

## Scientific note

## High abundances of marine animal forests dominated by the primnoid gorgonian genus *Thouarella* in shallow water of Chilean Patagonia

(Anthozoa, Octocorallia, Primnoidae)

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With 38 genera and more than 240 species, the soft coral family Primnoidae is one of the richest in genera and species (Cairns & Bayer 2009, Zapata-Guardiola & López-González 2010) including groups like sea whips and bottlebrush gorgonians. It includes many deep-water species, which, in Chilean Patagonia, reach into very shallow water, a phenomenon known mainly from fjord regions worldwide that is called deep-water emergence (Häussermann et al. 2021). From diving depths in Patagonia, we have documented three species of sea whips: *Primnoella chilensis* (Philippi, 1894), *Primnoella delicatissima* Kükenthal, 1909 and *Convexella magellanica* (Studer, 1879) (Häussermann & Försterra 2009, Försterra et al. 2017). Within the primnoid family, the genus *Thouarella* is one of the most speciose and the most common one in Antarctic and Subantarctic waters (Zapata-Guardiola & López-González 2010). Four species of bottlebrush gorgonians have been described from Chile to date: 1) *Thouarella chilensis* Kükenthal, 1908 was described from Iquique, North Chile (~20°S), with no depth mentioned, and was not recorded in Chile thereafter. The closest recorded collection site of a specimen of the genus *Thouarella* is from off Tomé (36.4°S) at 761 m depth (Häussermann et al. 2021). *Thouarella chilensis* was found on the Argentinian Patagonian Shelf, in the southern Atlantic Ocean, around the Antarctic Peninsula, and in the southern Indian Ocean, at depths between 84 and 960 m (Taylor et al. 2013). 2) *Thouarella koellikeri* Wright & Studer, 1889 was described from 320 m depth at Challenger Station 308 (~50°S), in a channel east of the Madre de Dios Archipelago, Chilean Patagonia, and has been reported later from the cruises R/V W. Herwig, R/V Eltanin and R/V Hero along the Argentinean Patagonian Shelf, around

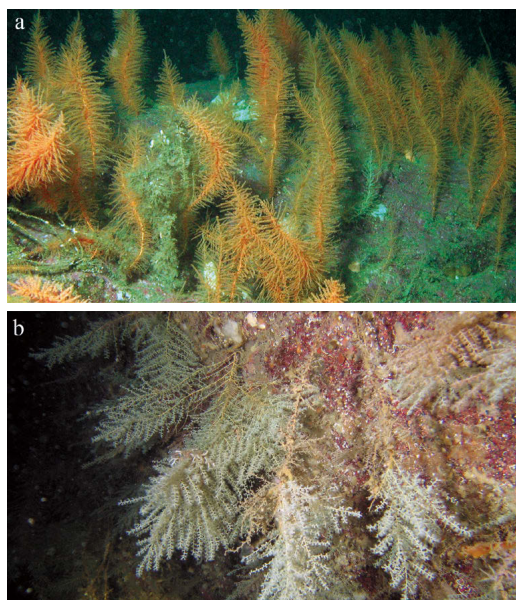
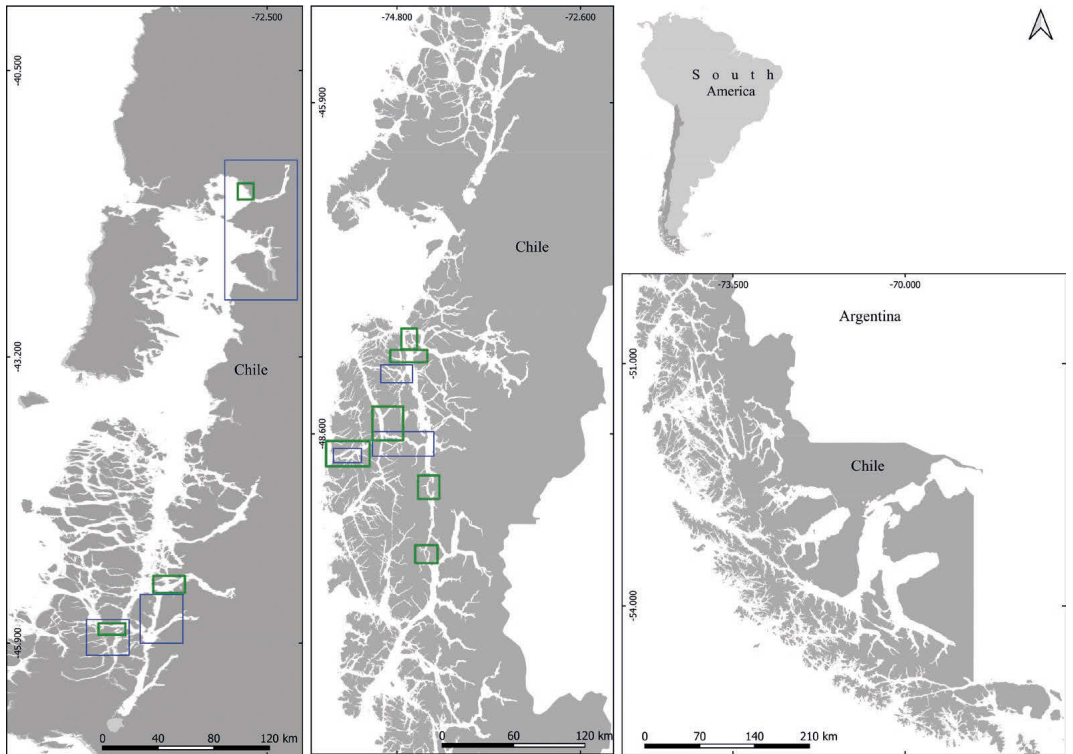


Fig. 1. Bottle brush gorgonian forests from shallow water of Chilean Patagonia. **a.** *Thouarella brucei* forest on a horizontal rocky substrate in Canal Cochrane, 25 m. Note the regular shape of the specimens with most being bright orange and a single one white. **b.** *Thouarella koellikeri* forest at a vertical rock wall at Canal Castilla, 25 m. Note the stronger branching and more irregular shape of the specimens of whitish, slightly bluish and light orange colour.

Falkland Island and off the Antarctic Peninsula between 91 m and 1920 m (Taylor et al. 2013). The specimens Betti et al. (2017, 2021) have described as *Thouarella* sp. and *T. aff. variabilis* (with a circum-

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**Fig. 2.** Distribution map of accumulations of the gorgonian genera *Primnoella* (thin blue line) and *Thouarella* (thick green line) throughout Chilean Patagonia.

Antarctic distribution), respectively, from nine out of 16 stations around Magdalena Island (approx. 44°30' to 45°S, 72°39' to 73°18' W) most probably belong to this species since we also dived at Seno Magdalena and found abundant *T. koellikeri* there. 3) *Thouarella brucei* Thomson & Ritchie, 1906 was described based on material collected during the Scottish Antarctic Expedition in 102 to 182 m from Burdwood Bank or Gough Island (Taylor et al. 2013). Later it was collected during the R/V *Eltanin*, R/V *Islas Orcadas* and R/V *Hero* cruises from the South Atlantic and around South Georgia between 261 and 686 m and from the western entrance of the Straights of Magellan, Chile (52°41'S, 74°35' W to 52°45'S, 74°28' W) between 188 m and 1908 m (Zapata-Guardiola & López-González 2010, Taylor et al. 2013). 4) We have recently described *Thouarella debilis* Cairns & Häussermann, 2021 from Lenca, Seno de Reloncaví, North Patagonia (41°38'18"S, 72°40'10" W), where it forms loose accumulations below 32 m depth (Cairns & Häussermann 2021).

During 45 SCUBA expeditions between 1998 and 2019 we studied the shallow-water marine benthic fauna at more than 500 sites throughout

Chilean Patagonia and reported 11 types of marine animal forests (Försterra et al. 2017), between others of the bottle-brush gorgonians *Thouarella brucei* and *T. koellikeri* (Fig. 1). *Thouarella brucei* is generally unbranched or very poorly branched with the typical bottle-brush shape, its colonies generally bright orange or exceptionally bright white in life (Fig. 1b). *T. koellikeri* grows as a roughly uniplanar colony with up to four main branches with a rather unorganized appearance, the secondary branches of a main branch often are of different lengths; the colonies in life are whitish, blueish or light orange (Fig. 1a). We have collected both species in diving depths (below ~20 m) in fjords and channels of the southern area of North Patagonia and in channels of Central Patagonia between 44.5°S and 53.4°S (*T. koellikeri*) and between 46°S and 53°S (*T. brucei*). At several sites, both species co-existed, with *T. koellikeri* generally dominating in North Patagonia (*T. brucei* was only present with some specimens at two sites of North Patagonia: Canal Ultima Esperanza, 45°58'34"S, 74°0'41" W and Punta Elisa, 45°17'56"S, 73°19'37" W), on steep to vertical rock walls. *Thouarella brucei* was dominating the moderately steep to horizontal rocky

substrates in some channels of Central Patagonia (e.g. along the east-west transect Canal Adalberto/ Canal Castillo/ Canal Cochrane, approx. 48.6–48.8°S, 74.5–75.5°W). We did not find any gorgonians in diving depths along the exposed coast of Chilean Patagonia and only single specimens of sea whips in South Patagonia (south of the Straights of Magellan). Specimens of the genus *Thouarella* were neither present in inner fjords of Central Patagonia, probably due to the high sediment load from the inland icefields. In some outer fjords, we documented the sea whip *Primnoella chilensis* in low density at steep walls, and in some moderately sediment-exposed channels, specimens of the genera *Acanthogorgia* and *Muriceides* were present. In Central Patagonia, the habitat-forming hydrocoral species *Errina antarctica* and the bryozoan *Aspidostoma giganteum* were often associated with the bottlebrush gorgonian forests. These marine animal forests provide habitat, protection, and food for numerous associated species. We have recorded, between others, the crinoids *Astrotona agassizi* and, less frequently, *Gorgonocephalus chilensis*. Hydrozoans, bryozoans, soft corals (e.g. *Alcyonium* spp. and *Clavularia magellanica*), sea anemones (e.g. *Actinostola chilensis*) and ascidians (e.g. *Paramolgula gregaria*) inhabited dead portions of the stem of *Thouarella* specimens. The sea anemone *Dactylanthus antarcticus* is a predator of the gorgonians and can provoke major damage to the specimens feeding on its polyps.

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