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A new alcyonacean octocoral (Cnidaria, Anthozoa, Octocorallia) from Chilean fjords

ODALISCA BREEDY[1], STEPHEN D. CAIRNS[2] & VERENA HÄUSSERMANN[3]

[1]Centro de Investigación en Ciencias del Mar y Limnología; Centro de Investigación en Estructuras Microscópicas Universidad de Costa Rica, P. O. Box 11501-2060, San José, Costa Rica; Smithsonian Tropical Research Institute, Republic of Panama, Panama. E-mail: odaliscab@gmail.com

[2]Department of Invertebrate Zoology, National Museum of Natural History, W-205, Smithsonian Institution, P. O. Box 37012, Washington, D. C. 20560, U.S.A. E-mail: cairnss@si.edu

[3]Pontificia Universidad Católica de Valparaíso, Facultad de Recursos Naturales, Escuela de Ciencias del Mar, Avda. Brasil 2950, Valparaíso, Chile, and Huinay Scientific Field Station, Chile. E-mail: v.haussermann@gmail.com

Abstract

A new species, *Swiftia comauensis*, is described from Chile. It occurs in shallow waters from 18 to 59 m in the Patagonian fjord region and seems to be endemic to the northern part of the region. The species is characterized by having straggly colonies with sparse branching and long drooping branches, prominent polyp mounds, and long, thin spindles; the colonies are bright orange with pale yellow polyp mounds. A sharp decline in colony abundance was observed between 2003 and 2013, and in January 2014 a proposal was submitted to the IUCN for the addition of this taxon to the Red List of Threatened Species.

Key words: Alcyonacea, Chile, Chilean fjord region, Cnidaria, new species, Octocorallia, Plexauridae, IUCN Red List of Threatened Species

Introduction

With a range between 42°S and 56°S and a coastline of more than 80,000 km, the Chilean Patagonian fjord region forms one of the most structured coastal marine areas in the world (Häussermann and Försterra 2009). With its labyrinth of channels and islands, it is characterized by a high amount of overlapping physical and chemical gradients (Pickart 1973), which form a complex interference pattern with a high number of different habitats (Fernandez *et al.* 2000; Häussermann and Försterra 2009). The result is an elevated number of species in the fjord region in comparison to the coast north of 42°S. Chilean Patagonia is recognized as a unique and highly fragile ecosystem (Iriarte *et al.* 2010, Pantoja *et al.* 2011) and a hotspot of biodiversity (Fernandez *et al.* 2000; Häussermann and Försterra 2009). However, due to its enormous size and complexity, the harsh weather conditions and its sparse colonization, the Chilean fjord region belongs to the least known marine regions in the world (Arntz 1999). In the framework of a recent SCUBA-based inventory project (Häussermann and Försterra 2009) more than 50 new species have been described including five new octocoral species in the genera *Incrustatus* Ofwegen *et al.*, 2006 and *Alcyonium* Linnaeus, 1758 (Ofwegen *et al.* 2006, 2007). Later, Ofwegen *et al.* (2009) mentioned the occurrence of the genus *Swiftia* in the Comau Fjord area, Northern Patagonian Zone. It was the first time the genus was reported from Chile.

The genus *Swiftia* Duchassaing & Michelotti, 1864 comprises 14 described species from the Atlantic and eastern Pacific (Williams 2013). Along the eastern Pacific, five species have been reported for California (Nutting 1909, Nutting 1912) all of them from deeper than 100 m. In this paper, we describe a new species from the Comau Fjord that has a shallower distribution than any other *Swiftia* species reported until now. The new species seems to be endemic to the northern part of the Patagonian fjord region, and we acknowledge its relevance to its unique environment.

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Material and methods

Between 1997 and early 2014, Vreni Häussermann and Günter Försterra collected, examined and preserved more than 2000 specimens of shallow-water (to 30–35 m depth) anthozoans at more than 300 sites along the Chilean coast between Arica (18°30'S) and Navarino Island, and the Beagle Channel (55ºS) with a focus on Chilean Patagonia (including more than 250 of the 300 study sites). In November 2004, February 2005 and October 2007, a remotely-operated vehicle was used to look at benthic communities down to 255 m depth at 32 sites in the Comau Fjord.

During the shallow-water surveys in the Comau Fjord, we collected specimens of *Swiftia* at one site (see Fig. 1) and documented the presence of this species at two additional sites close by (Fig 1). The Comau Fjord (42°24'14.74" S, 72°25'14.11" W) in the Hualaihué Province is located in the Northern Patagonian Zone, approx. 100 km south of Puerto Montt. It extends over 45 km, is between 2 and 8.5 km broad and possesses two lateral fjords, Quintupeu and Cahuelmo (Fig. 1). Its profile is U-shaped with near vertical walls both above and below the water. At its deepest point, it reaches nearly 500 m depth. Rainfall around 6000 mm per year produces a superficial low salinity layer.

Five specimens and two fragments of two additional colonies were collected by SCUBA diving down to 30 m. They were photographed *in situ*, preserved in 95% ethanol, and examined in detail. The morphological analysis took place in the Research Center of Microscopic Structures, University of Costa Rica (CIEMIC) following standard light and scanning electron microscopy (SEM) techniques using an Hitachi 3700 SEM (for details see Breedy & Guzman 2002). The number of polyp mounds was taken from the tip of each colony branch, independent from the colony size. It is expressed as the mean of this number by cm.

Two specimens and two fragments are deposited at the Museo de Zoología, Universidad de Costa Rica, Costa Rica (UCR); the other specimens (paratypes) are in the National Museum of Natural History, Smithsonian Institution, Washington D.C., U.S.A. (USNM); the Museo de Zoología de la Universidad de Concepción, Chile (MZUC-UCCC); and the Zoologische Staatssammlung München, Germany (ZSM).

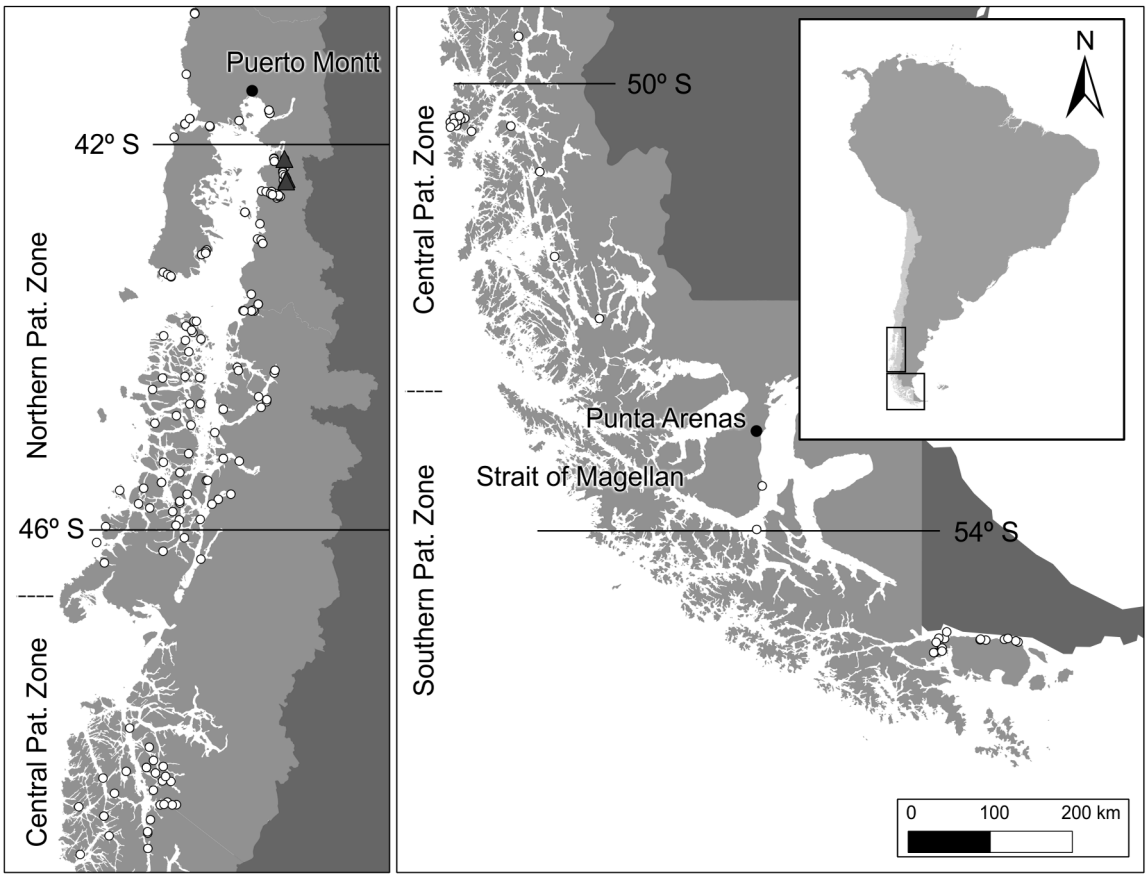

FIGURE 1. Map of Chilean Patagonia. Triangles are sites where *Swiftia comauensis* **sp. nov.** was found; white circles are surveyed sites.

Taxonomy

Class Anthozoa Ehrenberg, 1834

Subclass Octocorallia Haeckel, 1866

Order Alcyonacea Lamouroux, 1812

Family Plexauridae Gray, 1859

Genus Swiftia Duchassaing & Michelotti, 1864

Swiftia Duchassaing & Michelotti, 1864: 13; Kükenthal 1924: 236; Deichmann 1936: 185–186; Bayer 1956: F206; Bayer 1981: 945; Harden 1979: 109–110.
Stenogorgia Verrill, 1883: 29 (see Kükenthal 1924: 347 for *Stenogorgia* synonymy).
Platycaulos Wright & Studer, 1889: 61; Bayer 1981: 945.
Callistephanus Wright & Studer, 1889: 62; Bayer 1981: 945.
Allogorgia Verrill, 1928: 7; Bayer 1981: 945.

Diagnosis. Colonies branching mostly in one plane, fan-like, dichotomous, pinnate-like, or unbranched. Branches mostly free or with some anastomosing. Polyp mounds conical, prominent, or slightly raised, scattered or crowded, usually biserial and with two opposed polyp mounds at the tip of the branches. Coenenchyme usually thin. Coenenchymal sclerites are capstans, radiates and spindles. Thin, sharp and elongated spindles concentrated in the polyp mounds. Anthocodiae with points arrangements of bar-like rods straight or curved, frequently long. Collaret absent or of a few bar-like rods. Axis horny and flexible. Color of the colonies red, orange, pink or white.

Type species. *Gorgonia exserta* Ellis & Solander, 1786, by monotypy.

Remarks. According to Deichmann (1936) the definition of the genus *Swiftia* corresponds exactly with *Stenogorgia* Verrill, 1883. Deichmann stated that the problem was a misinterpretation of *G. exserta* Ellis & Solander, 1786 by Verrill and later by Kükenthal (1924). However, a thorough review is needed in order to clarify taxonomic problems related to *Swiftia*.

Swiftia comauensis sp. nov.
(Figs. 2–4)

Swiftia sp. nov. Ofwegen *et al.* 2009: 199–200

Material examined. *Holotype*: UCR 2378, chile1 Nr 22, 008, Río Tambor, Fjord Comau, Chile, 42°24'14.74" S, 72°25'14.11" W, depth 20 m, coll. V. Häussermann & G. Försterra, 13 March 2004.

Paratypes: USNM 1241828, chile1_a Nr 22, 008, Río Tambor, Fjord Comau, Chile, 42°24'14.74" S, 72°25'14.11" W, depth 20 m, coll. V. Häussermann & G. Försterra, 13 March 2004; MZUC- UCCC, chile1_b Nr 22, 008, Río Tambor, Fjord Comau, Chile, 42°24'14.74" S, 72°25'14.11" W, depth 20 m, coll. V. Häussermann & G. Försterra, 13 March 2004; ZSM 20140181, chile#5, VH 86I, close Río Tambor, Chile, depth 20 m, coll. V. Häussermann & G. Försterra, February 2004; UCR 2301, L-7, No 13, Río Tambor, 42°24'14.74" S, 72°25'14.11" W, depth 18–22 m, coll. V. Häussermann & G. Försterra, 9 October 2004.

Diagnosis. Colonies sparsely ramified with long drooping branches subdividing up to three times in lateral branches originating at open angles (60° to 90°). Anastomosis of few branches seldom present. Coenenchyme thin. Coenenchymal sclerites mostly long thin spindles, straight or branched,1.5–0.35 mm long, and tuberculate spindles, no capstans. Polyp mounds prominent and well spaced without a special type of sclerites. Anthocodial sclerites bar-like rods, and irregular flattened scales. Colour of the sclerites pale orange. Colour of the colonies bright orange with pale yellow polyp mounds.

Description. The holotype is a straggly colony scantily ramified, 13.5 cm tall, arising from an encrusting holdfast that is about 1 cm wide (Fig. 2A). The main stem is 2 mm in diameter, extending up to 4.8 cm in length, subdividing in four lateral branches, 1.5–2.8 cm apart: the lateral branches project perpendicular to the main axis,

one of them subdivides again in two branches. The branches are flexible, drooping, and reach up to 3 mm in diameter including polyp-mounds, and up to 9 cm long. The main stem is almost devoid of polyps. The colour of the colony is bright orange with pale yellow polyp mounds when alive, and keeps the colour when preserved; polyps are yellowish (Figs. 2A–B, 3). The polyps are well spaced, 1–2 mm apart, about 8 polyp mounds/cm (n=5 branches), mostly biserially arranged. The polyp mounds are raised up to 1 mm tall. The anthocodiae are preserved exsert, reaching up to 1 mm tall, and reaching up to 5 mm tall fully expanded in life (Fig. 3).

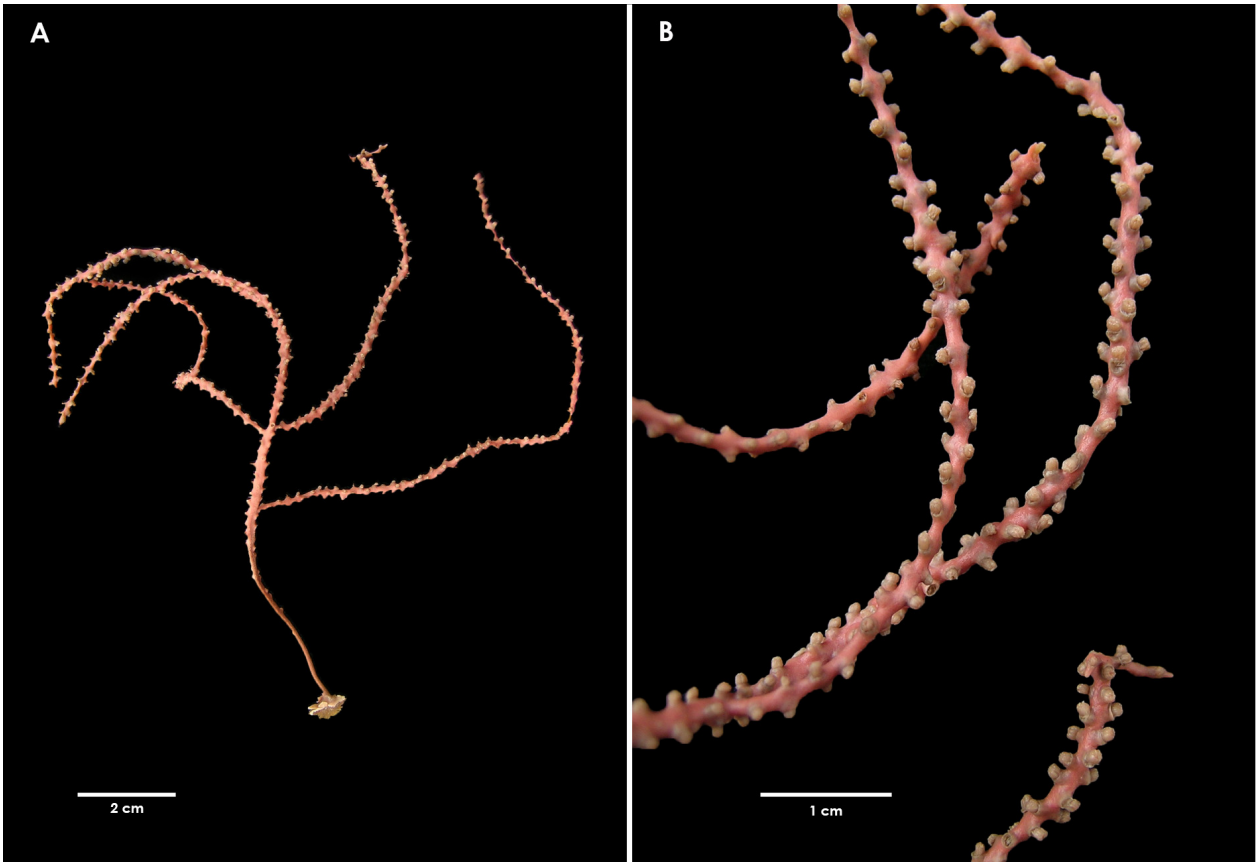

FIGURE 2. *Swiftia comauensis* **sp. nov.**, holotype UCR 2378; A, Complete colony; B, Branch detail, after preservation in ethanol.

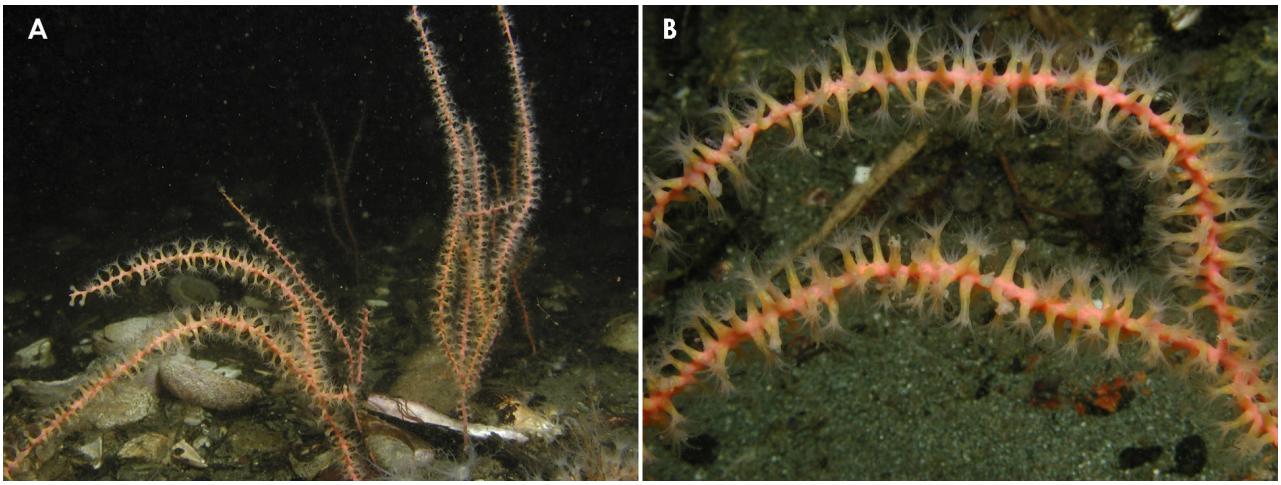

FIGURE 3. *Swiftia comauensis* **sp. nov.**, live colonies in situ, Río Tambor (type locality), 20 m.

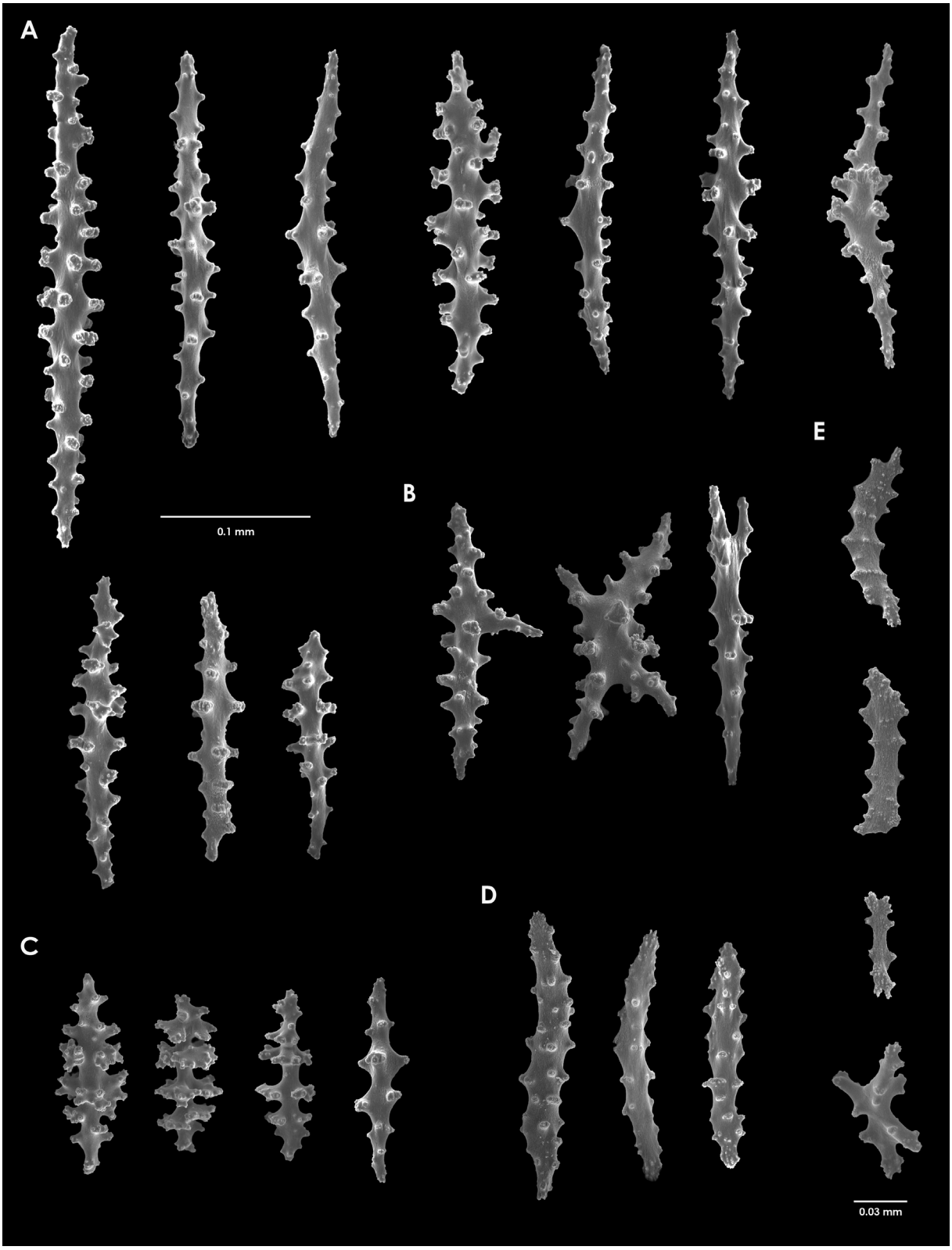

FIGURE 4. *Swiftia comauensis* **sp. nov.**, holotype UCR 2378; A–C, spindles, scale 0.1 mm; D, point bar-like rods, scale 0.1 mm; E, tentacular scales, scale 0.03 mm.

The coenenchyme is thin. Coenenchymal sclerites consist of long, thin, warty spindles, mostly straight, 1.5–0.35 mm long and 0.03–0.05 mm wide (Fig. 4A); irregularly branched spindles, 0.18–0.20 mm long and 0.01–0.03 mm wide (Fig. 4B); spindles with expanded, warty tubercles, 0.09–0.13 mm long and 0.03–0.05 mm wide (Fig. 4C); and small immature sclerites, 0.07–0.14 mm long and 0.017–0.03 mm wide. The spindles are

concentrated in the polyp mounds. The anthocodial armature is arranged in points, consisting of bar-like rods, straight or slightly bent, 0.15–0.27 mm long, and 0.025–0.036 mm wide (Fig. 4D), and irregular flattened scales around the peristome and along the tentacles, 0.06–0.1 mm long, and 0.016–0.028 mm wide (Fig. 4E). All sclerites are pale orange.

Variability. The paratypes reach up to 20 cm in height, the main stems extending up to 5 cm, and give off up to four lateral branches. Branches subdivide no more than three times. The branches are separated by about 0.5–4.5 cm, and originate at angles from 60° to 90°. Some colonies consist of a single unbranched stem. Anastomosis occurs in branches of some colonies. The branches and branchlets reach about 3–4 mm in diameter, including polyp-mounds. The polyp mounds are sparsely distributes, 6–8/cm. All other characteristics, including colours and sclerite sizes, are as in the holotype.

Distribution and abundance. This species is known only from the Comau Fjord area, SE Pacific from three sites: mouth of Río Tambor, (42°24'14.74" S, 72°25'14.11" W), Huinay dock (42º22´29"S, 72º 25´41.58"W), and the northern entrance of Quintupeu Fjord (42°9'49.32"S; 72°26'40.32"W), between 15 and at least 30 m depth. At Río Tambor and Quintupeu entrance it was observed in diving depth (15–30 m), while at Huinay dock a similar colony (not collected) was observed in 59 m depth with the ROV in October 2007. Type locality: Río Tambor, Comau Fjord.

The new species appears to be rare. In 2003 when we discovered the species, we observed approximately 30 to 40 colonies close together, approximately 50–60 cm tall at Río Tambor, and a couple of colonies at the entrance to Quintupeu Fjord. In late 2013, there were only about 10 colonies up to 20 cm tall sparsely distributed at Río Tambor, whereas, we did not see any colonies at the entrance of Quintupeu Fjord.

Habitat and Biology: The specimens are patchily distributed in clusters on hard, moderately steep to nearly vertical substrates between 15 and at least 59 m depth. At Huinay dock the predominant substrate is soft bottom, with a scattering of stones and rocks to which the observed colonies were anchored with encrusting holdfasts (Fig. 3).

We have regularly observed amphipods of the species *Caprella equilibra* Say, 1818 clinging to the stem of the gorgonian.

Etymology. The species is named after the Comau Fjord, the type locality.

Discussion

Swiftia torreyi (Nutting, 1909), *Swiftia kofoidi* (Nutting, 1909), *Swiftia spauldingi* (Nutting, 1909) and *Swiftia simplex* (Nutting, 1909) have been reported from Californian waters, but all are different from the new species described herein. *Swiftia spauldingi* has an irregularly dichotomous branching pattern and slightly raised and closely placed polyp mounds. *Swiftia simplex* is usually only branched slightly (as this new species is), but it is of a light pink colour, and having polyps, although slightly raised and closely spaced, almost the same color as the coenenchyme. These characteristics separate these two species from the new species, and from *S. torreyi* and *S. kofoidi*. The colony morphology of *S. spauldingi* and *S. simplex* looks similar to that of the genus *Psammogorgia* Verrill, 1868 in which they were originally placed, but the sclerites do not match those of *Psammogorgia* as presently defined. The other two species, *S. torreyi* and *S. kofoidi* present prominent and spaced polyp mounds like the new species. However, *S. comauensis* has sparse branching with long dropping branches different from *S. torreyi* and *S. kofoidi,* which are irregularly pinnate, conspicuously fan shaped (*S. torreyi* with characteristically dense anastomosing, relative to other species in the genus), and with stout branches. The sclerites of the new species are also different from those of the latter two species. The new species of *Swiftia* has a shallower depth range and a different geographic distribution than the others along the eastern Pacific. It is herein reported for the Northern Patagonian Zone of the Magellanic Province and from shallow-waters, down to 59 m in depth; the other species are from the Californian region and from a deeper bathymetric range, more than 100 m in depth (Nutting 1909, Nutting 1912). *Swiftia pacifica* (Nutting, 1912) and *Swiftia beringi* (Nutting, 1912) (also cited as *Calcigorgia beringi* [Heifetz *et al.* 2004]) are the other two species reported for the Pacific, both from Gulf of Alaska and the Aleutian Islands. They are fan-shaped colonies with irregular pinnate branching, *S. beringi* is a pale yellow colony and *S. pacifica* is red crimson. The sclerites in *S. beringi* are mostly small whitish radiates, and in *S. pacifica* are mostly spindles and characteristic bar-like rods. These sclerites are different from the ones in the new species.

Besides, the geographic distribution and bathymetric range (more than 880 m in depth) of *S. beringi* and *S. pacifica* are different from *S. comauensis*. It has been reported that gorgonian octocorals are affected by increased sedimentation (Rogers *et al.* 1990), and more susceptible to diseases when their environment is nutrient-enriched (Bruno *et al.* 2003). The reduced densities of *S. comauensis* in Comau Fjord from 2003 to 2013 might be connected to elevated sediment stress and increase in nutrient input through elevated impact of aquaculture. The salmonid production in Hualaihué Province, to which the Comau Fjord belongs, increased from 20,618 tons/yr in 2003 to 59,219 tons/yr in 2012; primary productivity increased by a factor of at least two during the last two decades (Mayr *et al.* 2014).

Although the region has been searched extensively (SCUBA dives down to 30–35 m depth have been carried out at more than 250 sites within Chilean Patagonia and 32 ROV transects down to 255 m depth have been carried out in the Comau Fjord) *S. comauensis* has only been found at three sites. Because the species has a restricted geographic and depth distribution (within only one fjord) and is represented by only low abundance of colonies, it might present a high risk of extinction. Therefore in January 2014 a proposal was submitted for the classification for the IUCN Red List of Threatened Species as endangered.

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