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First record of *Alternatipathes bipinnata* (Cnidaria: Antipatharia) in the Southern Hemisphere

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Antipatharians are still poorly documented in the southeastern Pacific, with just eleven species reported in Chilean waters, all of them distributed in subtidal areas from 70 to 2000 m depth (Häussermann & Försterra, 2007; Cañete & Häussermann, 2012; Araya *et al.* 2016a). Among the family Schizopathidae Brook, 1889, which is characterized by polyps elongated in the direction of the axis and having a transverse diameter of 2 mm or more (Opresko, 2002), the recently described deep-water genus *Alternatipathes* Molodtsova & Opresko, 2017, encompasses two recognized species, *Alternatipathes alternata* (Brook, 1889), reported from abyssal basins (2670 to 5089 m depth) of the Indian and Pacific Oceans, and *Alternatipathes bipinnata* (Opresko, 2005), known from a few specimens collected in deep waters (1130 to 2846 m) off the Pacific coasts of northern Mexico and southern USA (Opresko, 2005; Molodtsova & Opresko, 2017).

In the present work, as part of ongoing studies reviewing deep-water macroinvertebrates from the bycatch of fisheries operating off northern Chile (Araya, 2013, 2016; Araya *et al.* 2016b, 2016c, 2016d; Araya & Catalán, 2016; Reiswig & Araya, 2014), we present the first record of *A. bipinnata* in the Southern Hemisphere, based on a single colony which was found entangled in a demersal longline used in the fishery for the Patagonian Toothfish *Dissostichus eleginoides* Smith, 1898, at about 2000 m depth, off Caldera, northern Chile. This record extends the known geographical range of the species by about 57° (more than 8152 km) in a southward direction along the western coast of South America, and it is also the twelfth confirmed black coral species record for Chile.

Material and methods

The single specimen of *A. bippinata* reported herein is deposited in the collections of the Museo de Paleontología de Caldera (MPC280617), at Caldera, Chile. Measurements of the structures discernible by the naked eye were taken using a Vernier caliper, while the microscopic structures were measured from scanning electron microscope (SEM) images. The definition of the diameter of the pinnules, height of the spines and the spine spacing follows Araya *et al.* (2016a). Fragments of branches were washed with commercial bleach and then with ethanol and distilled water for the SEM examination. The distribution map was prepared using SimpleMappr (Shorthouse, 2010). Other abbreviations include: FV: Fishing vessel; MNHNCL: Museo Nacional de Historia Natural de Chile, Santiago, Chile; RV: Research vessel; USNM; United States National Museum of Natural History, Washington, USA.

Results

Systematics

Order Antipatharia Milne-Edwards & Haime, 1857

Family Schizopathidae Brook, 1889

Genus *Alternatipathes* Molodtsova & Opresko, 2017

Type species: *Umbellapathes bipinnata* Opresko, 2005 by original designation.

Alternatipathes bipinnata (Opresko, 2005) (Fig. 1)

Umbellapathes bipinnata Opresko, 2005: 138, figs 4–5.
Alternatipathes bipinnata, Molodtsova & Opresko, 2017: 10, fig. 5.

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Description. The colony is 210 mm tall with an intact basal attachment plate (about 14 mm in maximum dimensions). The unpinnulated portion of the corallum curves slightly toward the polyp side and then backwards; the pinnulated portion curves forward, with the tip of the corallum pointing downwards. The unpinnulated portion of the stem is 195 mm long and about 1.3 mm in diameter just above the basal plate. The 39 mm long pinnulated section contains 13 pinnules, six on one side and seven on the other. The pinnules on the stem are situated in two lateral rows and are arranged in a regularly alternating pattern. The stem pinnules are inclined toward the distal end of the stem (with a distal angle of about 49° for the lowermost pinnules, decreasing to about 46° for the pinnules at the top). The length of the stem pinnules increases toward the middle of the corallum; the longest simple pinnule is 36 mm and has a basal diameter of about 0.6 mm. The lowermost pinnule on the stem is developed into a 125 mm long pinnate branch with 44 pinnules (21 on one side and 23 on the other), with distal angles of 37° to 51°. This branch is itself branched, with its lowermost pinnule having five pinnules; three on one side and two on the other. Pinnules on the stem and branch are spaced from about 2.5 mm to 4 mm apart on each side of the axis, but some of the lowermost ones on the stem are about 9 mm apart. The average density of the pinnules in each lateral row is three per centimeter, and four to five pinnules per centimeter for both rows. The planes containing the two rows of pinnules and pinnulated branches form an interior angle of 160 to 170°. The spines on the pinnules are concavely conical, with an acute apex; their base is flared out along the axis distally and proximally. They are arranged in regular rows, four or five of which are normally seen in lateral view. Within each row they are spaced at varying distances, from about 289 to 591 μm apart; they are more widely spaced towards the distal part of the pinnules. The pinnular spines are larger on the polyp side of the axis; polypar spines are 95 to 150 μm tall; abpolypar spines range from 40 to 116 μm. No additional small secondary spines are observed. Spines are also present on the stem, extending down to about 4 mm of the basal plate. Those nearest the basal plate are irregularly arranged in two or three rows, higher up they occur in more neat rows; three to five of which are visible in lateral view. The spines on the stem are larger on the polypar side of the corallum; most of them extend out perpendicularly, and only a few of them slant downward towards the base. The spines on the pinnules extend out perpendicularly or are slightly inclined distally. Due to the poor condition of the remaining soft tissue (the specimen is an almost clean skeleton), no characteristics of the polyps could be determined.

Distribution. This species was previously known from three specimens collected in deep waters (1130 to 2085 m) off the Pacific coast of Mexico (31°16.4' N; 117°34.2' W to 31°22.0' N; 117°42.2' W) and off California, USA in 2634 to 2846 m depth (USNM 1234554, USNM 1234557); the present specimen represents the first record for the species in the Southern Hemisphere (Fig. 2).

Remarks. Overall, the pinnular densities appear to be similar to that of the holotype of *A. bipinnata* (Fig. 1b). In these features, however, our specimen is similar to one of the paratypes which has a maximum pinnular length of 45 mm and a pinnular density of 4 to 5 per centimeter. The skeletal morphology is similar to that of the Northern Hemisphere specimens, with conical, acute spines with flared bases; however, the maximum size of the polypar spines is smaller in the present specimen than in the previously described specimens (159 versus 200 to 300 μm tall, respectively). The additional small secondary spines reported for the holotype (Opresko, 2005) were not found in the Chilean *A. bipinnata* (Fig. 1c–f). The smaller size of the polypar spines and the absence of secondary spines, suggests that the Chilean specimen may represent a different species. Although spine size can be a valid species-level character, the examination of a larger suite of specimens is needed to eliminate the possibility that the differences reported here represent only intraspecific variability.

Of the approximately 247 known antipatharian species (Brugler *et al.*, 2013), only eleven of them, or about 4.5 %, occur along the southeastern Pacific off Chile. All of these species only occur in subtidal waters; from 79 m for *Plumapathes fernandezi* (Pourtalès, 1874) (USNM 99762) from the Juan Fernández Archipelago to a maximum depth of 1800 m for *Lillipathes ritamariae* Opresko & Breedy, 2010, from off Caldera, in northern Chile (Araya *et al.*, 2016a). The modest number of species reported for the area may reflect the lack of sampling in deep waters; from these species four are endemic and three of them have been found only once, while the rest has been collected as bycatch in deep-water fisheries.

Records of unidentified species, in the genera *Antipathes* Pallas, 1766; *Cladopathes* Brook, 1889; *Chrysopathes* Opresko, 2003; *Leiopathes* Haime, 1849 and *Lillipathes* Opresko, 2002, are also known from the area, derived from specimens collected serendipitously in the deep-water fisheries of the Patagonian Toothfish operating at 800–2000 m depth along the entire Chilean coast (Bravo *et al.*, 2005). Additionally, material obtained in several expeditions along the coasts of the Southeastern Pacific (RV *Anton Bruun*, HMS *Challenger*, etc.), accounted for a total number of twelve antipatharian species (including species only identified to genus-level) for Chilean waters (Häussermann & Försterra, 2007). Unfortunately, species-level identification in these specimens is hindered by the lack of local experts and the scant material deposited in local institutions; they are currently absent in the collections of the MNHNCL at Santiago, Chile (Jorge Pérez-Schultheiss, *pers. comm.*). This work adds to the scarce information on black corals from the Peruvian province; the present record from northern Chile extends the biogeographical range of this species significantly southwards, and it suggests a continuous distribution of this species along the South American continental margin.

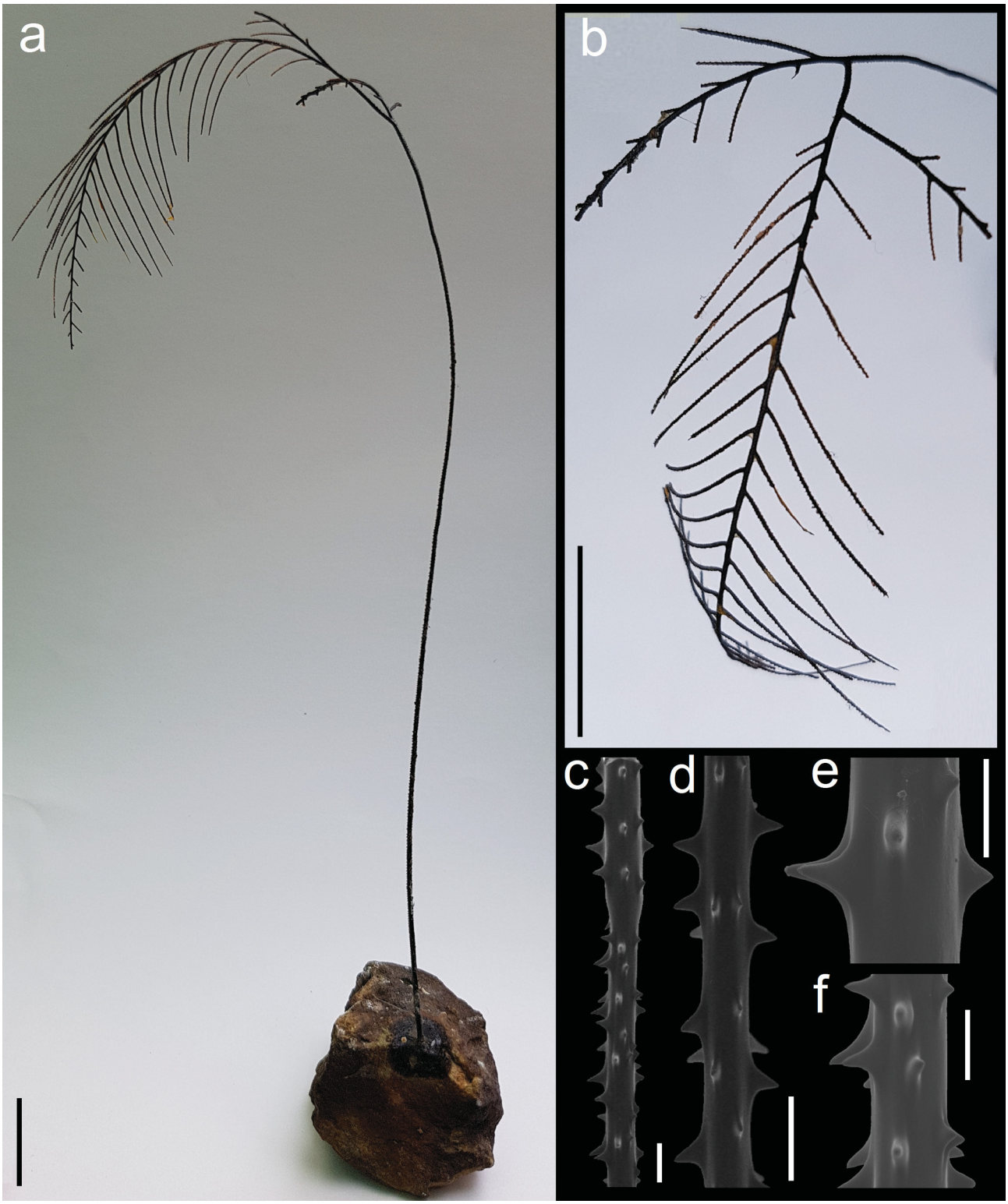

FIGURE 1. *Alternatipathes bipinnata* (Opresko, 2005) MPC280617. a, complete specimen. b, close up view of pinnulated portion of the corallum (abpolypar view). c, SEM of pinnules from pinnulated stem. d, SEM of lateral pinnule. e, detail of spines on pinnulated part of the stem. f, detail of spines on primary branch. Scale equals 20 mm for a and b, and 0.2 mm for c–f.

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FIGURE 2. Known distribution of *Alternatipathes bipinnata* (Opresko, 2005). Red circles indicate previous records and the red star denotes the location of the specimen described in this study.

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