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

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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 eretica 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.
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).
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., *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov., *Rhizaxinella strongylata* Bertolino, Costa & Pansini sp. nov., *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov. One species, *Hymeredemia (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. 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 1. Sampling sites with descriptions.

| SITES     | COORDINATES          | DESCRIPTIONS                                      | DEPTH  |
|-----------|----------------------|---------------------------------------------------|--------|
| A         | 44.669581° S         | Rocky slope covered by coralline algae and debris | 0–31 m |
|           | 72.798496° W         | at the entrance of a channel                      |        |
| B         | 44.650167° S         | Rocky cliff interrupted by large submarine        | 0–32 m |
|           | 72.890850° W         | detrital heights                                  |        |
| C         | 44.631113° S         | Rocky wall and detritus slope                     | 0–32 m |
|           | 72.929130° W         |                                                   |        |
| D         | 44.614863° S         | Vertical wall, ending at a depth of 20 m on a     | 0–32 m |
|           | 72.958312° W         | rocky bottom that slopes down to 32 m             |        |
| E         | 44.613885° S         | Rocky cliff                                       | 0–35 m |
|           | 72.941490° W         |                                                   |        |
| F         | 44.631235° S         | Rocky cliff and debris slope                      | 0–32 m |
|           | 72.904239° W         |                                                   |        |
| G         | 44.763254° S         | South side of a rocky slope covered by             | 0–20 m |
|           | 72.891581° W         | coralline algae and debris                        |        |
| H         | 44.609000° S         | Vertical rocky wall with debris slope              | 0–30 m |
|           | 72.757667° W         |                                                   |        |
| I         | 44.580650° S         | Vertical rocky wall with debris slope              | 0–30 m |
|           | 72.730850° W         |                                                   |        |
| L         | 44.522694° S         | Rocky wall ending on a debris bottom inside the   | 0–24 m |
|           | 72.693722° W         | channel located between the coast and the island  |        |
| M         | 44.345000° S         | Rocky walls ending on a debris bottom inside the  | 0–24 m |
|           | 72.951528° W         | channel located between the coast and the island  |        |
| N         | 44.271194° S         | Rocky walls ending on a debris bottom inside the  | 0–24 m |
|           | 73.209222° W         | channel located between the coast and the island  |        |
| Species | Sites | Distribution |
|---------|-------|--------------|
| Hymerabdia imperfecta Bertolino, Costa & Pansini sp. nov. | A B C D E F G H I L M N | outside fjords outside Chile |
| Axinella crinita Thiele, 1905 | 2 1 | × |
| Axinella cylindrica Bertolino, Costa & Pansini sp. nov. | 1 1 1 1 | |
| Axinella coronata Bertolino, Costa & Pansini sp. nov. | 1 1 1 | |
| Eurypon miniaceum Thiele, 1905 | 3 | × Antarctica |
| Biemna chilensis Thiele, 1905 | 1 | × Antarctica |
| Biemna lutea Bertolino, Costa & Pansini, 2018 | 1 | |
| Biemna typica Bertolino, Costa & Pansini sp. nov | 1 | |
| Biemna erecta Bertolino, Costa & Pansini sp. nov | 1 | |
| Biemna aurantiaca Bertolino, Costa & Pansini sp. nov | 1 | |
| Cliona chilensis Thiele, 1905 | 1 1 1 | × Galapagos |
| Clionaopsis platei (Thiele, 1905) | 1 1 | × |
| Amphilectus americanus (Ridley & Dendy, 1887) | 1 2 | |
| Hymedesmia (Stylopus) lissostyla (Bergquist & Fromont, 1988) * | 2 1 | |
| Latrunculia (Latrunculia) ciruela Hajdu, Desqueyroux-Faünde, Carvalho, Lôbo-Hajdu & Willenz, 2013 | 1 | × |
| Clathria (Thalysia) amabilis (Thiele, 1905) | 1 1 | × Argentina |
| Myxilla (Burtonanchora) araucana Hajdu, Desqueyroux-Faünde, Carvalho, Lôbo-Hajdu & Willenz, 2013 | 1 | × |
| Myxilla (Ectomyxilla) chilensis Thiele, 1905 | 1 | × Argentina, Brazil, South Africa |

* = new record for the Chilean fjord region.
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 outside fjords | Distribution outside Chile |
|--------------------------------------|-------|-----------------------------|-----------------------------|
| Neopodospongia tupecomareni          | A B   | C D E F G H I L M N        | ×                           |
| Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 |       |                             |                             |
| Scopalina cribrosa                  | A B   | C D E F G H I L M N        |                             |
| Bertolino, Costa & Pansini sp. nov  |       |                             |                             |
| Rhizaxinella unica                  |       |                             |                             |
| Bertolino, Costa & Pansini sp. nov  |       |                             |                             |
| Tethya papillosa (Thiele, 1905)      |       |                             | ×                           |
| Darwinella pronzatoi                |       |                             |                             |
| Bertolino, Costa & Pansini sp. nov. |       |                             |                             |
| Total specimens collected at each site |       |                             |                             |

|                  | A | B | C | D | E | F | G | H | I | L | M | N |   |
|------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
|                  | 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.
urn:lsid:zoobank.org:act:FF9FC2BD-D935-4B83-B345-228C74D457B2
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); 44.631235° 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, rhabdostrongyles, toxostrongyles) 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.
| Species                      | Shape                  | Colour                       | Consistency          | Spicules (μm)                                                                 | Distribution                                      |
|-----------------------------|------------------------|------------------------------|----------------------|----------------------------------------------------------------------------|-----------------------------------------------|
| *Hymerhabdia imperfecta*    | Encrusting             | Bright red                  | Hispid               | Styles: 800–(888.33)–1000 × 5–(7.16)–10                                    | Chile                                          |
| *Hymerhabdia contracta*     | Encrusting             | Golden yellow               | Hispid               | Styles I: 510–1480 × 10.5–17                                              | Mediterranean Sea                                |
| *Hymerhabdia intermedia*    | Encrusting Microlobate | Dull yellow to beige        | Microhispid no oscules visible | Styles I: 510–1480 × 10.5–17                                              | Mediterranean Sea                                |
| *Hymerhabdia kobluki*       | Encrusting             | Dull yellow to beige        | Microhispid no oscules visible | Styles I: 632–1176 × 12–36                                                | Guyana Shelf, Bonaire, Colombian Caribbean     |
| *Hymerhabdia oxeata*        | Encrusting             | Orange / red or yellow/orange | Hispid or papillate   | Styles I: 510–1480 × 10.5–17                                              | New Zealand                                     |
| *Hymerhabdia oxytrunca*     | Encrusting             | Brown, grey                 | Hispid               | Styles I: 350–610 × 7.8–12                                               | Mediterranean Sea, Azores, Canaries            |
| *Hymerhabdia pori*          | Encrusting             | Orange / red or yellow/orange | Hispid or papillate   | Styles: 400–270 × 2.4–12                                                  | Mediterranean Sea                                |

Table 3 (continued on the next page). Morphological characters and distribution of the species of *Hymerhabdia* Topsent, 1892 of all the world. The distribution refers to that present in the World Porifera Database (van Soest et al. 2020).
Table 3 (continued). Morphological characters and distribution of the species of *Hymerhabdia* 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                  |
|----------------------|-------------|--------|---------|-------------|------------------------|------------------------------|
| *Hymerhabdia topsentii* Lévi, 1952 | Encrusting  | Red    | Hispid  | –           | Styles I: 1600 × 12–13  | Atlantic Ocean               |
|                      |             |        |         |             | Styles II: 350–500 × 15–30 |
|                      |             |        |         |             | Styles III: 20–350 × 4–12 |
|                      |             |        |         |             | Oxeas: 160–320 × 8–18    |
| *Hymerhabdia typica* Topsent, 1892 | Encrusting  | –      | Hispid  | –           | Styles and Tylostyles: 650–800 × 10 |
|                      |             |        |         |             | Rhabdostyles: 80–120 × 8–10 | Mediterranean Sea, Celtic Sea, Azores, Canaries |
Axinella cylindrica Bertolino, Costa & Pansini sp. nov.  
urn:lsid:zoobank.org:act:21616DF2-8C48-428E-8631-C6A2553E214C  
Figs 3–4; Table 4

**Etymology**

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.

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

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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.
European Journal of Taxonomy 715: 1–49 (2020)

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.

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

| Specimens | Styles | Rhabdostyles | Oxeas |
|-----------|--------|--------------|-------|
| CILE 1 Holotype (MSGN 61493) | 700–(832.5)–960 × | 240–(296.5)–435 × | 197.5–(346)–425 × |
| | 20–(25.2)–32.5 | 15–(17)–20 | 12.5–(18.7)–22.5 |
| CILE 23 | 513–(686.6)–1005 × | 238–(323.5)–451 × | 283–(399.5)–492 × |
| | 21–(26.2)–29 | 13–(19)–26 | 16–(20)–29 |
| CILE 37 | 360–(614.7)–930 × | 117.5–(253.4)–390 × | 182.5–(345.3)–425 × |
| | 2.5–(20)–30 | 12.5–(17.9)–22.5 | 5–(17.9)–22.5 |
| CILE 81 | 204–(620.6)–887 × | 194–(274.4)–418 × | 224–(393.2)–612 × |
| | 8–(13.6)–23 | 5–(14.3)–21 | 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
**Fig. 5.** *Axinella coronata* Bertolino, Costa & Pansini sp. nov., holotype (CILE 22; MSGN 61494).

A–B. The holotype in life. C. Plumose multispicular 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                                      |
|-------------------------------|------------------------|-------------------|------------------|-----------------|-------------------------------------------------------------------------------|--------------------------------------------------|
| *Axinella cylindrica*          | Regular cylindrical    | Bright yellow     | Lightly hispid   | Firm            | Styles: 700–(832.5)–960 × 20–(25.2)–32.5                                      | Chilean Fjords                                   |
| Bertolino, Costa & Pansini sp. nov. | shape, 7 cm high     |                   |                  |                 | Rhabdosstyles: 240–(296.5)–435 × 15–(17)–20 Oxeas: 197.5–(346)–425 × 12.5–(18.7)–22.5 |                                                  |
|                               |                        |                   |                  |                 | (Holotype measure)                                                            |                                                  |
| *Axinella coronata*            | Fan shaped, 2 cm high  | Bright yellow     | Very hispid      | Hard but friable | Tylostyles: 1300–(1692)–2200 × 10–(17.42)–25 Styles: 460–(505)–590 × 10–(15.62)–20 | Chilean Fjords                                   |
| Bertolino, Costa & Pansini sp. nov. |                        |                   |                  |                 | Thin sinuous styles: 460–(556.5)–600 × 2.5–(3.5)–5                          |                                                  |
| *Axinella antarctica*          | Globular, slightly    | Brown             | –                | –               | Oxeas: 500–1300 × 21–50 μm Straight or sinuous styles: 980–2400 × 30–52       | Antarctica, New Zealand                          |
| (Koltun, 1964)                 | elongated, 5.5 cm high |                   |                  |                 |                                                                                |                                                  |
| *Axinella aruensis*            | Ramified, 17 cm high   | Orange            | –                | –               | Oxeas: 336–440 × 13–21 Styles: 336–440 × 13–21                                | East African coral coast, Banda Sea, New Guinea, North, Northwest Australian coast |
| (Hentschel, 1912)              |                        |                   |                  |                 |                                                                                |                                                  |
| *Axinella australiensis*       | Ramified               | Light red         | Hispid           | –               | Oxeas: 140–400 × 9–16 Styles: 120–130 × 1.5–16                               | New Zealand                                      |
| Bergquist, 1970                |                        |                   |                  |                 |                                                                                |                                                  |
| *Axinella bronstedi*           | Erect, irregularly    | Light yellowish   | Hispid           | –               | Oxeas: 400 × 6 Styles and sinuous strongyles: 400–900 × 28                   | New Zealand                                      |
| Bergquist, 1970                | lump-shaped            |                   |                  |                 |                                                                                |                                                  |
| *Axinella corrugata*           | Lamellated,            | 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) |
| (George & Wilson, 1919)        | corrugated             |                   |                  |                 |                                                                                |                                                  |
| *Axinella crassa*              | Sub-stipitate,         | Wax yellow        | –                | Firm,          | Oxeas: 1524 × 10.4                                                            | Southeast Australia                               |
| (Carter, 1885)                 | flabellate             |                   |                  | resilient       |                                                                                |                                                  |
| *Axinella crinita*             | Arborescent, very     | Brown             | –                | Soft            | Styles I: 600–750 × 20–25 Styles II: 200–250 × 10–15 Subtylostyles: 400–500 × 2 | Chilean coasts                                   |
| Thiele, 1905                   | ramified               |                   |                  |                 |                                                                                |                                                  |
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                      |
|------------------------|-------------------------------------------------|-----------------|---------------|------------------------------|--------------------------------|-----------------------------------|
| *Axinella elegans*     | Cylindrical stalk base, dichotomising above in two places, 4.2 cm high | White after preservation | –             | Flexible and elastic         | Styles I: 550 × 15              | New Zealand                      |
| (Dendy, 1924)          |                                                 |                 |               |                              | Styles II: 270 × 12             |                                   |
|                        |                                                 |                 |               |                              | Oxeas: 270 × 12                |                                   |
| *Axinella globula*     | Hemispherical shape                             | Grey            | Very hispid   | –                            | Styles: 250–400 × up to 22     | New Zealand                      |
| Brøndsted, 1924        |                                                 |                 |               |                              |                                |                                   |
| *Axinella kirki*       | Massive hemispherical with short conical process | Yellowish/grey  | Rugose        | –                            | Oxeas: up to 1000 × 9          | South Australia                  |
| Dendy, 1897            |                                                 |                 |               |                              | Styles I: 90–110 × 5.5–7.5     |                                   |
|                        |                                                 |                 |               |                              | Styles II: 160–180 × 4–5       |                                   |
|                        |                                                 |                 |               |                              | Oxeas: 160–180 × 4–5           |                                   |
| *Axinella lesueuri*    | Arborescent                                     | –               | –             | –                            | Styles: 2300–2500 × 25–35      | Australia                        |
| Topsent, 1932          |                                                 |                 |               |                              | Styles II: 400–750 × 12–25     |                                   |
|                        |                                                 |                 |               |                              | Oxeas: 300–1100 × 20–25        |                                   |
| *Axinella lifouensis*  | Fan-shaped with cylindrical stalk base           | –               | Hispid        | –                            |                                | New Caledonia                    |
| Lévi & Lévi, 1983      |                                                 |                 |               |                              | Styles I: 2300–2500 × 25–35    |                                   |
|                        |                                                 |                 |               |                              | Styles II: 400–750 × 12–25     |                                   |
|                        |                                                 |                 |               |                              | Oxeas: 300–1100 × 20–25        |                                   |
| *Axinella loribellae*  | 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 × 8.33–(13.5±2.7)–18.3 | Northern Australia between Darwin Harbour and the Wessel Is. |
| Alvarez & Hooper, 2009 |                                                 |                 |               |                              | Sinuous strongyles: 103.6–(190.1±74)–396.3 × 6.01–(10.3±1.9)–13.09 |                                   |
|                        |                                                 |                 |               |                              | Oxeas: 148.5–(226.8±63.6)–440.2 × 4.8–(8.7±2.1)–12.9 |                                   |
| *Axinella meloniformis*| Globular                                        | Yellow, red, orange | Corrugated | Firm                          | Oxeas: 635 × 17                | Southeast Australia (Port Phillip Heads Marine National Park) |
| Carter, 1885           |                                                 |                 |               |                              |                                |                                   |
| *Axinella natalensis*  | Cup-shaped                                      | Pale yellow     | –             | –                            | Styles: 450–1200 × 12–13       | Southeast Africa (Natal)         |
| (Kirkpatrick, 1903)    |                                                 |                 |               |                              | Oxeas: 300 × 12                |                                   |
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                                                                 |
|-----------------------|-------------------------------|-------------------------------|---------|--------------------|---------------------------------------------------|-----------------------------------------------------------------------------|
| *Axinella pilifera*   | Lobate                        | Orange, brown                 | –       | Soft               | Oxeas I: 275 × 7–8.4                             | Southeast Australia (Port Phillip Heads Marine National Park)               |
| Carter, 1885          |                               |                               |         |                    | Oxeas II: 330 × 8                                 |                                                                             |
| *Axinella plumosa*    | Plumeose with peduncle        | Light grey                    | –       | –                  | Oxeas I: 80–150 × 8–12                            | New Caledonia                                                               |
| (Lévi & Lévi, 1983)   |                               |                               |         |                    | Oxeas II: 250–400 × 8–12                          |                                                                             |
| *Axinella profunda*   | Stipitate, branching          | Yellowish grey                 | Hispid  | –                  | Oxeas: 84–550 × 20–37                             | North and South Pacific Abyssal Province                                    |
| Ridley & Dendy, 1886  | dichotomously in one plane    |                               |         |                    |                                                   |                                                                             |
| *Axinella richardsoni*| Long growing, concave lamella | Dull orange                   | Hispid  | Firm,              | Styles: 232–392 × 12–20                           | New Zealand                                                                 |
| Bergquist, 1970       | lobate                        |                               |         | compressible       | Oxeas: 208–435 × 6.9–20                           |                                                                             |
| *Axinella sinoxea*    | Single or multiple fans, 4–6  | Orange, pale yellow           | Smooth  | Soft,              | Thick Styles: 159–245 × 7–17                       | Common in the vicinity of East Point Sponge Gardens, Darwin Harbour, deep water in Western Australia |
| Alvarez & Hooper, 2009| mm thick, 8–14 cm long and up | or beige with light pink tinge| but slightly | floppy,   | Thin Styles: 97–201 × 2–6                          |                                                                             |
|                       | to 30 cm wide, on common stalk;| alive; brown-grey in alcohol  | rough to | slightly,    | Raphids: 192.9–(227.2±14.9)–249.6 × 0.8–(2±0.6)–3|                                                                             |
|                       | erect, uniplanar with digitate|                               | touch   | compressible       |                                                   |                                                                             |
|                       | to irregular margins or      |                               |         |                    |                                                   |                                                                             |
|                       | bifurcate tips               |                               |         |                    |                                                   |                                                                             |
| *Axinella symbiotica* | More or less flabellate, with | Yellowish grey                 | Rather  | Curved styles/     | Styles: 200–250 × 10–15                           | New South Wales, Australia                                                  |
| Whitelegge, 1907      | a series of irregular         |                               | brittle,| Strongyles: 250–300| Oxea: (very scarce and may not belong to the      |                                                                             |
|                       | terminal branches, 18 cm     |                                | harsh to| 15–20             | sponge)                                          |                                                                             |
|                       | height                       |                                | the touch|                     |                                                   |                                                                             |
| *Axinella torquata*   | Lump shape                    | Corrugate                     | Slightly |                | Styles: 170–520 × up to 12                        | New Zealand                                                                 |
| Brøndsted, 1924       |                               |                               | hispid  | –                 | Oxeas: 325–570 × up to 14                         |                                                                             |
| *Axinella villosa*    | Digitiform                    | –                              | Hispid  | –                 | Oxeas: 330 × 10.6                                 | Port Phillip Heads Marine National Park                                    |
| Carter, 1885          |                               |                               |         |                    |                                                   |                                                                             |
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 Biemmida Morrow, 2013
Family Biemmidae Hentschel, 1923
Genus Biemna Gray, 1867

*Biemna aurantiaca* Bertolino, Costa & Pansini sp. nov.
urn:lsid:zoobank.org:act:DD1D8BC5-DCF9-4294-9FA4-80FFD911417C
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 light bright orange (Fig. 7A–B). Consistency soft and friable.

**Skeleton.** Plumoreticulate choanosome (Fig. 7C) with spongin fibres cored by bundles of spicules typical of Biemmidae. 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 raphidioid 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 *Bienna 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
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 raphidioid 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 *Biemma erecta* Bertolino, Costa & Pansini sp. nov., holotype (CILE 74; MSGN 61496). A. Styles. B. Tylostyles/subtylostyles. 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 raphidioid 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. rhabderemioides
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 (*Biemma 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.** *Biemma typica* Bertolino, Costa & Pansini sp. nov., holotype (CILE 28; MSGN 61495). **A.** The holotype in life. **B.** Plumose 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     |
|--------------------------|-------------------------------|-------------------------|----------------|----------------------------|-------------------------------------------------------------------------------|-----------------|
| *Biemna aurantiaca*      | Cushion-shaped, almost spherical | Orange tending to red   | Lightly hispid | Friable                    | Styles: 700–(842.5)–920 × 2.5–(4.8)–7.5                                     | Chile           |
| Bertolino, Costa & Pansini sp. nov. |                      |                         |                |                            | Tylostyles: 120–(269.25)–380 × 5–(12.9)–20                                      |                 |
|                          |                               |                         |                |                            | Raphids I: 105–(129.5)–200                                                   |                 |
|                          |                               |                         |                |                            | Raphids II: 27.5–(35.6)–40 × 2                                                |                 |
|                          |                               |                         |                |                            | Sigma I: 130–(160.8)–170 × 5–(5.7)–7.5                                       |                 |
|                          |                               |                         |                |                            | Sigma II: 12.5–(13.12)–17.5                                                   |                 |
|                          |                               |                         |                |                            | Styles: 1810.5–(2033.3)–2295 × 15–(17.5)–20                                    |                 |
|                          |                               |                         |                |                            | Tylostyles/Subtylostyles: 350–(607.5)–960 × 10–(18.75)–30                     |                 |
| *Biemna erecta*          | Fan-shaped, lamellar with basal peduncle | Pale yellow tending to orange | Very hispid | Soft, compressible and friable | Styles: 1810.5–(2033.3)–2295 × 15–(17.5)–20                                    | Chile           |
| Bertolino, Costa & Pansini sp. nov. |                      |                         |                |                            | Raphids I: 87.5–(115)–167.5                                                  |                 |
|                          |                               |                         |                |                            | Raphids II: 23.4–(36.55)–42.5                                                 |                 |
|                          |                               |                         |                |                            | Sigma I: 140–(159.5)–180 × 5–(5.7)–7.5                                       |                 |
|                          |                               |                         |                |                            | Sigma II: 10–(14.5)–17.5                                                      |                 |
|                          |                               |                         |                |                            | Styles I: 1275–(1450.8)–1632 × 5.2–(6.5)–7.8                                  |                 |
|                          |                               |                         |                |                            | Styles II: 293.6–(340.3)–365.22 × 2–(2.25)–2.5                                 |                 |
|                          |                               |                         |                |                            | Styles III: 220–(409.7)–640 × 10–(13.76)–20.8                                  |                 |
|                          |                               |                         |                |                            | Raphids I: 87.5–(115)–167.5                                                  | Chile           |
|                          |                               |                         |                |                            | Raphids II: 23.4–(36.55)–42.5                                                 |                 |
|                          |                               |                         |                |                            | Sigma I: 145.5–(136.7)–152 × 2.6                                               |                 |
|                          |                               |                         |                |                            | Sigma II: 12.5–(19.8)–22.5                                                    |                 |
|                          |                               |                         |                |                            | Styles: 300–350 × 6–10                                                        |                 |
|                          |                               |                         |                |                            | Raphids: 115–130 × 1                                                          |                 |
|                          |                               |                         |                |                            | Microxeas: 55–68 × 2                                                          |                 |
|                          |                               |                         |                |                            | Sigma I: 35–40                                                                | South Africa,   |
|                          |                               |                         |                |                            | Sigma II: 18–22                                                               | Southwest       |
|                          |                               |                         |                |                            | Sigma III: 10                                                                | Madagascar      |
|                          |                               |                         |                |                            | Microstyles: 35–60 × 1                                                         |                 |
| *Biemna typica*          | Massive cushion-shaped        | Bright red              | Very hispid    | Friable and compressible   | Styles: 300–350 × 6–10                                                        | Chile           |
| Bertolino, Costa & Pansini sp. nov. |                      |                         |                |                            | Raphids: 115–130 × 1                                                          |                 |
| *Biemna anisotoxa*       | Massive                        | Yellow                  | Cavernous      | Friable                    | Styles: 300–350 × 6–10                                                        | South Africa,   |
| Lévi, 1963               |                               |                         |                |                            | Raphids: 115–130 × 1                                                          | Southwest       |
|                          |                               |                         |                |                            | Microstyles: 35–60 × 1                                                         | Madagascar      |
| Species                      | Shape                                      | Colour          | Surface       | Consistency | Spicules (μm)                | Distribution                                      |
|------------------------------|--------------------------------------------|-----------------|---------------|-------------|-------------------------------|--------------------------------------------------|
| *Biemna chilensis*           | Lamellate to digitate; flabellate-digitate; spherical | Yellow          | Conulose      | Friable     | Styles: 664–1016 × 25–29     | Chile, Falklands/Malvinas, East Antarctic Wilkes Land, Kerguelen Islands |
| Thiele, 1905                 |                                            |                 |               |             | Raphids: 360–424             |                                                  |
|                              |                                            |                 |               |             | Sigma I: 46–55               |                                                  |
|                              |                                            |                 |               |             | Sigma II: 18                 |                                                  |
| *Biemna flabellata*          | Erect, lamellate                           | Dull yellow     | Hispid        | Firm        | Styles: 266–496 × 10–30      | New Zealand                                      |
| Bergquist, 1970              |                                            |                 |               |             | Microxeas I: 90–140          |                                                  |
|                              |                                            |                 |               |             | Microxeas II: 28–50          |                                                  |
| *Biemna lutea*               | Massive sponge, rather irregular, about 5 cm long and 3 cm thick | Dull yellow     | Conulose      | Soft due to the flaky texture | Styles: 530–(627.5)–660 × 5–(18.5)–32.5 | Chile                                           |
| Bertolino, Costa & Pansini 2019 |                                |                 |               |             | Raphids: 112.5–(130.6)–142.5 × 1 |                                                  |
|                              |                                            |                 |               |             | Microxeas: 35–(37)–40 × 1    |                                                  |
|                              |                                            |                 |               |             | Sigma I: 140–(159.5)–180 × 5–(5.7)–7.5 |                                                  |
|                              |                                            |                 |               |             | Sigma II: 10–(14.5)–17.5     |                                                  |
| *Biemna macrorhaphis*        | Almost spherical, up to 1 cm in size        | Yellowish grey  | Conulose      | Soft and easy to tear       | Styles: 664–1016 × 25–29 | East Antarctica                                  |
| Hentschel, 1914              |                                            |                 |               |             | Raphids: 360–424 × 1         |                                                  |
|                              |                                            |                 |               |             | Styles: 1070 × 32             |                                                  |
|                              |                                            |                 |               |             | Raphids: 120                 |                                                  |
|                              |                                            |                 |               |             | Microxeas: 1 96 × 3           |                                                  |
|                              |                                            |                 |               |             | Microxeas: II 20              |                                                  |
|                              |                                            |                 |               |             | Sigma I: 56–140               |                                                  |
|                              |                                            |                 |               |             | Sigma II: 20                  |                                                  |
|                              |                                            |                 |               |             | Styles: 350–550 × 30–50       |                                                  |
|                              |                                            |                 |               |             | Raphids: 100–130              |                                                  |
|                              |                                            |                 |               |             | Sigma I: 80–95 × 8–9          |                                                  |
|                              |                                            |                 |               |             | Sigma II: 18–20               |                                                  |
|                              |                                            |                 |               |             | Sigma III: 9–10               |                                                  |
| *Biemna novaezealandiae*     | Crust rather thin                          | White           | –             | –           |                               | New Zealand                                      |
| Dendy, 1924                  |                                            |                 |               |             |                               |                                                  |
| *Biemna pedonculata*         | Massive pedunculate claviform               | Yellowish grey  | Hispid        | –           |                               | South Africa                                     |
| Lévi, 1963                   |                                            |                 |               |             |                               |                                                  |

Table 6 (continued). 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).
Table 6 (continued). Morphological characters and distribution of the species of *Biemma* 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 |
|-----------------------|---------------------------|-------------------------|--------------------------|----------------------------|-------------------------------------------------------------------------------|--------------|
| *Biemma polyphylia*   | Erect                     | Yellowish grey          | Corrugate porous         | –                          | Styles: 450–550 × 35–45                                                      | South Africa|
| Lévi, 1963            |                           |                         |                          |                            | Raphids: 100–110 × 1                                                          |              |
|                       |                           |                         |                          |                            | Raphidoid microxeas: 35–55                                                 |              |
|                       |                           |                         |                          |                            | Sigma I: 130–160 × 6–9                                                      |              |
|                       |                           |                         |                          |                            | Sigma II: 18–20                                                              |              |
|                       |                           |                         |                          |                            | Sigma III: 9–10                                                              |              |
|                       |                           |                         |                          |                            | Styles: 420–470 × 10–16                                                        |              |
|                       |                           |                         |                          |                            | Subtylostyles: 420–480 × 10–16                                               |              |
|                       |                           |                         |                          |                            |                                                                              |              |
| *Biemma rhabderemioides* | Encrusting to massive | Bright yellow          | Hispid, conulose         | Firm                       |                                                                              | South Africa|
| Bergquist, 1961       |                           |                         |                          |                            |                                                                              |              |
|                       |                           |                         |                          |                            | Raphids: 90                                                                  |              |
|                       |                           |                         |                          |                            | Microxeas: 50 × 3                                                            |              |
|                       |                           |                         |                          |                            | Sigma I: 42–45                                                               |              |
|                       |                           |                         |                          |                            | Sigma II: 12–14                                                              |              |
|                       |                           |                         |                          |                            | Styles: 800–1210 × 13–27                                                      |              |
|                       |                           |                         |                          |                            | Rhabdostyles: 130–215 × 8–11                                                 |              |
|                       |                           |                         |                          |                            |                                                                              |              |
| *Biemma rhabdostyla*  | Thickly encrusting        | Dirty brown after preservation | Glabrous, with some conules terminating in spicule brushes | Fragile                     |                                                                              | South Africa|
| Uriz, 1988            |                           |                         |                          |                            |                                                                              |              |
|                       |                           |                         |                          |                            | Raphids: 123–160                                                             |              |
|                       |                           |                         |                          |                            | Microxeas: 40–54 × 1.5                                                        |              |
|                       |                           |                         |                          |                            | Sigma I: 53–112 × 3–4.5                                                       |              |
|                       |                           |                         |                          |                            | Sigma II: 30–45 × 2–4                                                         |              |
|                       |                           |                         |                          |                            | Sigma III: 13–22 × 1.5                                                        |              |
|                       |                           |                         |                          |                            | Styles: 350–480 × 5–11.5                                                      |              |
|                       |                           |                         |                          |                            |                                                                              |              |
| *Biemma rufescens*    | Encrusting to massive with prominent ocular fistules | Purple, yellow | Quite smooth and finely hispid | Soft and compressible |                                                                              | New Zealand |
| Bergquist & Fromont, 1988 | 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 × 19–(26.5) 30                                      |              |
|                       |                           |                         |                          |                            | Raphids: 130–(179) 238                                                       |              |
|                       |                           |                         |                          |                            | Microxeas: 58–(72) 86                                                        |              |
|                       |                           |                         |                          |                            | Sigma I: 35–(82) 100 × 2                                                      |              |
|                       |                           |                         |                          |                            | Sigma II: 10–(16) 22 × 1                                                      |              |
|                       |                           |                         |                          |                            |                                                                              |              |
| *Biemma strongylota*  | 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 | –                           |                                                                              | Antarctica   |
Order Scopalinida Morrow & Cárdenas, 2015  
Family Scopalinidae Morrow, Picton, Erpenbeck, Boury-Esnault, Maggs & Allcock, 2012  
Genus Scopalina Schmidt, 1862

Scopalina cribrosa Bertolino, Costa & Pansini sp. nov.  
urn:lsid:zoobank.org:act:2C1EE9CB-2950-4449-AD77-D32D9A781E9C  
Fig. 13; Table 7

Etymology
The new species is named after the cribrose 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 bunkeri Goodwin, Jones, Neely & Brickle, 2011 has been recorded from Chilean coast by Bertolino et al. (2019). The new species differs from S. bunkeri in having a very spiky surface and by the presence of smaller styles (Table 7). Scopalina cribrosa 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 cribrosa 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 cribrosa 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. cribrosa sp. nov. differs from S. incrustans (Lendenfeld, 1887) from Australia by its larger styles. The nine species of Scopalina reported from the Northern Hemisphere differ from S. cribrosa in the size of spicules, and often in their shape (Table 7). We, therefore, propose that Scopalina cribrosa sp. nov. should be considered as a species new to science.
Fig. 13. *Scopalina cribrosa* 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          |
|--------------------------------------------|------------------------------|-------------------------------|-----------------------------|------------------------|---------------|-----------------------|
| *Scopalina cribrosa* Bertolino, Costa & Pansini sp. nov. | Encrusting                  | Reddish orange                | Slightly hispid             | Soft                   | Styles: 520–(1616.15)–2091 × 2.5–(23.25)–32.5 | Chile        |
| *Scopalina agoga* (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          | Palu, Caroline Islands |
| *Scopalina australiensis* (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 |
| *Scopalina azurea* Bibiloni, 1993           | Encrusting, 2 × 2 cm in diameter | Blue in alcohol               | Irregular                   | Soft                   | Styles: 430–739 × 6–8          | Mediterranean Sea |
| *Scopalina blanensis* 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 |
| *Scopalina bunkeri* Goodwin, Jones, Neely & Brickle, 2011 | Thin encrusting | Rusty orange                  | Spiky                       | –                      | Styles: 694–1741              | Falklands/Malvinas, Chile |
| *Scopalina canariensis* 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 |
| *Scopalina ceutensis* 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 |
| *Scopalina erubescens* Goodwin, Jones, Neely & Brickle, 2011 | Thick crust                  | Pale pink                     | Conulose                    | –                      | Styles: 331–(395)–459 × 9.4–(13)–15.6 | Falklands/Malvinas |
| *Scopalina hapalia* (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 | Australia |
|                                           |                              |                               |                             |                        | Stongyles: 182–(231.3)–275 × 1–(2.1)–2.5 |             |
| Species                  | Shape                        | Colour                        | Surface         | Consistency          | Spicules (µm)             | Distribution                           |
|-------------------------|------------------------------|-------------------------------|-----------------|----------------------|---------------------------|----------------------------------------|
| *Scopalina hispida*     | Encrusting, 1–3 mm thick     | Light orange, pale beige in alcohol | Uneven and hispid | Soft, limy, delicate | Styles: 493–1193 × 5–12 | Caribbean Sea, Venezuelan coasts, Bermuda |
|                         | Scopalina incrustans         | Encrusting, 4 mm thick        | –               | Conulose             | Styles: 600 × 10          | Australia                             |
|                         | (Lendenfeld, 1887)           |                               |                 |                      |                           |                                        |
| *Scopalina lophyropoda* | Encrusting                   | Red, brown                    | Hispid          | –                    | Styles: 560–1000 × 4–10   | Mediterranean Sea, Alboran Sea, Azores, Cape Verde, Western and Northern Madagascar |
| Schmidt, 1862            |                               |                               |                 |                      | by Topsent. 1934          |                                        |
| *Scopalina rubra*       | Encrusting                   | Red                           | –               | Friable              | Styles: 330–550 × 10–15  | Bermuda, Caribbean Sea, Brazilian coasts |
| (Vacelet & Vasseur, 1971)|                               |                               |                 |                      |                           |                                        |
| *Scopalina ruetzleri*   | Massive semi-encrusting, lobate | Bright orange to pinkish orange | Conulose       | Soft, delicate, compressible, easily torn | Styles: 400–500 × 5.5–8 |                                        |
| (Wiedenmayer, 1977)     |                               |                               |                 |                      |                           |                                        |
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

**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.
(250–800 × 10–17 μm) and strongyles (250–350 × 7–11.2 μm). 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

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 multiradiate 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.

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

| Order                     | Inside the fjords | Outside the fjords |
|---------------------------|-------------------|--------------------|
| **Order Clionaida Morrow & Cárdenas, 2015** |                   |                    |
| *Cliona chilensis* Thiele, 1905                          | +                  |
| *Clionaopsis platei* (Thiele, 1905)                       | +                  |
| *Cliothosa hancocki* (Topsent, 1888) ?                    | Doubt presence    |
| *Spheciospongia vesparium* (Lamarck, 1815) ?              | Doubt presence    |
| **Order Desmacellida Morrow & Cárdenas, 2015**            | +                  |
| *Callyspongia fusifera* (Thiele, 1905)                    | +                  |
| *Siphonochalina fortis* Ridley, 1881                      | +                  |
| *Chalinula variabilis* (Thiele, 1905)                     | +                  |
| *Haliclona (Halichoclona) conica* (Thiele, 1905)          | +                  |
| *Haliclona (Reniera) caduca* Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | + |
| *Haliclona (Reniera) delicata* (Sarà, 1978)              | +                  |
| *Haliclona (Reniera) infundibularis* (Ridley & Dendy, 1887) | + |
| *Haliclona (Reniera) topsenti* (Thiele, 1905)             | +                  |
| *Haliclona (Rhizoniera) anceps* (Thiele, 1905)            | +                  |
| *Haliclona (Soestella) auletta* (Thiele, 1905)            | +                  |
| *Haliclona (Soestella) chilensis* (Thiele, 1905)          | +                  |
| *Haliclona algicola* (Thiele, 1905)                      | +                  |
| *Haliclona bilamellata* Burton, 1932                      | +                  |
| *Haliclona ignobilis* (Thiele, 1905)                      | +                  |
| *Haliclona inepta* (Thiele, 1905)                        | +                  |
| *Haliclona macropora* (Thiele, 1905)                      | +                  |
| *Haliclona nodosa* (Thiele, 1905)                         | +                  |
| *Haliclona rugosa* (Thiele, 1905)                        | +                  |
| *Haliclona siphonella* (Thiele, 1905)                     | +                  |
| *Haliclona sordida* (Thiele, 1905)                       | +                  |
| *Haliclona spinosella* (Thiele, 1905)                     | +                  |
| *Haliclona thielei* van Soest & Hooper, 2020             | +                  |
| *Haliclona verrucosa* (Thiele, 1905)                      | +                  |
| *Haliclona virens* (Topsent, 1908)                       | +                  |
| *Amphimedon decurtata* (Sarà, 1978)                      | +                  |
| *Amphimedon maresi* (Sarà, 1978)                         | +                  |
| *Amphimedon reticulosa* (Thiele, 1905)                    | +                  |
| *Dasychalina magellanica* (Thiele, 1905)                  | +                  |
| *Dasychalina validissima* (Thiele, 1905)                  | +                  |
| *Pachychalina tenera* Thiele, 1905                        | +                  |
**Table 8** (continued). List of sponge species hitherto recorded for the whole Chilean coast. * = new record for Chile.

| Order       | Poecilosclerida Topsent, 1928                                                                 | Inside the fjords | Outside the fjords |
|-------------|-----------------------------------------------------------------------------------------------|-------------------|-------------------|
| *Oceanapia guaiteca* Hajdu, Desqueyrroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | +                                                             |                   |
| *Oceanapia spinisphaera* Hajdu, Desqueyrroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013 | +                                                             |                   |
| **Order**   | **Poecilosclerida Topsent, 1928**                                                             |                   |                   |
| *Iophon proximum* (Ridley, 1881) |                                               | +                                                             | +                 |
| *Iophon radiatum* Topsent, 1901 |                                               | +                                                             |                   |
| *Iophon timidum* Desqueyrroux-Faúndez & van Soest, 1996 |                                               | +                                                             |                   |
| *Iophon tubiforme* Desqueyrroux-Faúndez & van Soest, 1996 |                                               | +                                                             |                   |
| *Iophon unicorne* Topsent, 1907 |                                               | +                                                             |                   |
| *Forcepia (Leptolabis) irritans* (Thiele, 1905) |                                               | +                                                             |                   |
| *Lissodendoryx (Ectyodoryx) ballena* Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 |                                               | +                                                             |                   |
| *Lissodendoryx (Ectyodoryx) coloaenensis* Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 |                                               | +                                                             |                   |
| *Lissodendoryx (Ectyodoryx) corrugata* Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 |                                               | +                                                             |                   |
| *Lissodendoryx (Ectyodoryx) diegoramirezensis* Fernandez, Cárdenas, Bravo, Lôbo-Hajdu, Willenz & Hajdu, 2016 |                                               | +                                                             |                   |
| *Batzella mollis* Thiele, 1905 |                                               | +                                                             |                   |
| *Strongylacidon platei* (Thiele, 1905) |                                               | +                                                             |                   |
| *Abyssocladiella diegoramirezensis* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Abyssocladiella umbellata* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Asbestopluma (Asbestopluma) bitrichela* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             | +                 |
| *Asbestopluma (Asbestopluma) magnifica* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Asbestopluma (Helophloeina) delicata* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Chondrocladia (Chondrocladia) schlatteri* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Chondrocladia (Meliiderma) latrunculioides* Lopes, Bravo & Hajdu, 2011 |                                               | +                                                             |                   |
| *Lycopodina microstrongyla* (Lopes, Bravo & Hajdu, 2011) |                                               | +                                                             |                   |
| *Crambe amarilla* Esteves, Lôbo-Hajdu & Hajdu, 2007 |                                               | +                                                             |                   |
| *Crambe chilensis* Esteves, Lôbo-Hajdu & Hajdu, 2007 |                                               | +                                                             |                   |
| *Crambe maldonadoi* Esteves, Lôbo-Hajdu & Hajdu, 2007 |                                               | +                                                             |                   |
| *Amphilectus americanus* (Ridley & Dendy, 1887) |                                               | +                                                             |                   |
| *Amphilectus fucorum* (Esper, 1794)? |                                               | +                                                             | Doubt presence    |
| *Amphilectus rugosus* (Thiele, 1905) |                                               | +                                                             |                   |
| *Hamigera cleistochela* Bertolino, Costa & Pansini, 2019 |                                               | +                                                             |                   |
| *Hymedesmia (Stylopus) lissostyla* (Bergquist & Fromont, 1988) |                                               | +                                                             |                   |
| *Phorbas areolatus* (Thiele, 1905) |                                               | +                                                             |                   |
| *Isodictya delicata* (Thiele, 1905) |                                               | +                                                             | +                 |
| *Latrunculia (Latrunculia) basalis* Kirkpatrick, 1908 |                                               | +                                                             |                   |
Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| Species | Inside the fjords | Outside the fjords |
|---------|-------------------|--------------------|
| Latrunculia (Latrunculia) ciruela | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Latrunculia (Latrunculia) copihuensis | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Latrunculia (Latrunculia) yepayek | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Latrunculia (Latrunculia) verenae | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Antho (Acarnia) inconspicua | (Desqueyroux, 1972) | + |
| Clathria (Clathria) discreta | Thiele, 1905 | + |
| Clathria (Clathria) lipochela | Burton, 1932 | + |
| Clathria (Clathria) microxa | Desqueyroux, 1972 | + |
| Clathria (Clathria) papillosa | Thiele, 1905 | + |
| Clathria (Cornulotrocha) polita | (Ridley, 1881) | + |
| Clathria (Cornulotrocha) roseatafioridica | Hajdu, Desqueyroux-Faúndez & Willenz, 2006 | + |
| Clathria (Microciona) antarctica | (Topsent, 1917) | + |
| Clathria (Thalysias) amabilis | Thiele, 1905 | + |
| Clathria (Thalysias) membranacea | Thiele, 1905 | + |
| Mycale (Aegogropila) magellanica | (Ridley, 1881) | + |
| Mycale (Carmia) gaussiana | Hentschel, 1914 | + |
| Mycale (Mycale) doellojuradoi | Burton, 1940 | + |
| Mycale (Mycale) thielei | Hajdu & Desqueyroux-Faúndez, 1994 | + |
| Mycale (Mycale) tridens | Hentschel, 1914 | + |
| Mycale (Oxymycale) acerata | Kirkpatrick, 1907 ? | Doubt presence |
| Hymenancora laevis | Thiele, 1905 | + |
| Hymenancora tenuissima | Thiele, 1905 | + |
| Myxilla (Burtonanchora) araucana | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Myxilla (Ectyomyxilla) chilensis | Thiele, 1905 | + |
| Myxilla (Ectyomyxilla) massa | Ridley & Dendy, 1887 | + |
| Myxilla (Myxilla) mollis | Ridley & Dendy, 1886 | + |
| Stelodoryx cribrigera | Ridley & Dendy, 1886 | + |
| Neopodospongia tupecomareni | Hajdu, Desqueyroux-Faúndez, Carvalho, Lobo-Hajdu & Willenz, 2013 | + |
| Tedania (Tedaniopsis) charcoti | Topsent, 1907 | + |
| Tedania (Tedaniopsis) mucosa | Thiele, 1905 | + |
| Tedania (Tedaniopsis) tenuicapitata | Ridley, 1881 | + |
| Trachytedania patagonica | Ridley & Dendy, 1886 | + |
| Trachytedania spinata | Ridley, 1881 | + |
| Order                          | Polymastiida Morrow & Cárdenas, 2015                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------|
|                               | *Polymastia invaginata* Kirkpatrick, 1907                                                           |
|                               | *Polymastia isidis* Thiele, 1905                                                                     |
|                               | *Scopalina bunkeri* Goodwin, Jones, Neely & Brickle, 2011                                            |
|                               | *Scopalina cribrosa* Bertolino, Costa & Pansini sp. nov.                                             |
| Order                         | Suberitida Chombard & Boury-Esnault, 1999                                                           |
|                               | *Halichondria (Halichondria) prostrata* Thiele, 1905                                                 |
|                               | *Hymeniacidon calva* (Ridley, 1881)                                                                  |
|                               | *Hymeniacidon corticata* (Thiele, 1905)                                                              |
|                               | *Hymeniacidon fernandezii* Thiele, 1905                                                              |
|                               | *Hymeniacidon longistylus* Desqueyroux, 1972                                                        |
|                               | *Hymeniacidon rubiginosa* Thiele, 1905                                                               |
|                               | *Johannesia reticulosa* (Thiele, 1905)                                                               |
|                               | *Plicatellopsis expansa* (Thiele, 1905)                                                              |
|                               | *Plicatellopsis flabellata* Burton, 1932                                                             |
|                               | *Protosuberites epiphytoides* (Thiele, 1905)                                                         |
|                               | *Pseudosuberites digitatus* (Thiele, 1905)                                                           |
|                               | *Pseudosuberites hyalinus* (Ridley & Dendy, 1887)                                                   |
|                               | *Pseudosuberites sulcatus* (Thiele, 1905)                                                            |
|                               | *Rhizaxinella strongylata* Bertolino, Costa & Pansini sp. nov.                                      |
|                               | *Suberites cranium* Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013               |
|                               | *Suberites punctatus* Thiele, 1905                                                                  |
|                               | *Suberites ruber* Thiele, 1905                                                                      |
| Order                         | Tethyda Morrow & Cárdenas, 2015                                                                     |
|                               | *Tethya melinka* Hajdu, Desqueyroux-Faúndez, Carvalho, Lôbo-Hajdu & Willenz, 2013                  |
|                               | *Tethya papillosa* (Thiele, 1905)                                                                   |
|                               | *Timea authia* de Laubenfels, 1930                                                                  |
| Order                         | Tetractinellida Marshall, 1876                                                                      |
|                               | *Stelletta clarella* de Laubenfels, 1930                                                            |
|                               | *Stelletta phrissens* Sollas, 1886                                                                  |
|                               | *Geodia magellani* (Sollas, 1886)                                                                   |
| Subclass                      | Keratosa Grant, 1861                                                                               |
| Order                         | Dendroceratida Minchin, 1900                                                                        |
|                               | *Aplysilla lendenfeldi* Thiele, 1905                                                                |
|                               | *Darwinella pronzatoi* Bertolino, Costa & Pansini sp. nov.                                          |
|                               | *Spongionella regularis* (Ridley, 1881)                                                             |
|                               | *Spongionella repens* (Thiele, 1905)                                                                |
| Order                         | Dictyoceratida Minchin, 1900                                                                        |
|                               | *Dysidea chilensis* (Thiele, 1905)                                                                  |
Table 8 (continued). List of sponge species hitherto recorded for the whole Chilean coast.

| Subclass | Order | Class | Genus and Species | Inside the fjords | Outside the fjords |
|----------|-------|-------|-------------------|-------------------|-------------------|
| Verongimorpha Erpenbeck, Sutcliffe, Cook, Dietzel, Maldonado, van Soest, Hooper & Wörheide, 2012 | Chondrillida Redmond, Morrow, Thacker, Díaz, Boury-Esnault, Cárdenas, Hajdu, Lôbo-Hajdu, Picton, Pomponi, Kayal & Collins, 2013 | Hexactinellida Schmidt, 1870 | Halisarca desqueyrouxae Willenz, Ereskovsky & Lavrov, 2016 | + | 
| | | | Halisarca magellanica Topsent, 1901 | + | 
| Amphidiscophora Schulze, 1886 | | Hexasterophora gigas (Schulze, 1886) | + | 
| Subclass | Order | Class | Genus and Species | Inside the fjords | Outside the fjords |
|----------|-------|-------|-------------------|-------------------|-------------------|
| Lyssacinosida Zittel, 1877 | | Homoscleromorpha Bergquist, 1978 | Plakina trilopha Schulze, 1880 | Doubt presence | 
| | | Homosclerophorida Bergquist, 1978 | Rossella arctica Topsent, 1872 | + | 
| | | | Rossella antarctica Carter, 1872 | + | 
| | | | Scyphidium chilense Ijima, 1927 | + | 
| Subclass | Order | Class | Genus and Species | Inside the fjords | Outside the fjords |
|----------|-------|-------|-------------------|-------------------|-------------------|
| Hexasterophora Schulze, 1886 | | | Total 187 species + 8 doubt presence | 139 | 73 |
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