SPIXIANA	44	1	1–8	München, November 2021	ISSN 0341-8391

A new species of *Thouarella* from Chilean Patagonia

(Anthozoa, Octocorallia, Primnoidae)

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Cairns, S. D. & Häussermann, V. 2021. A new species of *Thouarella* from Chilean Patagonia (Anthozoa, Octocorallia, Primnoidae). Spixiana 44 (1): 1–8.

A new species of the primnoid genus *Thouarella* is described from off Lenca, Northern Chilean Patagonia, bringing to four the number of *Thouarella* species known from this country. *Thouarella debilis* sp. nov. is distinctive in having very slender branchlet axes, which produces a very weakly supported colony. Occurring at 28–33 m, this species is among the shallowest of the 34 species known in the genus.

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Introduction

In the seminal field guide to the marine benthic fauna of Chilean Patagonia (Häussermann & Försterra 2009) Ofwegen et al. (2009) keyed four species of the primnoid genus *Thouarella* from off Chile: *T. chilensis*, *T. koellikeri*, *T.* sp. 1 and *T.* sp. 2. They described the latter three from shallow waters of Chilean Patagonia including in situ photographs and electron microscope pictures, but did not name two of them. Since then Taylor et al. (2013) monographed the genus, which included a key to all species, which greatly facilitates research on that genus. Using that reference, it is now apparent that *Thouarella* sp. 1 sensu Ofwegen et al. (2009) is *T. brucei* Thomson & Richie, 1906, but their *Thouarella* sp. 2 appears to be an undescribed species. It is the purpose of this paper to finally describe that species.

Primnoid gorgonians is the family including the deepest living species, which can be found down to 6400 m depth (Cairns 2016). In Chilean Patagonia, six primnoid species can be found in shallow water, a phenomenon called deep-water emergence (Häussermann et al. 2021). Gorgonian meadows formed by different species form an important part of the marine animal forests described from shallow waters of Chilean Patagonia (Försterra et al. 2017). In Northern Chilean Patagonia, the dominant primnoid gorgonian is *Primnoella chilensis* (Philippi 1894), forming dense meadows on moderately steep rocky slopes. In this region, *Thouarella* species to date have only been described from south of 44° S, and are relatively rare. In Central Chilean Patagonia, south of the Golfo de Penas (48° S), several *Thouarella* and *Acanthogorgia* species dominate the gorgonian forests (Försterra et al. 2017). These gorgonian species create habitat for other species and thus are partly responsible for the high biodiversity described from Chilean Patagonia (Fernández et al. 2000, Häussermann & Försterra 2009). However, abundances of gorgonians have been reported to decrease dramatically in anthropogenically impacted fjords (Häussermann et al. 2013), which indicates the need to monitor these sensitive species.

Fig. 1. Type locality of *Thouarella debilis* sp. nov. in shallow water of the Chilean fjord region. Triangle: study sites where *T. debilis* was collected. Squares: study sites where *T. debilis* was not found.

Material and methods

The specimens were collected by Verena Häussermann and Günter Försterra over the course of 13 years, but always from the same locality (Fig. 1). Abbreviations used in the text include: SEM – scanning electron microscopy; USNM – United States National Museum (now the National Museum of Natural History, Smithsonian); ZSM – Bavarian State Collection, Munich, Germany.

Results

Phylum Cnidaria
Class Anthozoa
Subclass Octocorallia
Order Alcyonacea
Suborder Calcaxonia Grasshoff, 1999
Family Primnoidae Milne Edwards & Haime, 1857

Genus *Thouarella* Gray, 1870

Thouarella Gray, 1870: 45. – Cairns, 2006: 175–176; 2011: 4–5. – Taylor et al., 2013: 20–21 (species groups 1 and 2, complete synonymy). – Taylor & Roger, 2015: 197.

Thouarella (Diplocalyptra) Kinoshita, 1908: 454. – Cairns & Bayer, 2009: 34–35.

Thouarella (Euthouarella) Kükenthal, 1915: 149. – Cairns & Bayer, 2009: 34. – Cairns & Wirshing, 2018: 18.

Thouarella (Parathouarella) Kükenthal, 1915: 150.

Thouarella (Epithouarella) Kükenthal, 1915: 150–151. – Cairns & Bayer, 2009: 35.

Thouarella (Thouarella) Bayer, 1956: F220. – Cairns & Bayer, 2009: 33–34. – Cairns & Wirshing, 2018: 18.

Type species. *Primnoa antarctica* Valenciennes, 1846, by monotypy.

Diagnosis (from Cairns 2011)**.** Colonies bottlebrush, uniplanar pinnate, or dichotomous in branching.

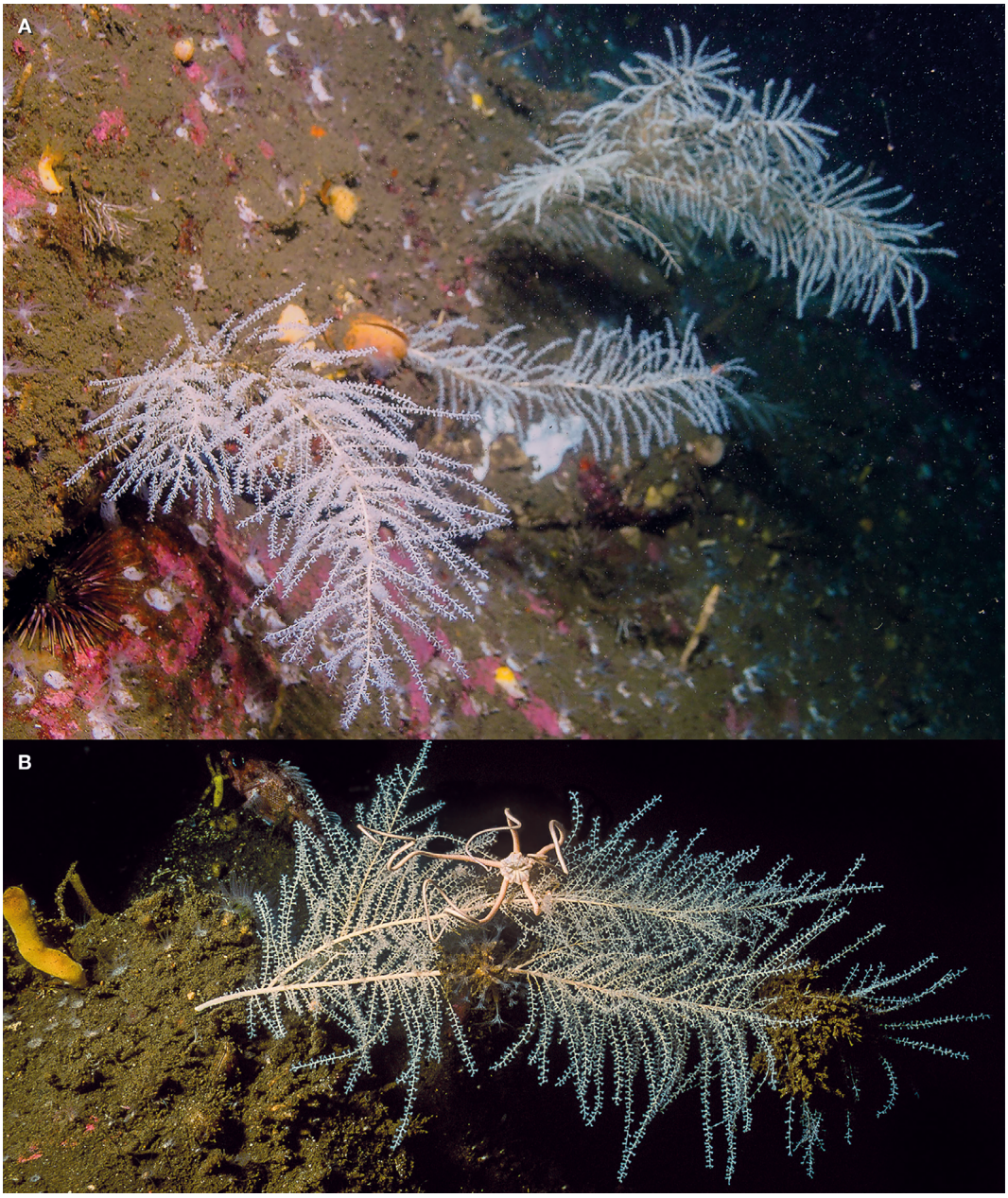

Fig. 2. *Thouarella debilis* sp. nov. in situ. Lenca, 28–35 m. **A.** Several specimens of *T. debilis* surrounded by numerous sea cucumbers of the species *Psolidium disciformis* (white). Next to the specimens the sea urchin *Arbacia dufresnii* (Blainville, 1825) and the brachiopod *Magellania venosa* (Solander, 1789). Photo: Ulrich Pörschmann; **B.** Specimen of *T. debilis* with epifauna: the crinoid *Astrotoma agassizii* and the octocoral *Clavularia*.

Polyps isolated (occurring on all sides on the stem and branchlets in a random fashion, i. e., subgenus *Thouarella*) or arranged in pairs of whorls (subgenus *Euthouarella*). Each polyp covered by 6 or 8 longitudinal rows of body wall scales, the scales on the adaxial side reduced in size and number to accommodate inward flexing of polyp. Marginal scales often arranged in 2 circles of 4 scales that alternate

with one another, each marginal bearing simple or ornate longitudinal keel or multiple keels that, when the marginals fold over the opercular scales, glide along the outer concave surface of the underlying opercular scales. Opercular scales lanceolate or tongue-shaped, often bearing a longitudinal ridge on inner surface; smaller accessory opercular scales sometimes present.

Remarks. The genus *Thouarella* has been intensely studied over the last century, its species being allocated to various subgenera and species groups (see synonymy above) based on various morphological criteria such as polyp placement, colony branching, and nature of the distal edge of the marginal scales. The history of research in this genus is recounted by Cairns (2006, 2011), Cairns & Bayer (2009), Taylor et al. (2013), Taylor & Rogers (2015), and Cairns & Wirshing (2018), and will not be repeated here, except to say that the monograph of Taylor et al. (2013) includes descriptions and illustrations of all extant species to that time (usually based on type material), an exhaustive key to the species, and a discussion of character states. Most recently, the molecular studies of Taylor & Rogers (2015) and Cairns & Wirshing (2018) suggest that there are two subgenera within the genus, differing in the arrangement of their polyps, i. e., randomly (nominate subgenus) or in pairs and whorls (subgenus *Euthouarella*). The nominate subgenus consists of 25 species, subgenus *Euthouarella* consists of nine species. The new species described herein belongs to the nominate subgenus.

Distribution. Cosmopolitan, especially common in the Antarctic and Subantarctic, 11–6400 m.

Thouarella (Thouarella) debilis sp. nov.
Figs 1–4

Thouarella (Thouarella) sp. 2 Ofwegen, Breedy & Cairns, 2008: 209–210, 955 (including 5 figures, one in situ).

Types. Holotype: Lenca, Chile, 32 m, colony and SEM stubs 1223, 1226, 2565–2566, USNM 1116614. – Paratypes: Lenca, Chile, 28 m, 8 Feb 2014, HF19-5, Museo Nacional de Historia, Santiago, Chile, MNHNCL CNID-15059; Lenca, Chile, depth unknown, 24 March 2001, USNM 1569221; Lenca, Chile, 33 m, 8 Feb 2014, HF19-5, ZSM 20190632.

Type locality. Lenca (41°38.298' S, 72°40.164' W), Chile, 32 m.

Distribution. Lenca is the only site out of hundreds of dive sites throughout Chilean Patagonia where this species was found.

Description

Colonies are very sparsely branched, the main stem sometimes remaining simple, in other colonies producing one or two secondary stems (Fig. 2A, B). The holotype is 33 cm in height and has a simple unbranched stem, whereas the largest of specimens is up to 53 cm in height. Branchlets diverge from the main stem in all directions (Fig. 3A) but are most common on opposites of the stem, producing a loose bottlebrush arrangement tending toward pinnate. The base of the main may be up to 2 mm in diameter, whereas the branchlets are very thin, filiform, only 0.5–0.15 mm in diameter and up to 50 mm in length, producing a weak or flaccid support for the polyps. The branchlets are themselves unbranched. The stem is pale yellow in colour, the polyps are white. The polyps are flared in shape (Fig. 3C, E), 1.2–1.7 mm in length, and 12–16 of them occurring randomly (not paired or in whorls, Fig. 3A) on a 1 cm length of branchlet.

The body wall scales are arranged in eight longitudinal rows, the number of scales in each row decreasing in number (but not size) from ab- to adaxial polyp side. The body wall sclerite formula is: 7–9 : 5–9 : 3–5 : 2–3, the abaxial scales (Figs 3C, 4F) increasing in size toward the base of the polyp. The marginal scales (Figs 3F, 4A–B) are diamond shaped, with broad lateral wings and thus a low L : W ratio of 1.1–1.6. They measure 0.45–0.65 mm in length, including an elongate distal spine; their distal inner surface bears a prominent, sometimes multi-ridged, serrate keel (Fig. 4B); their outer surface is sparsely granular proximally and smooth distally. Sometimes the submarginal scales (Fig. 4C) have a shorter pointed distal spine (length of scale about 0.55, L : W = 0.9–0.95), others having a rounded distal edge consistent with the other body wall scales. The body wall scales (Fig. 4F) are fan-shaped, usually broader than tall (L : W = 0.6–1.0), 0.35–0.45 mm in height, and have a straight, finely serrate distal edge. The opercular scales (Fig. 4D–E) are lanceolate in shape, 0.45–0.52 mm in length, having a L : W ranging from 1.4–2.0. Like the marginals, they bear a prominent serrate inner keel (Fig. 4E) and a sparsely granular outer surface. The operculum itself is relatively low. The coenenchymal scales (Fig. 4G–H) are circular to elliptical in shape, thin, and imbricate, ranging from 0.15–0.40 mm in greater diameter. Their upper surface bears prominent ridges that radiate from a boss near the base of each scale.

The colonies were all whitish in colour, attached to moderately steep rocky substrata covered with some sediment, with the colony protruding perpendicular from the rock.

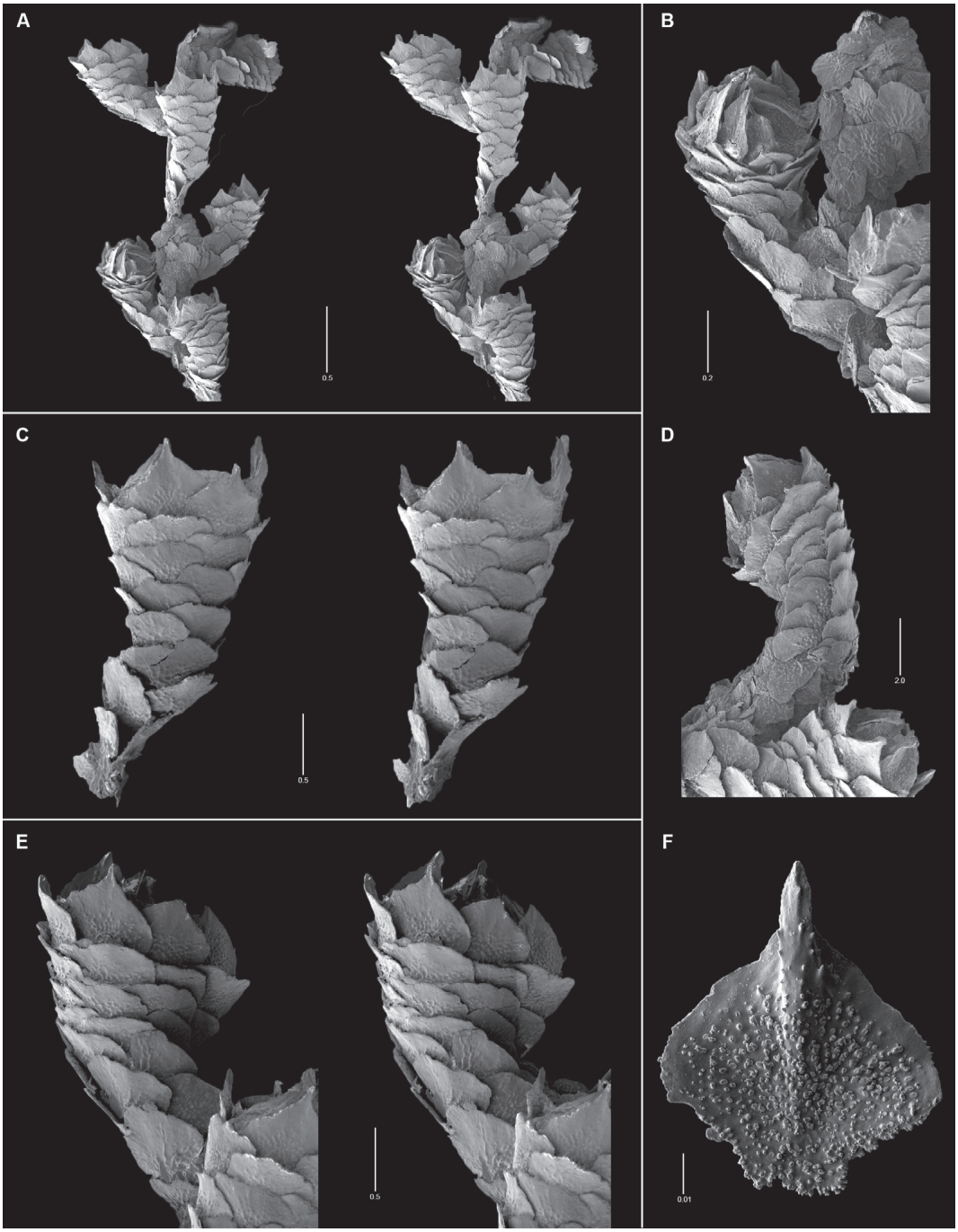

Fig. 3. Holotype of *Thouarella debilis* sp. nov., polyps and sclerite. **A.** Distal branchlet showing several polyps (stereo view); **B.** oblique adaxial view of a polyp; **C.** abaxial view of a polyp; **D.** lateral view of a polyp; **E.** lateral view of a polyp (stereo pair); **F.** marginal scale. All scale bar measurements in mm.

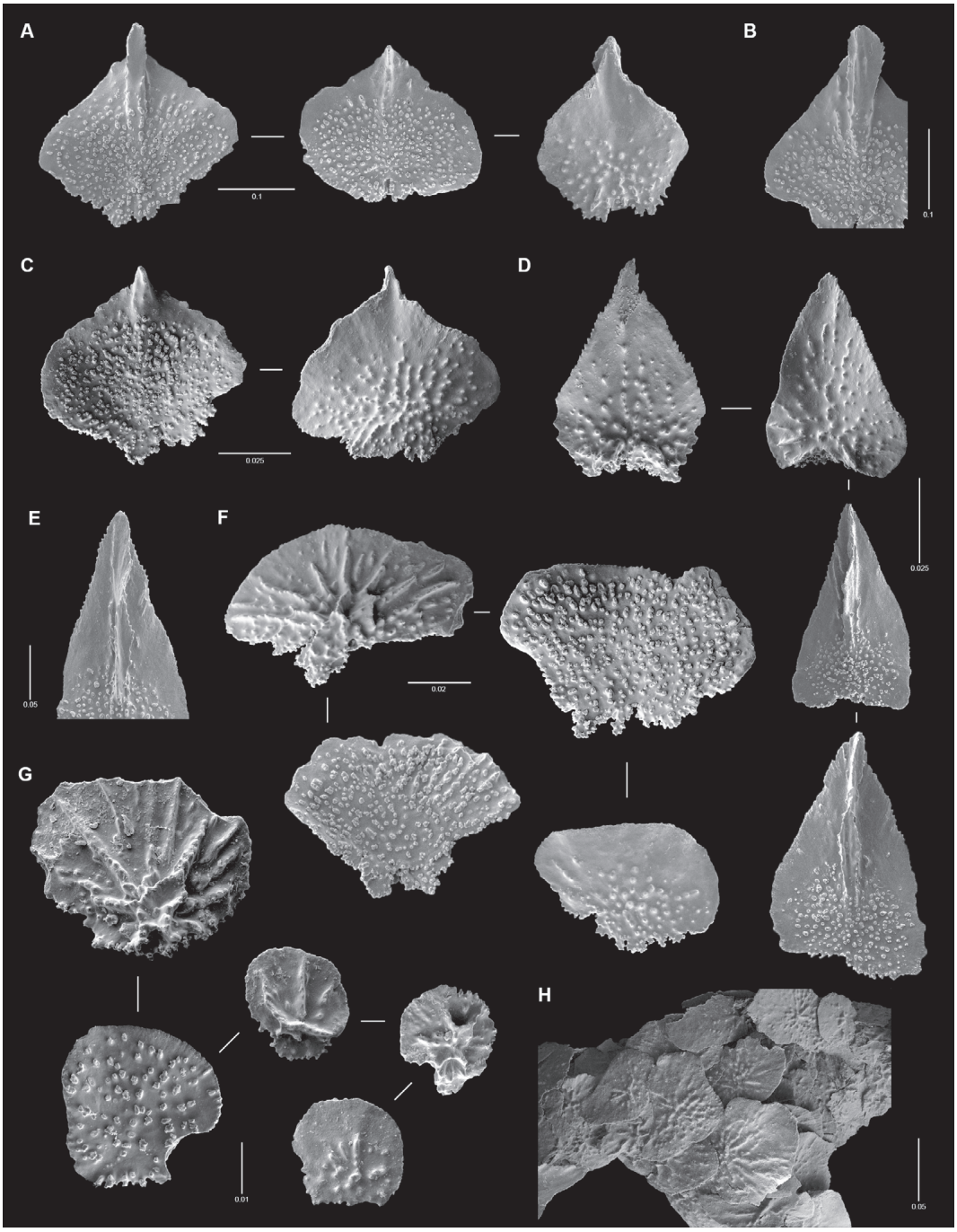

Fig. 4. Holotype of *Thouarella debilis* sp. nov., sclerites. **A.** Marginal scales; **B.** keel on inner distal face of a marginal scale; **C.** submarginal scales; **D.** opercular scales; **E.** keel of inner distal face of opercular scale; **F.** body wall scales; **G.** coenenchymal scales; **H.** coenenchymal scales in situ. All scale bar measurements in mm.

Associated species. The hard substratum below 15 m is densely populated with the primnoid gorgonian *Primnoella chilensis*; below approximately 20 m numerous deep-water sea anemones such as *Actinostola chilensis* McMurrich, 1904 have been recorded. At vertical or overhanging sites, the scleractinian coral *Desmophyllum dianthus* (Esper 1794) is found. The hard substratum around the gorgonians is inhabited by numerous holothuriids of the species *Psolidium disciformis* (Théel 1886), the zoanthid *Epizoanthus fiordicus* Sinniger & Häussermann 2009, the bryozoan *Cellaria malvinensis* (Busk 1852), the sea anemone *Gonactinia prolifera* (Sars 1835) and numerous species of sponges. The crinoid species *Astrotoma agassizii* Lyman, 1875, the octocoral *Clavularia magelhaenica* Studer, 1878, and the gastropod *Nasserius gayii* (Kiener 1834) have been recorded using *Thouarella debilis* as substrate.

Comparisons. When run through the comprehensive key to all *Thouarella* species that have isolated polyps, i. e., the nominate subgenus (Taylor et al. 2013), *T. debilis* comes closest to *T. chilensis* Kükenthal, 1908, another species obviously also known from Chile. However, *T. chilensis* differs in having a robust bottlebrush shape, much shorter (15 mm length) and thicker (0.25 mm diameter) branchlets, accessory opercular scales, and larger (2.5–2.7 mm) polyps.

Remarks. This species was briefly described and illustrated by Ofwegen et al. (2009) but not named, except for the common name of "limp bottlebrush gorgonian", as only one specimen was available. Since then more specimens have been collected and thus a formal description is given herein. It is one of the shallowest of the 34 species in the genus.

Distribution. Known only from Lenca (about 41.61° S, 72.66° W), Los Lagos Region, Gulfo de Ancud, Chile (Fig. 1), 28–38 m.

Etymology. Named *debilis* (Latin for weak), in allusion to the weak, limp, or flaccid colony strength.

Acknowledgements

We would like to thank Juan Pablo Espinoza for constructing the map and in situ colony figures, and thank Robert Ford, who constructed the Photoshop figures.

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