, sometimes modified to rhabdostyles (Fig. 12C), 220–(409.7)–640 µm long and 10.4–(13.76)–20.8 µm thick. Microscleres: two raphid categories; raphids I, straight or sinuous (Fig. 12D), 87.5–(115)–167.5 µm long; raphids II, short and thick, similar to raphidioïd microxeas with one microspined tip (Fig. 12E), 23.4–(36.55)–42.5 µm long. C-shaped sigmas with microspined extremities clearly divided into two size categories: sigmas I, (Fig. 12F), 145.5–(136.7)–152 µm long and 2.6 µm thick; sigmas II, (Fig. 12G), 12.5–(19.8)–22.5 µm long.

Habitat

Species lives on a rocky slope covered by coralline algae, at a depth between 15 and 20 m.

Remarks

The three new species, *Biemna aurantiaca* sp. nov., *B. erecta* sp. nov. and *B. typica* sp. nov., differ from each other primarily in their external morphology and colour (see descriptions above and Table 6). Regarding megascleres, *B. aurantiaca* sp. nov. has smaller styles and tylostyles than *B. erecta* sp. nov., while *B. typica* sp. nov. has only three categories of styles, with no tylostyles. Furthermore, the microscleres differ in size between the three new species which are, therefore, clearly distinguishable from each other. From the cold waters of the Southern Hemisphere, twelve species of the genus *Biemna* are known (Table 6). Two of these have been reported on the Chilean coast: *B. chilensis* Thiele, 1905 and *B. lutea* Bertolino, Costa & Pansini, 2019. The new species described in the present study differ from these two species in the presence of more categories of styles and different forms of spicules. Additionally, only one category of raphids is present in *B. chilensis* (see Table 6). *Biemna typica* sp. nov. differs from all other *Biemna* listed in Table 6 in the presence of only one category of styles. *Biemna erecta* sp. nov. and *B. aurantiaca* sp. nov. have spicule complements similar to *B. rhabderemoides*

Bergquist, 1961 and *B. rhabdostyla* Uriz, 1988, but the latter two species possess much smaller styles and subtylostyles (Table 6).

In conclusion, the three species described here (*Biemna aurantiaca* sp. nov., *B. erecta* sp. nov and *B. typica* sp. nov.) differ from each other in the size and shape of the spicules, and should be considered as new species.

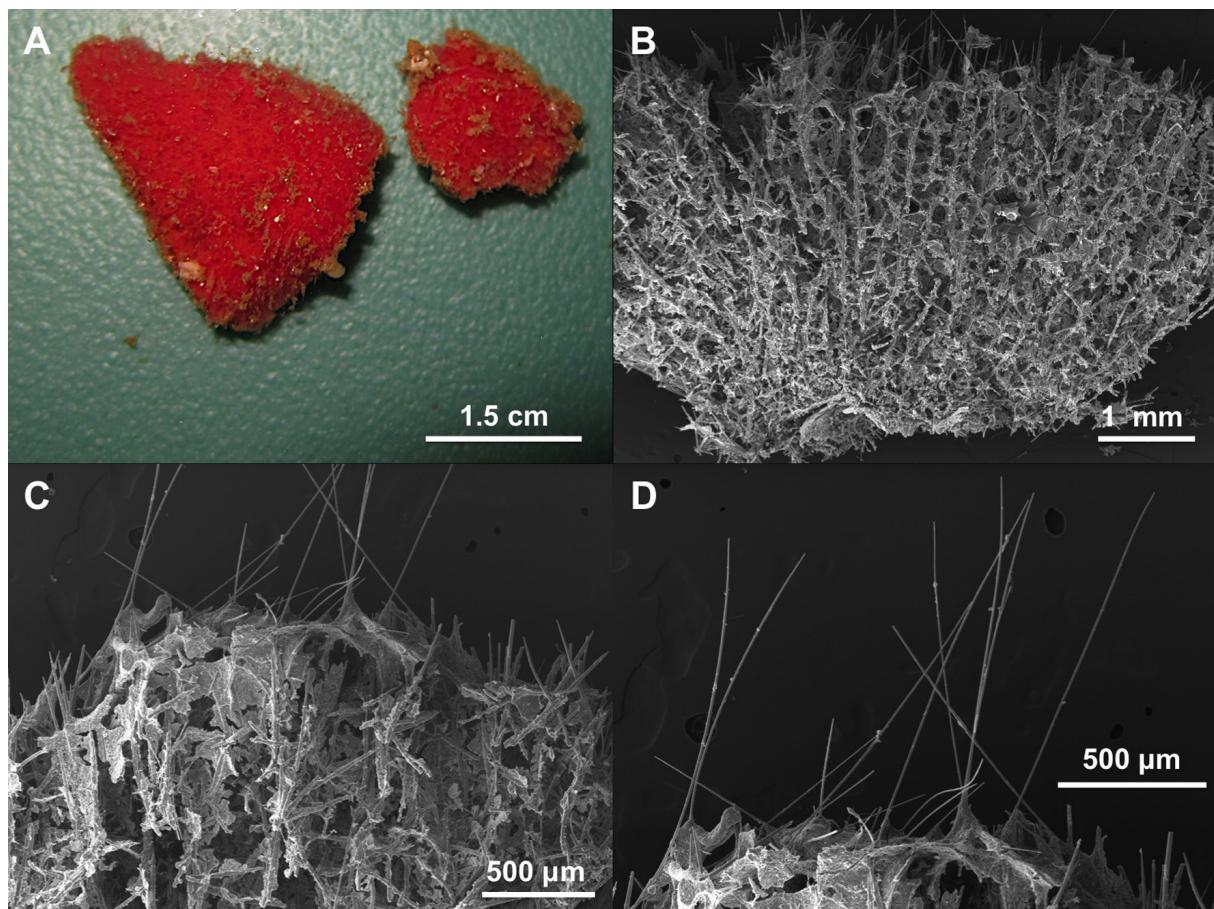


Fig. 11. *Biemna typica* Bertolino, Costa & Pansini sp. nov., holotype (CILE 28; MSGN 61495). **A.** The holotype in life. **B.** Plumeous skeleton. **C–D.** Ectosomal skeleton.

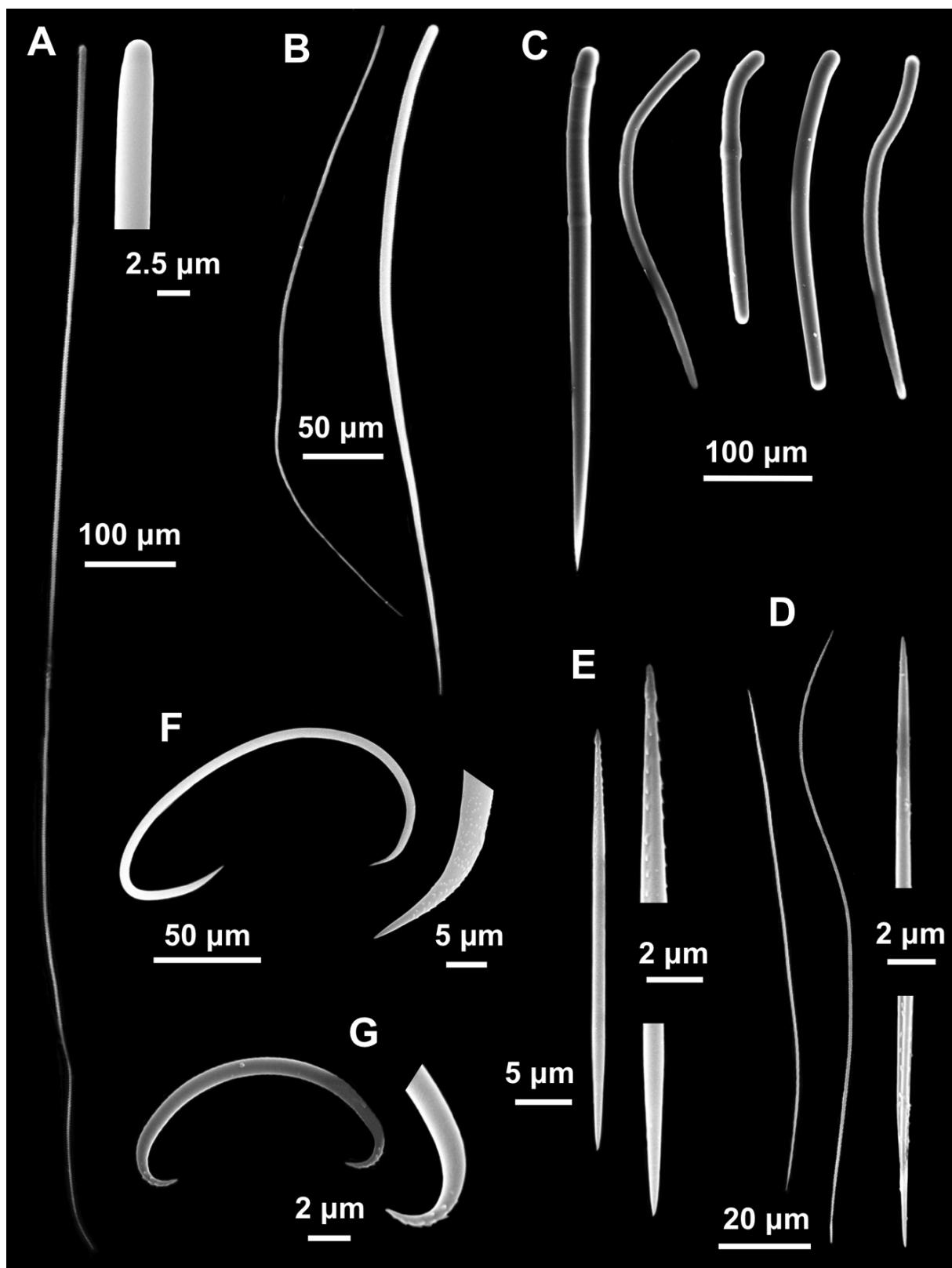


Fig. 12. Spicules of *Biemna typica* Bertolino, Costa & Pansini sp. nov., holotype (CILE 28; MSGN 61495). **A.** Styles I. **B.** Styles II. **C.** Styles III, sometimes modified to rhabdostyles. **D.** Raphids I. **E.** Raphids II. **F.** Sigmas I. **G.** Sigmas II.

Table 6 (continued on the next two pages). Morphological characters and distribution of the species of *Biemna* Gray, 1867 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|--|--|-------------------------------------|-------------------|--------------------------------------|---|--|
| <i>Biemna aurantiaca</i> Bertolino, Costa & Pansini sp. nov. | Cushion-shaped, almost spherical | Orange tending to red | Lightly hispid | Friable | Styles: 700–(842.5)–920 \times 2.5–(4.8)–7.5 Tylostyles: 120–(269.25)–380 \times 5–(12.9)–20 Raphids I: 105–(129.5)–200 Raphids II: 27.5–(35.6)–40 \times 2 Sigma I: 130–(160.8)–170 \times 5–(5.7)–7.5 Sigma II: 12.5–(13.12)–17.5 Styles: 1810.5–(2033.3)–2295 \times 15–(17.5)–20 Tylostyles/Subtylostyles: 350–(607.5)–960 \times 10–(18.75)–30 | Chile |
| <i>Biemna erecta</i> Bertolino, Costa & Pansini sp. nov. | Fan-shaped, lamellar with basal peduncle | Pale yellow tending to orange | Very hispid | Soft, compressible and friable | Raphids I: 87.5–(115)–167.5 Raphids II: 23.4–(36.55)–42.5 Sigma I: 140–(159.5)–180 \times 5–(5.7)–7.5 Sigma II: 10–(14.5)–17.5 Styles I: 1275–(1450.8)–1632 \times 5.2–(6.5)–7.8 Styles II: 293.6–(340.3)–365.22 \times 2–(2.25)–2.5 Styles III: 220–(409.7)–640 \times 10.4–(13.76)–20.8 | Chile |
| <i>Biemna typica</i> Bertolino, Costa & Pansini sp. nov. | Massive cushion- shaped | Bright red | Very hispid | Friable and compressible | Raphids I: 87.5–(115)–167.5 Raphids II: 23.4–(36.55)–42.5 Sigma I: 145.5–(136.7)–152 \times 2.6 Sigma II: 12.5–(19.8)–22.5 Styles: 300–350 \times 6–10 Raphids: 115–130 \times 1 Microx eas: 55–68 \times 2 Sigma I: 35–40 Sigma II: 18–22 Sigma III: 10 Microstylos: 35–60 \times 1 | South Africa, Southwest Madagascar |
| <i>Biemna anisotaxa</i> Lévi, 1963 | Massive | Yellow | Cavernous | Friable | | |

Table 6 (continued). Morphological characters and distribution of the species of *Bienna* Gray, 1867 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|---|---|-------------------|--------------------------|-------------------------------------|-------------|---|--|
| <i>Bienna chilensis</i> Thiele, 1905 | Lamellate to digitate; flabellate-digitate; spherical | Yellow | Conulose | Friable | | Styles: 664–1016 \times 25–29 Raphids: 360–424 Sigma I: 46–55 Sigma II: 18 | Falklands/Malvinas, East Antarctic Wilkes Land, Kerguelen Islands Chile, |
| <i>Bienna flabellata</i> Bergquist, 1970 | Erect, lamellate | Dull yellow | Hispid | Firm | | Styles: 266–496 \times 10–30 Microxes I: 90–140 Microxes II: 28–50 Sigma I: 27–40 | New Zealand |
| <i>Bienna lutea</i> Bertolini, Costa & Pansini 2019 | Massive sponge, rather irregular, about 5 cm long and 3 cm thick | Dull yellow | Conulose, very hispid | Soft due to the flaky texture | | Styles: 530–(627.5)–660 \times 5–(18.5)–32.5 Raphids: 112.5–(130.6)–142.5 \times 1 Microxes: 35–(37)–40 \times 1 Sigma I: 140–(159.5)–180 \times 5–(5.7)–7.5 | Chile |
| <i>Bienna macrorhaphis</i> Hentschel, 1914 | Almost spherical, up to 1 cm in size | Yellowish grey | Conulose | Soft and easy to tear | | Styles: 664–1016 \times 25–29 Raphids: 360–424 \times 1 Styles: 1070 \times 32 Raphids: 120 | East Antarctica |
| <i>Bienna novazealandiae</i> Dendy, 1924 | Crust rather thin | White | — | — | | Microxes: I 96 \times 3 Microxes: II 20 Sigma I: 56–140 Sigma II: 20 | New Zealand |
| <i>Bienna pedonculata</i> Lévi, 1963 | Massive peduncolate claviform | Yellowish grey | Hispid | — | | Styles: 350–550 \times 30–50 Raphids: 100–130 Sigma I: 80–95 \times 8–9 Sigma II: 18–20 Sigma III: 9–10 | South Africa |

Table 6 (continued). Morphological characters and distribution of the species of *Bienna* Gray, 1867 recorded in the Southern Hemisphere. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|--|---|--------------------------------|--|-----------------------|---|--|--------------|
| <i>Bienna polyphylla</i> Lévi, 1963 | Erect | Yellowish grey | Corrugate porous | — | Raphids: 100–110 \times 1 Raphidoid microxesas: 35–55 Sigma I: 130–160 \times 6–9 Sigma II: 18–20 Sigma III: 9–10 | Styles: 450–550 \times 35–45 | South Africa |
| <i>Bienna rhabdermioides</i> Bergquist, 1961 | Encrusting to massive | Bright yellow | Hispid, conulose | Firm | Substylostyles: 420–470 \times 10–16 Raphids: 90 | Styles: 420–480 \times 10–16 | South Africa |
| <i>Bienna rhabdostyla</i> Uriz, 1988 | Thickly encrusting | Dirty brown after preservation | Glabrous, with some conules terminating in spicule brushes | Fragile | Microxesas: 50 \times 3 Sigma I: 42–45 Sigma II: 12–14 | Styles: 800–1210 \times 13–27 Rhabdostyles: 130–215 \times 8–11 Raphids: 123–160 | South Africa |
| <i>Bienna rufescens</i> Bergquist & Fromont, 1988 | Encrusting to massive with prominent ocular fistules | Purple, yellow | Quite smooth and finely hispid | Soft and compressible | Microxesas I: 90–130 Microxesas II: 45–73 Sigma I: 30–50 Sigma II: 20–32 Sigma III: 13–20 | Styles: 350–480 \times 5–11.5 Microxesas I: 90–130 Microxesas II: 45–73 Sigma I: 30–50 Sigma II: 20–32 Sigma III: 13–20 | New Zealand |
| <i>Bienna strongylota</i> Rios & Cristobo, 2006 | Erect sponges, supported by stalk 5 to 10 mm long and 1.5 to 2 mm in diameter at the base | White in ethanol | Hispid, rough to the touch | — | Strongyles: 400–(553) 640 \times 19–(26.5) 30 Raphids: 130–(179) 238 Microxesas: 58–(72) 86 Sigma I: 35–(82) 100 \times 2 Sigma II: 10–(16) 22 \times 1 | Antarctica | |

Order Scopalinida Morrow & Cárdenas, 2015

Family Scopalinidae Morrow, Picton, Erpenbeck, Boury-Esnault, Maggs & Allcock, 2012

Genus *Scopalina* Schmidt, 1862

Scopalina cibrosa Bertolino, Costa & Pansini sp. nov.

[urn:lsid:zoobank.org:act:2C1EE9CB-2950-4449-AD77-D32D9A781E9C](https://doi.org/10.1545/ejt.2020.0001)

Fig. 13; Table 7

Etymology

The new species is named after the cibrose surface of the sponge.

Type material

Holotype

CHILE – Puerto Cisnes • Jacaf Canal N; 44.271194° S, 73.209222° W; depth 20 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky slope by scuba diving; CILE 32; MSGN 61498.

Description

HABITUS. Encrusting sponge 5 mm thick and 10 cm long (Fig. 13A). Surface slightly conulose with visible oscula, ostia and canal network. Slightly hispid. Colour in life reddish orange (Fig. 13A). Consistency soft.

SKELETON. Choanosomal skeleton consisting of bundles of thin styles entirely enclosed in spongin. Dendritic fibres rising up from basal spongin plate. Low spicular density.

SPICULES. Megascleres: Smooth styles, bent near the head, ending with tip not pointed but almost rounded (Fig. 13B–C), 520–(1616.15)–2091 µm long and 2.5–(23.25)–32.5 µm thick.

Habitat

Species lives at a depth of 20 m, on a rocky slope covered by coralline algae.

Remarks

From five species of the *Scopalina* genus known in the Southern Hemisphere (Table 7), only *Scopalina bunkerii* Goodwin, Jones, Neely & Brickle, 2011 has been recorded from Chilean coast by Bertolino *et al.* (2019). The new species differs from *S. bunkerii* in having a very spiky surface and by the presence of smaller styles (Table 7). *Scopalina cibrosa* sp. nov. differs from *S. australiensis* (Pulitzer-Finali, 1982) from Eastern Australia in its external morphology, having an erect habit, large body and spicule size, but much smaller styles (Table 7). *Scopalina cibrosa* sp. nov. differs from *S. erubescens* Goodwin, Jones, Neely & Brickle, 2011 from the Falklands/Malvinas in its pale pink colour, a conulose surface, and styles that are four times shorter than those of *S. erubescens* (Table 7). *Scopalina cibrosa* sp. nov. differs from *S. hapalia* (Hooper, Cook, Hobbs & Kennedy, 1997) from Australia both in the colour and the presence of strongyles, which are lacking in the new species. Finally, regarding species of the Southern Hemisphere, *S. cibrosa* sp. nov. differs from *S. incrassata* (Lendenfeld, 1887) from Australia by its larger styles. The nine species of *Scopalina* reported from the Northern Hemisphere differ from *S. cibrosa* in the size of spicules, and often in their shape (Table 7). We, therefore, propose that *Scopalina cibrosa* sp. nov. should be considered as a species new to science.

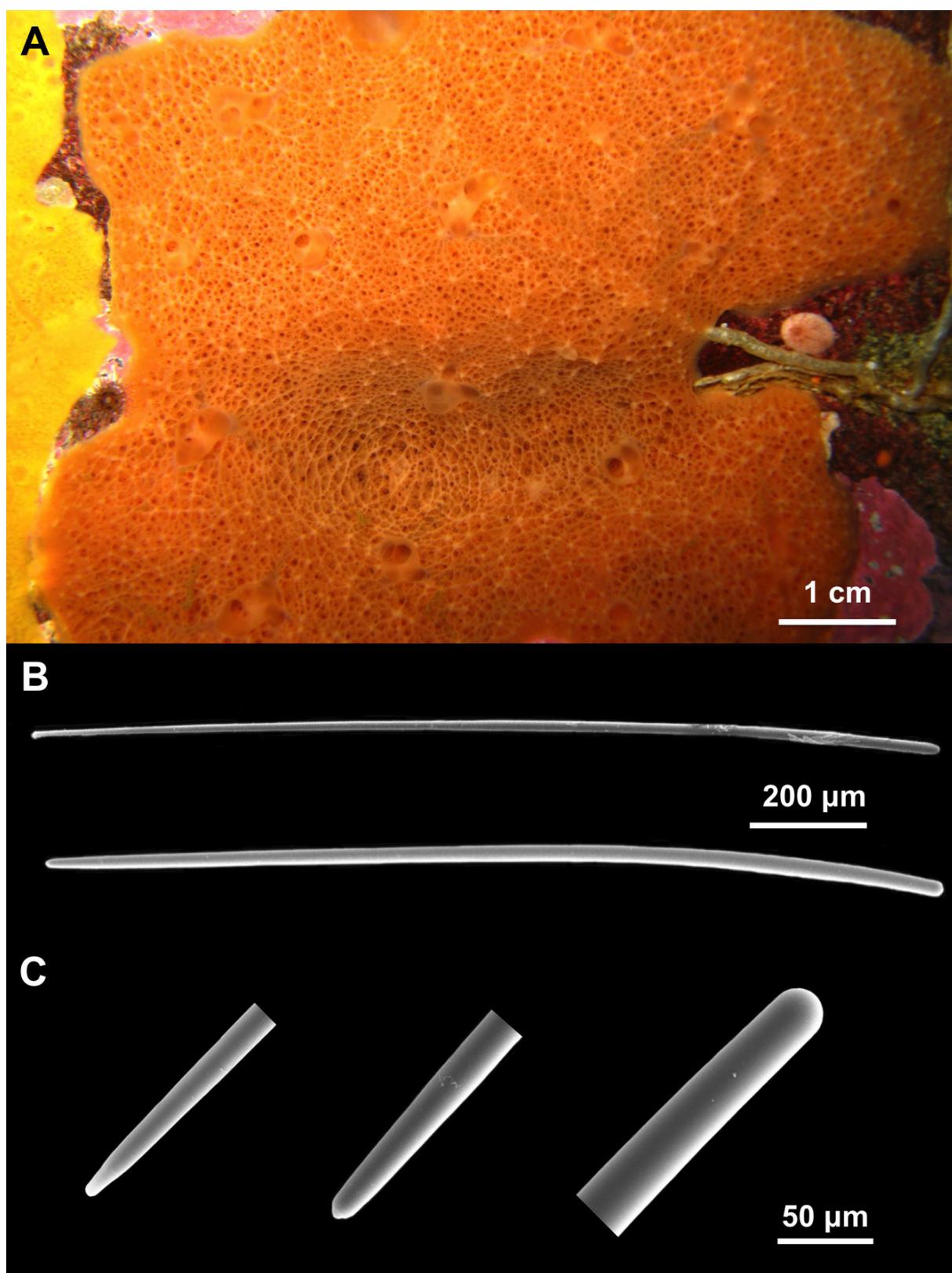


Fig. 13. *Scopalina cibrosa* Bertolino, Costa & Pansini sp. nov., holotype (CILE 32; MSGN 61498). **A.** The holotype in life. **B.** Styles. **C.** Magnification of the style ends.

Table 7 (continued on the next page). Morphological characters and distribution of the species of *Scopalina* Schmidt, 1862. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (µm) | Distribution |
|--|--|--|---------------------------|---|---|---------------------------|
| <i>Scopalina cribrosa</i> Bertolino, Costa & Pansini sp. nov. | Encrusting | Reddish orange | Slightly hispid | Soft | Styles: 520–(1616.15)–2091 × 2.5–(23.25)–32.5 | Chile |
| <i>Scopalina agoga</i> (de Laubenfels, 1954) | Subspherical, 4 cm high and 5–6 cm lateral dimension | Rose, red verging slightly towards purple | — | Spongy | Oxeas: 280–300 × 2–10 | Palau, Caroline Islands |
| <i>Scopalina australiensis</i> (Pulitzer-Finali, 1982) | Growing erect, 25 × 20 × 12 mm; cushion shaped, 45 × 25 mm wide, 20 mm thick | Orange in life, light orange/brown after preservation | — | Softly elastic, resilient | Styles: 430–600 × 4–9.5/11 | Eastern Australia |
| <i>Scopalina azurea</i> Bibiloni, 1993 | Encrusting, 2 × 2 cm in diameter | Blue in alcohol | Irregular | Soft | Styles: 430–739 × 6–8 | Mediterranean Sea |
| <i>Scopalina blanensis</i> Blanquer & Uriz, 2008 | Encrusting, 2 × 3 × 0.4 cm | Salmon to pale orange in life, cream in alcohol | Conulose | Fleshy, extremely soft in life, easily torn | Styles: 380–(600)–800 × 2.3–(5.3)–9 | Mediterranean Sea |
| <i>Scopalina bunkerii</i> Goodwin, Jones, Neely & Brickle, 2011 | Thin encrusting | Rusty orange | Spiky | — | Styles: 694–1741 | Falklands/Malvinas, Chile |
| <i>Scopalina canariensis</i> Blanquer & Uriz, 2008 | Thick encrusting, 0.5 to 1 cm thick, 4 × 3 cm | Bright orange in life, beige in alcohol | Smooth, strongly conulose | Fleshy | Styles: 160–(199)–399 × 1.9–2.5 | Canarian Islands |
| <i>Scopalina centensis</i> Blanquer & Uriz, 2008 | Thickly encrusting, 1.5 mm thickness | Bright yellow-orange in life, beige in alcohol | Smooth and conulose | Compressible and fleshy | Styles: 480–(537)–603 × 3.4–(5)–6.8 | Alboran Sea |
| <i>Scopalina erubescens</i> Goodwin, Jones, Neely & Brickle, 2011 | Thick crust | Pale pink | Conulose | — | Styles: 331–(395)–459 × 9.4–(13)–15.6 | Falklands/Malvinas |
| <i>Scopalina hapalia</i> (Hooper, Cook, Hobbs & Kennedy, 1997) | Thickly encrusting, massive bulbous, stoloniferous or elongate ridges | Bright orange to dark orange alive, pale orange-brown in ethanol | Sharply pointed | Soft, membranous, easily torn, fragile | Styles: 375–(583.5)–1130 × 3–(8.1)–15 Stongyles: 182–(231.3)–275 × 1–(2.1)–2.5 | Australia |

Table 7 (continued). Morphological characters and distribution of the species of *Scopalina* Schmidt, 1862. The distribution refers to that present in the World Porifera Database (van Soest *et al.* 2020).

| Species | Shape | Colour | Surface | Consistency | Spicules (μm) | Distribution |
|---|---------------------------------|-------------------------------------|-------------------|---|--|--|
| <i>Scopalina hispida</i> (Hechtel, 1965) | Encrusting, 1–3 mm thick | Light orange, pale beige in alcohol | Uneven and hispid | Soft, limy, delicate | Styles: 493–1193 \times 5–12 | Caribbean Sea, Venezuelan coasts, Bermuda |
| <i>Scopalina incrustans</i> (Lendenfeld, 1887) | Encrusting, 4 mm thick | — | Conulose | — | Styles: 600 \times 10 | Australia |
| <i>Scopalina lophyropoda</i> Schmidt, 1862 | Encrusting | Red, brown | Hispid | — | Styles: 560–1000 \times 4–10 by Topsent. 1934 | Mediterranean Sea, Alboran Sea, Azores, Cape Verde |
| <i>Scopalina rubra</i> (Vacelet & Vasseur, 1971) | Encrusting | Red | — | Friable | Styles: 330–550 \times 10–15 | Western and Northern Madagascar |
| <i>Scopalina ruetzleri</i> (Wiedenmayer, 1977) | Massive semi-encrusting, lobate | Bright orange to pinkish orange | Conulose | Soft, delicate, compressible, easily torn | Styles: 400–500 \times 5.5–8 | Bermuda, Caribbean Sea, Brazilian coasts |

Order Suberitida Chombard & Boury-Esnault, 1999

Family Suberitidae Schmidt, 1870

Genus *Rhizaxinella* Keller, 1880

Rhizaxinella strongylata Bertolino, Costa & Pansini sp. nov.

[urn:lsid:zoobank.org:act:78052288-83C4-4D9F-91DE-6275C19187CE](https://lsid.zoobank.org/act:78052288-83C4-4D9F-91DE-6275C19187CE)

Fig. 14

Etymology

The new species is so named for the presence of strongyloid styles in the spicules.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena D; 44.614863° S, 72.958312° W; depth 25 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a vertical wall by scuba diving; CILE 65; MSGN 61499.

Description

HABITUS. Small erect sponge, 5 cm high, with thin stalk (5 mm in diameter) which divides into two branches with peariform extremities (Fig. 14A). Two round oscula visible. Surface hispid. Colour in life bright yellow (Fig. 14A). Consistency strong but compressible.

SKELETON. Stalk characterized by axial compact skeleton that diverges into thinner secondary axes in branches. Close to surface ectosomal skeleton composed of brushes of spicules.

SPICULES. Megascleres: Smooth, slightly curved, long tylostyles (Fig. 14B), 841.5–(1466.3)–2320.5 µm long and 17.5–(21.75)–30 µm thick. Shorter, straight or curved, often fusiform tylostyles, with different heads (Fig. 14C), 175–(230.25)–320 µm long and 10–(14.1)–17.5 µm thick. Smooth strongyloid styles, more or less curved (Fig. 14D), 200–(274.55)–340 µm long and 10–(18.75)–25 µm thick.

Habitat

Species lives at a depth between 20 and 25 m on a vertical wall.

Remarks

Only one species of this genus has been reported from the channels and fjords of southern Chile: *Rhizaxinella spiralis* (Ridley & Dendy, 1886). The new species *R. strongylata* sp. nov. described here differs from *R. spiralis* in external morphology, shape and size of styles/tylostyles, and in the presence of strongyloid spicules. In fact, *R. spiralis* has a stipitate cylindrical shape and two categories of tylostyles/styles that measure 1000 × 13 µm and 400 µm (width not reported in original description).

Four other *Rhizaxinella* species are present in the Southern Hemisphere and so geographically closer to the new species. *Rhizaxinella australiensis* Hentschel, 1909 (North Patagonian Gulf, East Antarctic Wilkes Land, West Australia) is ramified with vertical branches; tylostyles are sinuous, straight or strongyloid and measure 500–1200 × 9–19 µm and 240–500 × 9–12 µm. *Rhizaxinella dichotoma* Lévi, 1993 (New Zealand, New Caledonia) is pedunculate with multiple branches, has principal tylostyles (725–1200 × 15–30 µm) and peripheral tylostyles (400–800 × 4–10 µm). *Rhizaxinella durissima* (Ridley & Dendy, 1886) (Southwest Australia) with pedunculate shape has straight styles/tylostyles (240 × 6.3 µm) and fusiform tylostyles (1500 × 15.7 µm). The species morphologically closest to the new species, based on the large spicules and the presence of strongyloid forms, appears to be *R. radiata* Hentschel, 1909 (West Australia) which has a pedunculate shape, straight styles (1100–2150 × 27–45 µm), styles/subtylostyles

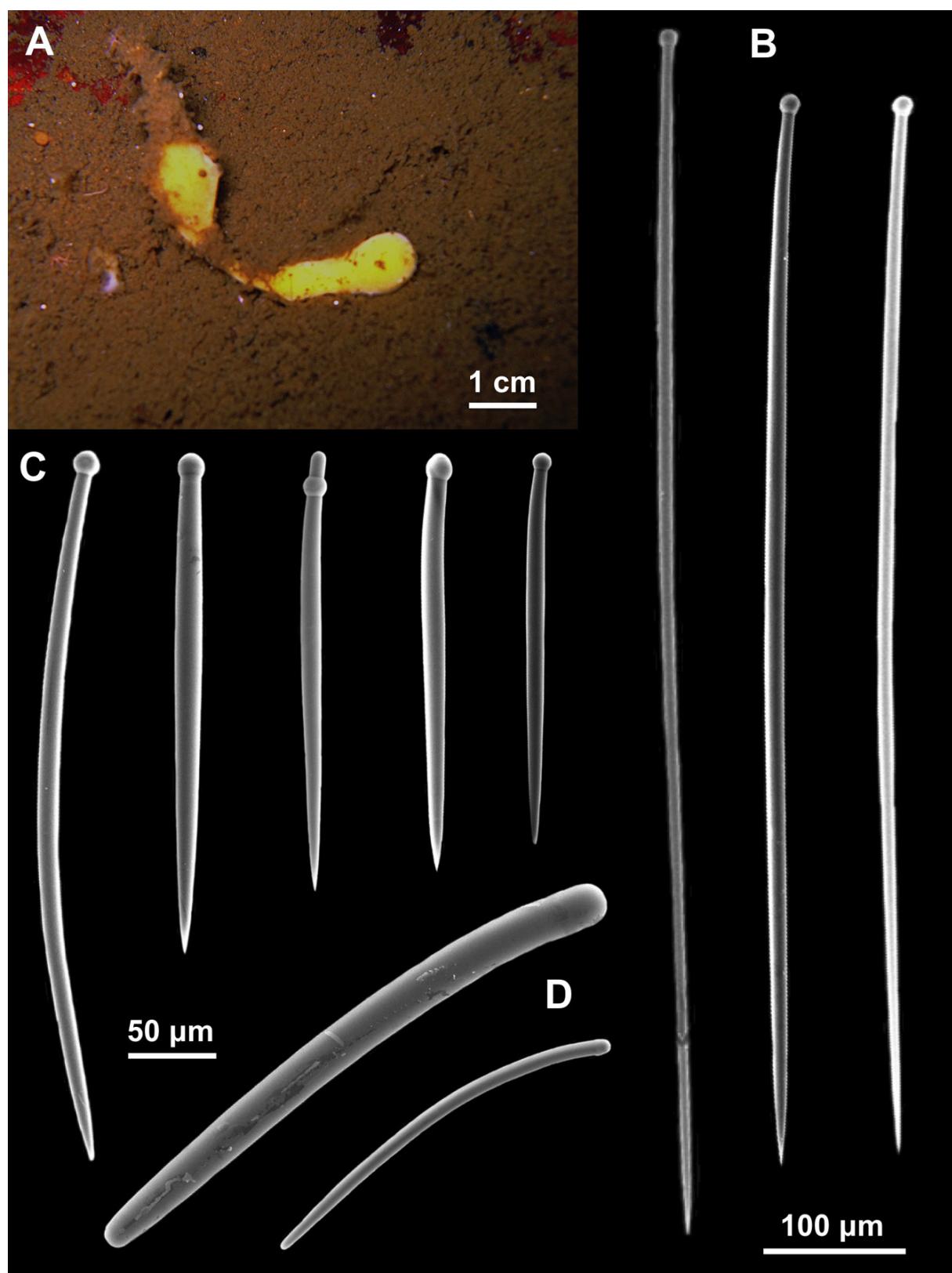


Fig. 14. *Rhizaxinella strongylata* Bertolino, Costa & Pansini sp. nov., holotype (CILE 65; MSGN 61499). **A.** The holotype in life. **B.** Tylostyles I. **C.** Tylostyles II. **D.** Strongyloid styles.

($250\text{--}800 \times 10\text{--}17 \mu\text{m}$) and strongyles ($250\text{--}350 \times 7\text{--}11.2 \mu\text{m}$). Even allowing for the lesser importance of sponge shape and a degree of morphological variability within the genus, the present description of type and size of spicules of *R. strongylata* sp. nov. merits the establishment of a new species.

Subclass Keratosa Grant, 1861
Order Dendroceratida Minchin, 1900
Family Darwinellidae Merejkowsky, 1879

Genus ***Darwinella*** Müller, 1865

Type species

Darwinella muelleri (Schultze, 1865).

Emended diagnosis

In the *Darwinella*, the dendritic fibre skeleton is supplemented by fibrous spicules which can be diactinal, triactinal or polyactinal. There is no sand in the fibres but dispersed cellular elements can occur. The sponges are fleshy, encrusting, or massive to lobate; to which fibrous spicule with style shape may be added (emended from Müller 1865).

Remarks

The species of *Darwinella* may be confused with those belonging to the genus *Aplysilla* Schulze, 1878 because of the similarity in external shape; however, *Darwinella* is characterized by the presence of diactinal, triactinal or polyactinal fibrous spicules (Pronzato 1975). In the present study we described a new fibrous spicule type for the *Darwinella* genus.

Darwinella pronzatoi Bertolino, Costa & Pansini sp. nov.

[urn:lsid:zoobank.org:act:FA17C8DB-1973-4E6F-9AB9-A025F68D38F5](https://doi.org/10.12693/ejt.715.0001)

Fig. 15

Etymology

The new species is named after Professor Roberto Pronzato (DISTAV – Università degli Studi di Genova) in recognition of his significant contributions to taxonomic studies on horny sponges.

Type material

Holotype

CHILE – Puerto Cisnes • Seno Magdalena C; 44.631113° S, 72.929130° W; depth 15 m; 5–10 Aug. 2016; Marco Bertolino leg.; on a rocky wall by scuba diving; CILE 100; MSGN 61500.

Description

HABITUS. Encrusting sponge about 5 cm long and 1.5 cm thick, with regular conulose surface. Colour in life bright yellow (Fig. 15A). Live specimens soft, very fragile, showing numerous oscula with low rim (Fig. 15A). Ostia also visible on sponge surface (Fig. 15A)

SKELETON. Structure typical of *Darwinella* genus with ascending dendritic fibres supporting surface conules. Several dendritic fibres arise from common basal plate. Red dendritic fibres laminated, linear and sinuous, 14–(15)–16 mm long and 70–(80)–90 μm thick, with opaque core (Fig. 15B); axial core 10–(11)–12 μm thick.

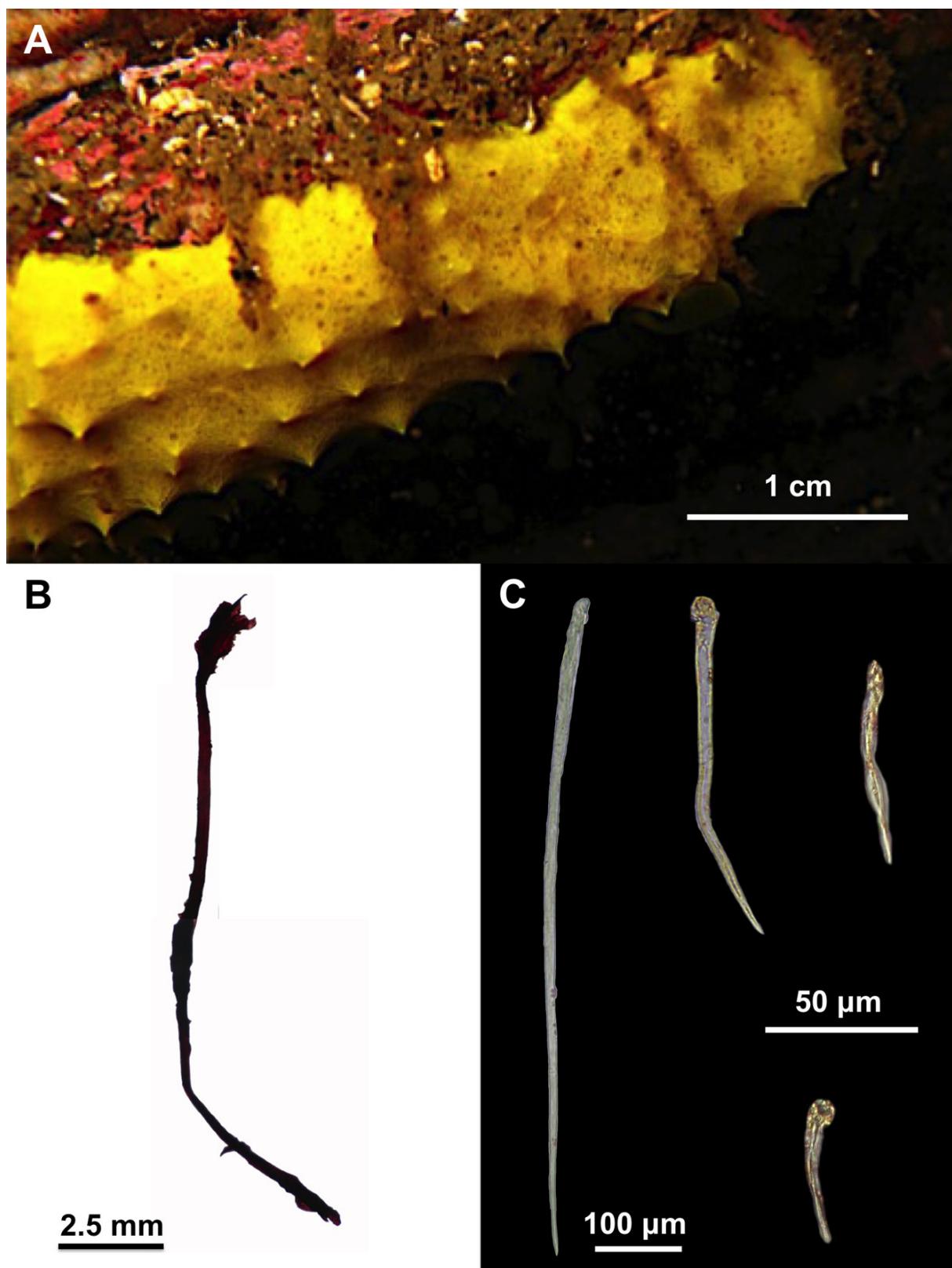


Fig. 15. *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov., holotype (CILE 100; MSGN 61500). **A.** The holotype in life. **B.** Dendritic fibres. **C.** Horny styles

SPICULES. Smooth, straight, slightly curved or sinuous horny styles, with visible axial core (Fig. 15C), 87.5–(436)–830 µm long and 9–(12.5)–16 µm thick; axial core 2.5–(8.3)–13 µm thick.

Habitat

Species lives at a depth of 15 m in a shady area on rocky wall.

Remarks

Up to now, there was no evidence of the presence of the genus *Darwinella* from the Chilean coasts. Thirteen species belonging to this genus have been described worldwide, eleven of which have multi-radiate spicules and one species, *Darwinella tango* (Poiner & Taylor, 1990), has no spicules. Only two species are characterized by monaxonic spicules: *D. gardineri* Topsent, 1905, characterised by curved horny oxeas (1600–2000 × 20 µm), and *D. oxeata* Bergquist, 1961, having horny spined oxeas (530–2083 × 4.2–29.8 µm). Due to the presence of smooth, straight, slightly curved or sinuous horny styles, *D. pronzatoi* is clearly different from both these species, therefore it should be considered as a species new to science.

Discussion

With 23 identified species the present study notably increases the number of sponges reported from Chilean fjords to 139 (Table 8).

From a biogeographic standpoint, apart from the nine new species, one species, *Biemna lutea* Bertolino, Costa & Pansini, 2019, is recorded for the first time after its description in the same region; 12 species were already recorded from the Chilean coast; and one species, *Hymedesmia (Stylopus) lissostyla* described from New Zealand, is recorded for the first time in the Chilean sponge fauna (Table 2).

Taking into account the literature together with our data, the total number of sponge species known along the Chilean coasts, increases to 187 (Table 8).

The sponge fauna of the fjord region is strongly separated from that recorded in the other areas of the Chilean coasts. In fact, among the 139 species described for the fjords and the 73 listed for the Chilean coasts, only 25 are in common. This number clearly shows the peculiarity of the Southern Chilean coast and suggests the necessity of a further effort to achieve a satisfactory knowledge of the biodiversity of this area.

Table 8 (continued on the next five pages). List of sponge species hitherto recorded for the whole Chilean coast.

| | | Inside the fjords | Outside the fjords |
|-----------------|--|----------------------|-----------------------|
| Class | Calcarea Bowerbank, 1864 | | |
| Subclass | Calcaronea Bibber, 1898 | | |
| Order | Leucosolenida Hartman, 1958 | | |
| | <i>Sycettusa chilensis</i> Azevedo, Hajdu, Willenz & Klautau, 2009 | + | + |
| | <i>Vosmaeropsis sericata</i> (Ridley, 1881) | + | |
| | <i>Leucosolenia australis</i> Brøndsted, 1931 | + | |
| | <i>Leucosolenia lucasi</i> Dendy, 1891 | + | |
| | <i>Leucandra fernandensis</i> (Breitfuss, 1898) | | + |
| | <i>Leucandra masatierrae</i> (Breitfuss, 1898) | | + |
| | <i>Leucandra platei</i> (Breitfuss, 1898) | + | |
| | <i>Sycon huinayense</i> Azevedo, Hajdu, Willenz & Klautau, 2009 | + | |
| | <i>Sycon incrustans</i> Breitfuss, 1898 | + | + |
| | <i>Sycon proboscideum</i> sensu Breitfuss, 1898 | + | + |
| Subclass | Calcinea Bibber, 1898 | | |
| Order | Clathrinida Hartman, 1958 | | |
| | <i>Clathrina antofagastensis</i> Azevedo, Hajdu, Willenz & Klautau, 2009 | | + |
| | <i>Clathrina fjordica</i> Azevedo, Hajdu, Willenz & Klautau, 2009 | + | |
| | <i>Clathrina primordialis</i> (Haeckel, 1872) ? | | Doubt presence |
| | <i>Clathrina ramosa</i> (Azevedo, Hajdu, Willenz & Klautau, 2009) | + | |
| | <i>Leucettusa nuda</i> (Azevedo, Hajdu, Willenz & Klautau, 2009) | + | + |
| | <i>Ascalitis poterium</i> (Haeckel, 1872) | + | |
| Class | Demospongiae Sollas, 1885 | | |
| Subclass | Heteroscleromorpha Cárdenas, Pérez & Boury-Esnault, 2012 | | |
| Order | Agelasida Hartman, 1980 | | |
| | <i>Hymerhabdia imperfecta</i> Bertolino, Costa & Pansini sp. nov. | + | |
| Order | Axinellida Lévi, 1953 | | |
| | <i>Axinella antarctica</i> (Koltun, 1964) | + | |
| | <i>Axinella coronata</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Axinella crinita</i> Thiele, 1905 | + | + |
| | <i>Axinella cylindrica</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Dragmacidon egregium</i> (Ridley, 1881) | + | |
| | <i>Phakellia sur</i> Carvalho, Desqueyroux-Faúndez & Hajdu, 2007 | + | |
| Order | Bubarida Morrow & Cárdenas, 2015 | | |
| | <i>Bubaris murrayi</i> Topsent, 1913 | + | |
| | <i>Bubaris vermiculata</i> (Bowerbank, 1866) ? | | Doubt presence |
| | <i>Acanthella danerii</i> Costa, Bavestrello, Pansini & Bertolino, 2020 | + | |
| | <i>Eurypon miniaceum</i> Thiele, 1905 | + | |
| | <i>Halicnemia papillosa</i> (Thiele, 1905) | + | |
| Order | Biemnida Morrow, 2013 | | |
| | <i>Biemna aurantiaca</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Biemna chilensis</i> Thiele, 1905 | + | |
| | <i>Biemna erecta</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Biemna lutea</i> Bertolino, Costa & Pansini, 2019 | + | |
| | <i>Biemna typica</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Rhabderemia uruguaiensis</i> van Soest & Hooper, 1993 | + | |

Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| | | Inside the fjords | Outside the fjords |
|--------------|---|----------------------|-----------------------|
| Order | Clionaida Morrow & Cárdenas, 2015 | | |
| | <i>Cliona chilensis</i> Thiele, 1905 | + | |
| | <i>Clionaopsis platei</i> (Thiele, 1905) | + | + |
| | <i>Cliothosa hancocki</i> (Topsent, 1888) ? | Doubt presence | |
| | <i>Spheciospomia vesparium</i> (Lamarck, 1815) ? | Doubt presence | |
| Order | Desmacellida Morrow & Cárdenas, 2015 | | |
| | <i>Desmacella vestibularis</i> (Wilson, 1904) | | + |
| Order | Haplosclerida Topsent, 1928 | | |
| | <i>Callyspongia fusifera</i> (Thiele, 1905) | + | + |
| | <i>Siphonochalina fortis</i> Ridley, 1881 | + | |
| | <i>Chalinula variabilis</i> (Thiele, 1905) | + | |
| | <i>Haliclona (Halichoclona) conica</i> (Thiele, 1905) | + | |
| | <i>Haliclona (Reniera) caduca</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| | <i>Haliclona (Reniera) delicata</i> (Sarà, 1978) | + | |
| | <i>Haliclona (Reniera) infundibularis</i> (Ridley & Dendy, 1887) | + | |
| | <i>Haliclona (Reniera) topsenti</i> (Thiele, 1905) | + | |
| | <i>Haliclona (Rhizoniera) anceps</i> (Thiele, 1905) | | + |
| | <i>Haliclona (Soestella) auletta</i> (Thiele, 1905) | + | |
| | <i>Haliclona (Soestella) chilensis</i> (Thiele, 1905) | + | + |
| | <i>Haliclona algicola</i> (Thiele, 1905) | + | |
| | <i>Haliclona bilamellata</i> Burton, 1932 | + | |
| | <i>Haliclona ignobilis</i> (Thiele, 1905) | + | + |
| | <i>Haliclona inepta</i> (Thiele, 1905) | + | |
| | <i>Haliclona macropora</i> (Thiele, 1905) | + | + |
| | <i>Haliclona nodosa</i> (Thiele, 1905) | + | |
| | <i>Haliclona rugosa</i> (Thiele, 1905) | + | |
| | <i>Haliclona siphonella</i> (Thiele, 1905) | + | |
| | <i>Haliclona sordida</i> (Thiele, 1905) | + | |
| | <i>Haliclona spinosella</i> (Thiele, 1905) | + | |
| | <i>Haliclona thielei</i> van Soest & Hooper, 2020 | | + |
| | <i>Haliclona verrucosa</i> (Thiele, 1905) | + | |
| | <i>Haliclona virens</i> (Topsent, 1908) | + | |
| | <i>Amphimedon decurtata</i> (Sarà, 1978) | + | |
| | <i>Amphimedon maresi</i> (Sarà, 1978) | + | |
| | <i>Amphimedon reticulosa</i> (Thiele, 1905) | + | |
| | <i>Dasychalina magellanica</i> (Thiele, 1905) | + | |
| | <i>Dasychalina validissima</i> (Thiele, 1905) | + | |
| | <i>Pachychalina tenera</i> Thiele, 1905 | + | |

Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast. * = new record for Chile.

| | | Inside the fjords | Outside the fjords |
|--------------|---|----------------------|-----------------------|
| | <i>Oceanapia guaiteca</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| | <i>Oceanapia spinisphaera</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| Order | Poecilosclerida Topsent, 1928 | | |
| | <i>Iophon proximum</i> (Ridley, 1881) | + | + |
| | <i>Iophon radiatum</i> Topsent, 1901 | | + |
| | <i>Iophon timidum</i> Desqueyroux-Faúndez & van Soest, 1996 | + | |
| | <i>Iophon tubiforme</i> Desqueyroux-Faúndez & van Soest, 1996 | + | |
| | <i>Iophon unicorn</i> Topsent, 1907 | + | |
| | <i>Forcepia (Leptolabis) irritans</i> (Thiele, 1905) | | + |
| | <i>Lissodendoryx (Ectyodoryx) ballena</i> Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 | + | |
| | <i>Lissodendoryx (Ectyodoryx) coloanensis</i> Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 | + | |
| | <i>Lissodendoryx (Ectyodoryx) corrugata</i> Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 | + | |
| | <i>Lissodendoryx (Ectyodoryx) diegoramirezensis</i> Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 | + | |
| | <i>Lissodendoryx (Ectyodoryx) patagonica</i> (Ridley & Dendy, 1886) | + | |
| | <i>Batzella mollis</i> Thiele, 1905 | | + |
| | <i>Strongylacidon platei</i> (Thiele, 1905) | | + |
| | <i>Abyssocladia diegoramirezensis</i> Lopes, Bravo & Hajdu, 2011 | | + |
| | <i>Abyssocladia umbellata</i> Lopes, Bravo & Hajdu, 2011 | | + |
| | <i>Asbestopluma (Asbestopluma) bitrichela</i> Lopes, Bravo & Hajdu, 2011 | + | + |
| | <i>Asbestopluma (Asbestopluma) magnifica</i> Lopes, Bravo & Hajdu, 2011 | + | |
| | <i>Asbestopluma (Helophloeina) delicata</i> Lopes, Bravo & Hajdu, 2011 | + | |
| | <i>Chondrocladia (Chondrocladia) schlatteri</i> Lopes, Bravo & Hajdu, 2011 | | + |
| | <i>Chondrocladia (Meliiderma) latrunculoides</i> Lopes, Bravo & Hajdu, 2011 | | + |
| | <i>Lycopodina microstrongyla</i> (Lopes, Bravo & Hajdu, 2011) | | + |
| | <i>Crambe amarilla</i> Esteves, Lôbo-Hajdu & Hajdu, 2007 | + | |
| | <i>Crambe chilensis</i> Esteves, Lôbo-Hajdu & Hajdu, 2007 | + | |
| | <i>Crambe maldonadoi</i> Esteves, Lôbo-Hajdu & Hajdu, 2007 | + | |
| | <i>Amphilectus americanus</i> (Ridley & Dendy, 1887) | + | |
| | <i>Amphilectus fucorum</i> (Esper, 1794)? | | Doubt presence |
| | <i>Amphilectus rugosus</i> (Thiele, 1905) | + | |
| | <i>Hamigera cleistochela</i> Bertolino, Costa & Pansini, 2019 | + | |
| | <i>Hymedesmia (Stylopus) lissostyla</i> (Bergquist & Fromont, 1988) * | + | |
| | <i>Phorbas areolatus</i> (Thiele, 1905) | + | |
| | <i>Isodictya delicata</i> (Thiele, 1905) | + | + |
| | <i>Latrunculia (Latrunculia) basalis</i> Kirkpatrick, 1908 | + | |

Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| | Inside the fjords | Outside the fjords |
|---|----------------------|-----------------------|
| <i>Latrunculia (Latrunculia) ciruela</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Latrunculia (Latrunculia) copihuensis</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Latrunculia (Latrunculia) yepayek</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Latrunculia (Latrunculia) verenae</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Antho (Acarnia) inconspicua</i> (Desqueyroux, 1972) | | + |
| <i>Clathria (Clathria) discreta</i> (Thiele, 1905) | + | + |
| <i>Clathria (Clathria) lipochela</i> Burton, 1932 | + | |
| <i>Clathria (Clathria) microxa</i> Desqueyroux, 1972 | + | |
| <i>Clathria (Clathria) papillosa</i> Thiele, 1905 | + | |
| <i>Clathria (Cornulotrocha) polita</i> (Ridley, 1881) | + | + |
| <i>Clathria (Cornulotrocha) rosetafiordica</i> Hajdu, Desqueyroux-Faúndez & Willenz, 2006 | + | |
| <i>Clathria (Microciona) antarctica</i> (Topsent, 1917) | | + |
| <i>Clathria (Microciona) mytilifila</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Clathria (Thalysias) amabilis</i> (Thiele, 1905) | + | |
| <i>Clathria (Thalysias) membranacea</i> (Thiele, 1905) | | + |
| <i>Mycale (Aegogropila) magellanica</i> (Ridley, 1881) | + | |
| <i>Mycale (Carmia) gaussiana</i> Hentschel, 1914 | | + |
| <i>Mycale (Mycale) doellojuradoi</i> Burton, 1940 | | + |
| <i>Mycale (Mycale) thielei</i> Hajdu & Desqueyroux-Faúndez, 1994 | + | |
| <i>Mycale (Mycale) tridens</i> Hentschel, 1914 | + | |
| <i>Mycale (Oxymycale) acerata</i> Kirkpatrick, 1907 ? | Doubt presence | |
| <i>Hymenancora laevis</i> (Thiele, 1905) | + | + |
| <i>Hymenancora tenuissima</i> (Thiele, 1905) | + | |
| <i>Myxilla (Burtonanchora) araucana</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Myxilla (Ectyomyxilla) chilensis</i> Thiele, 1905 | + | + |
| <i>Myxilla (Ectyomyxilla) massa</i> Ridley & Dendy, 1887 | + | |
| <i>Myxilla (Myxilla) mollis</i> Ridley & Dendy, 1886 | + | |
| <i>Stelodoryx cribrigera</i> (Ridley & Dendy, 1886) | + | |
| <i>Neopodospongia tupecomareni</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| <i>Tedania (Tedaniopsis) charcoti</i> Topsent, 1907 | + | |
| <i>Tedania (Tedaniopsis) mucosa</i> Thiele, 1905 | + | + |
| <i>Tedania (Tedaniopsis) tenuicapitata</i> Ridley, 1881 | + | |
| <i>Trachytedania patagonica</i> Ridley & Dendy, 1886 | + | |
| <i>Trachytedania spinata</i> Ridley, 1881 | + | |

Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| | | Inside the fjords | Outside the fjords |
|-----------------|---|----------------------|-----------------------|
| Order | Polymastiida Morrow & Cárdenas, 2015 | | |
| | <i>Polymastia invaginata</i> Kirkpatrick, 1907 | + | |
| | <i>Polymastia isidis</i> Thiele, 1905 | + | |
| | <i>Scopalina bunkeri</i> Goodwin, Jones, Neely & Brickle, 2011 | + | |
| | <i>Scopalina cibrosa</i> Bertolino, Costa & Pansini sp. nov. | + | |
| Order | Suberitida Chombard & Boury-Esnault, 1999 | | |
| | <i>Halichondria (Halichondria) prostrata</i> Thiele, 1905 | | + |
| | <i>Hymeniacidon calva</i> (Ridley, 1881) | + | + |
| | <i>Hymeniacidon corticata</i> (Thiele, 1905) | + | + |
| | <i>Hymeniacidon fernandezi</i> Thiele, 1905 | | + |
| | <i>Hymeniacidon longistylus</i> Desqueyroux, 1972 | + | |
| | <i>Hymeniacidon rubiginosa</i> Thiele, 1905 | | + |
| | <i>Johannesia reticulosa</i> (Thiele, 1905) | | + |
| | <i>Plicatellopsis expansa</i> (Thiele, 1905) | | + |
| | <i>Plicatellopsis flabellata</i> Burton, 1932 | + | |
| | <i>Protosuberites epiphytoides</i> (Thiele, 1905) | | + |
| | <i>Pseudosuberites digitatus</i> (Thiele, 1905) | + | + |
| | <i>Pseudosuberites hyalinus</i> (Ridley & Dendy, 1887) | + | + |
| | <i>Pseudosuberites sulcatus</i> (Thiele, 1905) | + | + |
| | <i>Rhizaxinella strongylata</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Suberites cranium</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| | <i>Suberites puncturatus</i> Thiele, 1905 | | + |
| | <i>Suberites ruber</i> Thiele, 1905 | + | + |
| Order | Tethya Morrow & Cárdenas, 2015 | | |
| | <i>Tethya melinka</i> Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + | |
| | <i>Tethya papillosa</i> (Thiele, 1905) | | + |
| | <i>Timea authia</i> de Laubenfels, 1930 | | + |
| Order | Tetractinellida Marshall, 1876 | | |
| | <i>Stelletta clarella</i> de Laubenfels, 1930 | + | |
| | <i>Stelletta phriszens</i> Sollas, 1886 | + | |
| | <i>Geodia magellani</i> (Sollas, 1886) | + | |
| Subclass | Keratosa Grant, 1861 | | |
| Order | Dendroceratida Minchin, 1900 | | |
| | <i>Aplysilla lendenfeldi</i> Thiele, 1905 | | + |
| | <i>Darwinella pronzatoi</i> Bertolino, Costa & Pansini sp. nov. | + | |
| | <i>Spongionella regularis</i> (Ridley, 1881) | + | |
| | <i>Spongionella repens</i> (Thiele, 1905) | | + |
| Order | Dictyoceratida Minchin, 1900 | | |
| | <i>Dysidea chilensis</i> (Thiele, 1905) | + | |

Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| | | Inside the fjords | Outside the fjords |
|-----------------|--|----------------------|-----------------------|
| | <i>Ircinia clavata</i> (Thiele, 1905) | | + |
| | <i>Ircinia paupera</i> (Thiele, 1905) | | + |
| | <i>Ircinia variabilis</i> (Schmidt, 1862) ? | Doubt presence | |
| | <i>Spongia (Spongia) cerebralis</i> Thiele, 1905 | | + |
| | <i>Spongia (Spongia) magellanica</i> Thiele, 1905 | + | + |
| | <i>Hyrtios arenosus</i> (Thiele, 1905) | | + |
| | <i>Hyrtios sororia</i> (Thiele, 1905) | | + |
| | <i>Scalarispongia similis</i> (Thiele, 1905) | | + |
| Subclass | Verongimorpha Erpenbeck, Sutcliffe, Cook, Dietzel, Maldonado, van Soest, Hooper & Wörheide, 2012 | | |
| Order | Chondrillida Redmond, Morrow, Thacker, Díaz, Boury-Esnault, Cárdenas, Hajdu, Lôbo-Hajdu, Picton, Pomponi, Kayal & Collins, 2013 | | |
| | <i>Halisarca desqueyrouxae</i> Willenz, Ereskovsky & Lavrov, 2016 | + | |
| | <i>Halisarca magellanica</i> Topsent, 1901 | + | |
| Class | Hexactinellida Schmidt, 1870 | | |
| Subclass | Amphidiscophora Schulze, 1886 | | |
| Order | Amphidiscosida Schrammen, 1924 | | |
| | <i>Hyalonema (Corynonema) grandancora</i> Lendenfeld, 1915 | + | |
| | <i>Hyalonema (Prionema) poculum</i> Schulze, 1886 | + | |
| | <i>Pheronema nasckaniense</i> Tabachnick, 1990 | + | |
| | <i>Schulzeviella gigas</i> (Schulze, 1886) | + | |
| Subclass | Hexasterophora Schulze, 1886 | | |
| Order | Lyssacinosida Zittel, 1877 | | |
| | <i>Pseudoplectella dentatum</i> Tabachnick, 1990 | + | |
| | <i>Regadrella phoenix</i> Schmidt, 1880 | + | |
| | <i>Staurocalyptus roeperi</i> (Schulze, 1886) | + | |
| | <i>Caulophacus (Caulophacus) chilensis</i> Reiswig & Araya, 2014 | + | |
| | <i>Lanugonychia flabellum</i> Lendenfeld, 1915 | + | |
| | <i>Aphorme horrida</i> Schulze, 1899 | + | |
| | <i>Hyalascus stellatus</i> (Schulze, 1886) | + | |
| | <i>Rossella antarctica</i> Carter, 1872 | + | |
| | <i>Rossella racovitzae</i> Topsent, 1901 | + | |
| | <i>Scyphidium chilense</i> Ijima, 1927 | + | |
| Subclass | Hexasterophora Schulze, 1886 | | |
| Order | Sceptrulophora Mehl, 1992 | | |
| | <i>Pararete farreopsis</i> (Carter, 1877) | + | |
| Class | Homoscleromorpha Bergquist, 1978 | | |
| Order | Homosclerophorida Bergquist, 1978 | | |
| | <i>Plakina trilopha</i> Schulze, 1880 ? | Doubt presence | |
| Total | 187 species + 8 doubt presence | 139 | 73 |

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